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3rd International conference on
Latest Trends in Engineering and Management

ICLTEM

26th - 27th February 2021

Amanora Park Town, Pune

3rd International conference on Latest Trends in Engineering and Management

(ICLTEM-21)

Pune, India

26th - 27th February, 2021

Institute For Engineering Research and Publication (IFERP)

Editorial

We cordially invite you to attend the **3rd International conference on Latest Trends in Engineering and Management (ICLTEM)** which will be held on **26th & 27th February 2021** in **Amanora Park Town, Pune, India**. The main objective of **3rd ICLTEM** is to provide a platform for Researchers, Students, Academicians as well as Industrial Professionals from all over the world to present their research results and development activities in relevant fields of Engineering and Management. This conference will provide opportunities for the delegates to exchange new ideas and experience face to face, to establish business or research relationship and to find global partners for future collaboration.

These proceedings collect the up-to-date, comprehensive and worldwide state-of-art knowledge on cutting edge development of academia as well as industries. All accepted papers were subjected to strict peer-reviewing by a panel of expert referees. The papers have been selected for these proceedings because of their quality and the relevance to the conference. We hope these proceedings will not only provide the readers a broad overview of the latest research results but also will provide the readers a valuable summary and reference in these fields.

The conference is supported by many universities, research institutes and colleges. Many professors played an important role in the successful holding of the conference, so we would like to take this opportunity to express our sincere gratitude and highest respects to them. They have worked very hard in reviewing papers and making valuable suggestions for the authors to improve their work. We also would like to express our gratitude to the external reviewers, for providing extra help in there view process, and to the authors for contributing their research result to the conference.

Since December 2020, the Organizing Committees have received more than 90 manuscript papers, and the papers cover all the aspects in Engineering and Management. Finally, after review, about 27 papers were included to the proceedings of **3rd ICLTEM-2021**.

We would like to extend our appreciation to all participants in the conference for their great contribution to the success of **3rd ICLTEM-2021**. We would like to thank the keynote and individual speakers and all participating authors for their hard work and time. We also sincerely appreciate the work by the technical program committee and all reviewers, whose contributions made this conference possible. We would like to extend our thanks to all the referees for their constructive comments on all papers; especially, we would like to thank to organizing committee for their hard work.

Acknowledgement

IFERP is hosting the **3rd International conference on Latest Trends in Engineering and Management (ICLTEM)** this year in month of February. The main objective of 3rd ICLTEM-2021 is to grant the amazing opportunity to learn about groundbreaking developments in modern industry, talk through difficult workplace scenarios with peers who experience the same pain points, and experience enormous growth and development as a professional. There will be no shortage of continuous networking opportunities and informational sessions. The sessions serve as an excellent opportunity to soak up information from widely respected experts. Connecting with fellow professionals and sharing the success stories of your firm is an excellent way to build relations and become known as a thought leader.

I express my hearty gratitude to all my Colleagues, staffs, Professors, reviewers and members of organizing committee for their hearty and dedicated support to make this conference successful. I am also thankful to all our delegates for their pain staking effort to make this conference successful.

Er. R. B. Satpathy
CEO (Chief Executive Officer)
Institute for Engineering Research and Publication (IFERP)

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College of Education &Language
Department of General Education

زانكۆی لوبنانی فەرەنسی
کۆلێژی پەروەردەوزمان
بەشی پەروەردەی گشتی

Prof. Dr. Vinnaras Nithyanantham, M.A., M.Phil., M.Ed., M.Phil., M.Sc., PhD.

Professor in Education
Dept. of General Education
College of Education and Languages
Lebanese French University
Erbil, Kurdistan Region, Iraq.

Message

On behalf of the 3rd International Conference (ICLTEM-21) organizing committee I am very much delighted to invite all the experts and academics from and around the world to Pune, Maharashtra, India for the international conference on "Latest Trends in Engineering and Management" that will take place on 26th and 27th February, 2021 at Pune by the IFERP.

While much inspiration and evaluation going on these days, that's too during the pandemic COVID19 era, the topic is the need of the day. It will be a great pleasure to join with the Academic Doctors, Teaching Professionals, Academicians and Scholars from and around the world. As we need to know the new trends in Engineering and Management for a better knowledge of the future social system, the conference will be an effective tool in delivering the most authentic and supportive ideas to society.

I hope you will find the conference and your intellectual discussions at the conference will be treasured and cherished.

Dr Vinnaras Nithyanantham

Dr. Abhay Kumar
Vice Chancellor,
Pratap University,
Sunderpura (Chandwaji),
Jaipur, Rajasthan.

Message

At the outset I would like to congratulate Institute for Engineering Research and Publication (IFERP) for taking revolutionary steps in imparting and promoting world class research education in India and abroad and at the same time bringing luminaries from across the globe to share their wisdom and areas of research. It is a matter of great delight and proud to see IFERP have the legacy of research and innovation being practiced consistently at their end even at the times of pandemic and conducting learning sessions and conferences in an online mode. I would like to congratulate team IFERP for the successfully organizing **3rd International conference on Latest Trends in Engineering and Management (ICLTEM- 2021)** held on 26th and 27th February 2021. The theme of this Conference is extremely important and upon reviewing the wide variety of topics & exclusive sessions covered during conference, offered unlimited scope of further research and innovation.

There are thousands of online sessions and webinars are currently going with an intent to engage masses. It is important for the organizers to make sessions content rich, engaging and learning oriented. Students must have great learning outcomes from the same. I appreciate the fact that the people not only from PAN India have delivered lectures during this conference but has witnessed sessions by people from outside India as well. These days students are in immense stress because the fall in economy and businesses is also worrying them about their career progressions, jobs, higher education, and many other personal and professional aspects. Having live sessions directly with the stake holders i.e. industry experts is needed and I am sure that this conference must have been rewarding for students and must have helped them to have a clear road map to how to proceed further especially the direction.

The deliberations made by the Industry Experts & Researchers at such forums are the source of ultimate inspiration, innovation, strategy building and career advancements to students & the research fraternity. I am sure that the Global gathering of researchers in this conference have led to great collaborations and helped the participants to identify the avenues to have much advanced and joint research for the building of NextGen World. I congratulate and offer my heartiest greetings to all national as well as international researchers, scholars, delegates, speakers, industry leaders, chairs and co-chairs of the conference for their participation in the conference.

With warm regards
Dr. Abhay Kumar

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PAPERS

Cloud Computing: A Techno-Legal Analysis of Data Security & Privacy Threats In India

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Abstract—Cloud computing is a concept that includes a set of software services on the network a standard (usually using the Internet) that contains remote data storage and online applications on remote virtual servers. Cloud architect has made miraculous progress in recent years by giving the benefits it offers like an increase in storage capacity and computing power with minimal investment. Collaborating on a computer shares information from one cloud to another cloud in an online environment. Often the private and public sectors use it. Organizations and businesses transmit information to the cloud. One user can use another user's information available in the cloud. The Indian market for cloud computing is very vibrant and consists of all varieties of cloud computing transactions taking place. The private sector is leading the way but the central government is also taking initiatives and actively considering and implementing various cloud-based computing services. While sharing information between user and server, there are risks of data attacks in the context of data security and privacy. This research paper is focused on firstly, the analysis of cloud computing service, types of delivery and the attacks that may arise and secondly, the legal control mechanism in India to mitigate the challenges. An attempt will be made to provide relevant suggestions for the better regulation of cloud computing services.

Index Terms— Cloud Computing, Data Security, Computing Services, Data Privacy, Legal Challenges

I. INTRODUCTION

Cloud computing may not be defined everywhere with the same standards, but a description of it that tends to explain the purpose of cloud computing would be to say that clouds, or clusters of distributed computers, provide on-demand resources and services over a network, usually the Internet, and the said services are not only of in bulk but also in a sequenced and protected manner as would be found in a data centre.[1] Cloud Computing clearly shows a change in the way technology is invented, developed, deployed, scaled, updated, maintained and paid for specifically with respect to Information Technology.[2]

Cloud computing represents a convergence of two major trends in information technology[3] -

(a) The efficiency of information technology to utilise both hardware as well as software resources to its fullest and

(b) The flexibility and agility of a business, so that the technology can be used as a rapid deployment, parallel batch processing, use of compute-intensive business analytics and mobile interactive applications that respond in real time to user requirements.

The basis of cloud computing is Transmission Control Protocol/Internet Protocol (TCP/IP) with the intention of integrating it with a smarter and faster microprocessor,

further ensuring a very large amount of memory available with high-speed network and reliable system architecture.[4] 'Cloud computing' has 4 basic characteristics including needing flexibility, growing exponentially or demanding scalability, wanting to run economically and independent in nature.[5]

This paper covers, the challenges that we face with respect to cloud computing and the need to regulate the same with well-established laws that can help govern all cloud-related inventions and computing devices.

II. MOTIVATION AND OBJECTIVE

The objective and motivation of this paper is to address the various challenges in the area of cloud computing and to establish the various laws and policies in place to overcome the challenges addressed. Further, this paper's motivation is to make the readers think and worry about the regulatory policies and the reasons why improvements must be seen in order to implement new laws in the context of cloud computing services.

Challenges in Cloud-computing

1. Security

Security is the most major challenge in cloud computing. A lot of personal data is stored on clouds and this may happen knowingly or unknowingly. The issue with respect to cloud

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[1] Robert L Grossman, *The Case for Cloud Computing*, 23–27 (2009)
[2] Sean Marston et al., *Cloud computing - The business perspective*, 51 DECISION SUPPORT SYSTEMS 176–189 (2011), http://dx.doi.org/10.1016/j.dss.2010.12.006
[3] Won Kim, *Cloud computing: Today and Tomorrow*, 8 JOURNAL OF OBJECT TECHNOLOGY 65–72 (2009)

[4] Chunye Gong et al., *The characteristics of cloud computing*, PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON PARALLEL PROCESSING WORKSHOPS 275–279 (2010)
[5] Sanjay Ram M, *Secure cloud computing based on mutual intrusion detection system*, 1 INTERNATIONAL JOURNAL OF COMPUTER APPLICATION 57–67 (2012)

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computing is also majorly because the customer using the services is not aware what part of their data is getting saved on their device and what is getting saved on their cloud. The simplest example that can help exhibit the problem would be- putting your data, running your software at someone else's hard disk using someone else's CPU. A lot of cases have come up in the past where the data was stolen from clouds or phishing attacks conducted through clouds and also botnet attacks majorly take place through clouds itself. For example, hackers are planning to use Cloud to organize botnet as Cloud often provides more reliable infrastructure services at a relatively cheaper price for them to start an attack.[6]

2. Costing

Since the technology was only developed a few years ago there are a lot of factors to consider like integration, computing and so on while deciding its costing. The costs increase drastically when a customer uses a cloud that is of hybrid nature that is uses computing resources of private, public as well community clouds.[7] Further the costs of integrating the data on various different clouds can also be very high as they often use protocols or interfaces that belong to someone else and therefore, must be bought. Therefore the user of the cloud computing devices must interact with various different APIs that are particularly owned by separate individuals who impose various charges to ensure confidentiality, integrity and availability of data.

3. Legal Agreements

To ensure the quality, integrity, availability and confidentiality of the data being provided on the cloud it is important to have agreements in place that provide for an assurance to consumers that their data is being treated in the best possible way. This assurance gives a sense of relief to all the consumers using the said cloud computing service, even though the consumer does not have any particular rights in hand to change the methods of computing they must have some kind of relief in terms of the services being provided. This raises a lot of difficulties with respect to implementation of the cloud computing service.

4. Cloud interoperability issue

There is a phenomenon that exists that is called "Hazy cloud effect".[8] . This severely hinders the development of cloud ecosystems by forcing vendor lockin, which prohibits the ability of users to choose from alternative vendors/offering simultaneously in order to optimize resources at different levels within an organization. This is not limited to the operation of part of the cloud computing service but also extends to the entire service being offered. This issue proves to be a very major hinderance.

Cloud Regulation and Governance in India:

Time and again the advancements in technology has diminished the necessity for physical communication in the formation of important relationships in legal terms between the parties.[9]

The legal fraternity in India has been in front of a range of complexities in dealing with technological advancements. Hence, it is to the legal fraternity to settle the code of behavior to be followed in virtual world in sustaining trustworthy legal relationships. Prior to the enactment of Information Technology Act, 2000, there was no law with respect to the usage of computers, computer systems and computer networks, as well as data and information in an electronic form in India. The IT Act deals with a range of computer related works such as digital signatures, electronic governance, electronic records, regulation of certifying authorities, duties of subscribers, cyber regulations, the appellate tribunal, etc., and also offer for legal identification of electronic documents and transactions, the admissibility of electronic data/evidence in a court of law, penalty for cybercrimes, the institution of an appellate tribunal, and regulations regarding the maintenance of electronic records. The Act has extra-territorial jurisdiction as well as intra territorial jurisdiction to covers offences.[10]

In the current scenario, the government of India is considering a separate policy in order to create a separate legal framework for cloud computing. The Telecom Regulatory Authority of India released a consultation paper in 2016 on Cloud Computing in India and recommendations on cloud services in 2017 in furtherance of this.[11] The Ministry of Electronics and Information Technology (MEITY) addresses some aspects pertaining to cloud computing in its National Policy on Information Technology and the National Telecom Policy of 2012.[12] One of the objectives of these policies is to develop an ecosystem to allow India to emerge as a global leader in the development and provision of cloud services. This focus is further enhanced in the Draft National Digital Communications Policy, 2018 released for consultations by the Department of Telecommunications on 1 May 2018.[13] This policy, when finalised and notified, will form the overarching policy framework for all aspects of digital technologies in India over the next few years. The draft policy envisages establishing India as a global hub for

[6] Tharam Dillon et al., *Cloud computing: Issues and challenges*, PROCEEDINGS - INTERNATIONAL CONFERENCE ON ADVANCED INFORMATION NETWORKING AND APPLICATIONS, AINA 27–33 (2010)

[7] Jim Gray, *Distributed Computing Economics*, 6 QUEUE 63–68 (2008)

[8] Michael R. Nelson, *Building an open cloud*, 324 SCIENCE 1656–1657 (2009)

[9] Patrick Spaulding, Ronak Merchant and Sarah Falvey, "Regulation of the Cloud in India", Journal of Internet Law, Vol. 15, No. 4, p. 7, October 2011, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1941494

[10] The Information Technology Act, 2000 as amended in 2008.

[11] https://trai.gov.in/sites/default/files/Recommendations_cloud_computing_16082017.pdf visited on 2 February, 2021

[12] http://www.nishithdesai.com/information/research-and-articles/nda-hotline/nda-hotline-single-view/newsid/4201/html/1.html?no_cache=1 visited on 4 February, 2021.

[13] http://www.nishithdesai.com/information/research-and-articles/nda-hotline/nda-hotline-single-view/newsid/4201/html/1.html?no_cache=1 visted on 6 February 2021.

cloud computing which includes a light touch regulatory approach to cloud computing. Hence, it seems reasonable to expect a growing and beneficial policy focus on cloud computing in India over the next few years.There is no legislation in India that specifically recognizes or deals with cloud computing. However, cloud computing services would fall under the ambit of the following:

Information Technology Act, 2000

As per notification by Government of India, the Information Technology (Reasonable security practices and procedures and sensitive personal data or information) Rules of 2011, for the protection of sensitive personal data or information of individuals or organizations by the entity who possesses, deals with or handles such data in a computer resource owned, controlled or operated by it. But various provisions of the rules are not applicable to entities providing services under a contractual obligation with any other entity located extraterritorially, unless such entity ensures the same level of data protection as laid down in the Rules.

So a cloud computing service company, before trading with "sensitive personal information" having a link to India, has to make sure to be in observance with the Rules as any noncompliance would invite penalties, and imprisonment in the case of any breach of contractual obligations under the Information Technology Act 2000. Hence, cloud service companies have to make sure that both the rules and terms of contract entered into with the customers are complied with.

Under Section 43A of the Information Technology Act,2000 (the IT Act) read with the Information Technology (Reasonable security practices and procedures and sensitive personal data or information) Rules 2011 (the Privacy Rules) provide guidelines for the collection, use and protection of any sensitive personal data or information of natural persons by a body corporate that possesses, deals with or handles such data. The IT Act and the Privacy Rules together set out the regulatory framework for creation, collection, storage, processing and use of electronic data (including personal and sensitive personal information recorded in electronic form) in India. Cloud computing services that deal with personal or sensitive personal information need to comply with the requirements set out under the Privacy Rules relating to security, encryption, access to data subject, disclosure, international transfer and publication of policy statements. Cloud service providers in India may also be required to comply with the Information Technology (Intermediaries Guidelines) Rules 2011 (Intermediary Guidelines) prescribed under the IT Act.

Section 2(1)(w) of IT Act defines Intermediary as "Intermediary" with respect to any particular electronic records, means any person who on behalf of another person receives, stores or transmits that record or provides any service with respect to that record and includes telecom service providers, network service providers, internet service providers, web hosting service providers, search engines, online payment sites, online-auction sites, online market places and cyber cafes."[14]

The IT Act and Privacy Rules prescribe payment of damages on account of failure to or in case of negligence in implementing or maintaining reasonable security practices to protect any sensitive personal information. The non-compliant entity is required to pay damages to the aggrieved party to the extent of wrongful loss or damage suffered by the aggrieved party. Further, any person who has received any personal or sensitive personal information for performing any services, and discloses it with a mala fide intent is liable to a fine of up to 500,000 rupees or imprisonment of up to three years, or both.

Personal Data Protection Bill, 2018

The government of India has a published a Personal Data Protection Bill, 2018 (the Bill) which if notified will overhaul the existing privacy and data protection framework in India. The Bill is in many respects similar to the EU's General Data Protection Regulation and it, inter alia, enhances the stringency of obligations and corresponding penalties governing data protection from a customer perspective. The Bill has also set high standards for the processing of personal data within India and abroad and is expected to replace or amend the IT Act and the Privacy Rules in these respects.

RBI's guidelines

In addition to the IT Act and Privacy Rules, the use of cloud computing in the banking and insurance sectors is subject to specific restrictions. The RBI's guidelines on Managing Risks and Code of Conduct in Outsourcing of Financial Services by Banks read along with the Report of Working Group of RBI on Electronic Banking set out specific requirements to be complied with by banks while engaging cloud service providers.[15] These requirements, inter alia, relate to vendor selection, data security, form of agreement, business continuity and disaster recovery or management practices.

The Insurance Regulatory and Development Authority of India's Guidelines on Information and Cyber Security for Insurers require insurers to comply with requirements, inter alia, in relation to data, application and network security, incident management, and information security audit while using services from a cloud service provider. The government retains the authority to intercept any information transmitted through a computer system, network, database or software for the prevention of serious

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[14] Section 2(1)(w), INFORMATION TECHNOLOGY ACT, 2008.
[15] https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=892 accessed on 7 February 2021.

crimes or under grave circumstances affecting public order and national security.[16]

Telecom Regulatory Authority issues Recommendations on Cloud Services

Since 2012, when the National Telecom Policy was introduced, Cloud computing has been on the Government radar, 2012 policy referred to cloud computing as " *means to improve the delivery of services, participative governance, e-commerce at globally competitive prices".[17]* In India, the concept and benefits of cloud computing have been acknowledged in the National Telecom Policy, 2012. In end-2012, the Department of Telecommunications (DoT) had sought recommendations from the Telecom Regulatory Authority of India (TRAI) on various licensing and regulatory issues arising from cloud services. The Ministry of Communications & Information Technology in December 2012 issued a reference to The Telecom Regulatory Authority of India ("**TRAI**") asking for recommendations in regard to cloud based services and its various aspects and challenges. Under Section 11(1) of the Telecom Regulatory Authority of India Act, 1997 the reference was made. Following this, TRAI issued a consultation paper in June 2016, seeking detailed inputs on various issues raised by stakeholders. Most of the stakeholders have raised concerns related to the implementation of quality of service (QoS) standards, prescription and enforcement of service level agreements (SLAs), transparent billing and metering of cloud services, data protection, security and the framework for the redressal of grievances of cloud users. Some of them are of the opinion that the licensing/registration of service providers is not required at this stage as it may be counterproductive and restrict inventions.

Integrated Goods and Services Tax Act , 2017

'Cloud services' have been specifically recognized under the Integrated Goods and Services Tax Act 2017 (the GST Act) under 'online information and database access or retrieval services' and therefore the services rendered by cloud services providers would be subject to goods and services tax. The section 2(17) of the IGST Act, 2017 states that, "Online information and database access or retrieval services" mean "services whose delivery is mediated by information technology over the internet or an electronic network, nature of which renders their supply essentially automated, involving minimal human intervention & impossible to ensure in the absence of information technology and includes electronic services such as, advertising on the internet; Providing cloud services; Provision of movie, software, e-books, music, and other intangibles through telecommunication networks or internet; Providing data or information, retrievable or otherwise, to any person in electronic form through a computer network; Online supplies of digital content (movies, television shows, music and the like); Digital data storage; and Online gaming."[18] This includes and recognizes cloud services with in its ambit as OIDAR (Online information and database access or retrieval services).

MeghRaj Policy

"The Ministry of Electronics and Information Technology (MEITY) has started implementation strategies of cloud services in Central and State Government organizations through its MeghRaj initiative."[19] The Indian government has taken the initiative to control the cloud by developing a strategic policy known as the Meghraj Policy. Its vision is clear on the goal of speeding up the delivery of e-services by the government and improving government spending on ICT. This policy is based on three principles[20]:

- All government clouds to follow the standards and guidelines set by the Government of India

- During consideration of any new Mission Mode Project (MMP) or another government project, the existing services (IaaS, PaaS, SaaS) of GI Cloud will be pre-tested for use.

- All new apps are cloud-ready

Highlights of the Meghraj Policy are the use of Optimum infrastructure, Accelerated development and distribution of eGov applications, easy duplication of effective applications in all provinces to avoid duplication of effort and expense in developing similar applications, and access to certified applications that follow common standards in one place. Government is very much focused on this Policy because changing the strategy and implementing a variety of factors including the governance system to ensure the expansion of Cloud Government.[21]

III.   CONCLUSION

This paper is a collated research of all the existing laws and policies in India that are particularly implemented with cloud computing in mind in India. The research helps establish that even though there are existing laws and policies in place with respect to cloud computing, all the challenges of cloud computing cannot be overcome within the scope of existing laws. There is a need to develop better laws and standards with respect to cloud computing and only then can the challenges be overcome. The regulatory measures of cloud computing have never been a topic that has been discussed often and a collation of the same is something that has been done for the very first time in

[16] https://www.meity.gov.in/writereaddata/files/Work%20Item8_End%20user%20guide%20for%20adoption%20of%20Cloud%20services.pdf visted on 7 February 2021.
[17] Home, DEPARTMENT OF TELECOMMUNICATIONS | MINISTRY OF COMMUNICATION | GOVERNMENT OF INDIA, http://dot.gov.in/cloud-computing.

[18] Section 2(17), INTEGRATED GOODS AND SERVICES TAX ACT, 2017.
[19] GI Cloud (MeghRaj) | Ministry of Electronics https://meity.gov.in/content/gi-cloud-meghraj
[20] Meity, Government of India's GI Cloud (Meghraj) Strategic Direction Paper, (2013). https://www.meity.gov.in/writereaddata/files/GI-Cloud%20Strategic%20Direction%20Report%281%29_0.pdf
[21] Ravindra Dastikop, Meghraj GI Cloud, https://www.slideshare.net/indravi/meghraj-government-of-india-cloud.

India. The importance of the same clearly lies in the fact that with every right comes forth many responsibilities which must be always be highlighted.

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[13] http://www.nishithdesai.com/information/research-and-articles/nda-hotline/nda-hotline-single-view/newsid/4201/html/1.html?no_cache=1 visted on 6 February 2021.

[14] Section 2(1)(w), INFORMATION TECHNOLOGY ACT, 2008.

[15] https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=892 accessed on 7 February 2021.

[16] https://www.meity.gov.in/writereaddata/files/Work%20Item8_End%20user%20guide%20for%20adoption%20of%20Cloud%20services.pdf visted on 7 February 2021.

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A Way to Look at the Management Education under the Aegis of 4.0 Industrial Revolution and Beyond

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Abstract— Stepping into the 21st century, India witnessed a transformational change in its educational system due to Globalization. It transformed Indian education to become more professional and skill based with more efficacy. At this juncture new courses were added in, which had more economic value - even in today's time pace. Management education was one among those courses which got a face lift with the changing time by adding new specialisations into its stream. Globalization and liberalization of business gave rise to varied nature of businesses in India from opening up of more manufacturing sectors, service operations, consultancy firms, and outsourcing operations which spur the need for more management graduates. To fulfil the lacunae, many management institutions were set up to equip the needs of management graduates. Since then in last twenty years, India has witnessed a phenomenal growth in management education but at the same time the quality of management education and graduate employment is not up to the mark and is questioned. Therefore we need to understand the notion of both graduate and post graduate 'employability', along with dynamics of professional labor market in this current Industrial revolution which they call it has 4th Industrial Revolution 4.0 (IR). With reference to this the issues are cropping in Academia and Employability of management graduates which needs to be sensitised. In this regard a Descriptive study is taken up and primary data is collected from MBA Alumni of Tier-2, Tier-3 MBA colleges and Employers in Karnataka to understand how they rated different Disciplines (Domains) in MBA. This was done in order to explore how Information System (ICT), IT and Business Research and Analytics as a domain was gauged compared to other disciplines like Marketing, HR, finance and General management studies. The study revealed MBA graduates were not very much influenced by the IT domain compared to other domains. The employers review on the other hand was, they were very much influenced by the ICT, IT, IS domain and marketing as they perceived good marketing skills with ICT knowledge is necessary in today's business environment, as the businesses are almost running on ERP platforms and are service oriented too, where both ICT skills and Marketing skills stands out. This signifies that though Employers outlook was very clear on IT, ICT, Business Analytics domain but students lacked in it. This conceptualises that both the students and the MBA program are under the shell of traditional management courses and not in match with requirements of the Industry.

This paper tries to forsee how the future opens up for MBA graduates in this digital world of business. And how the academia especially MBA programs needs to take in its stride about the challenges of the fourth Industrial revolution. Are we ready for this?.

Index Terms— Academia, Industry, Employability, Globalization, Liberalization, Privatization, Fourth Industrial Revolution 4.0 (IR), Internet of Technology (IoT), Information System (IS)

I. INTRODUCTION

During the second half of the twentieth century, tremendous changes have been seen in the business environment. Industrialized countries' - domestic markets got saturated this triggered them to move beyond boundaries for their business opportunities in foreign markets, reduction in trade-barriers, availability of low cost labor (labor arbitrage), innovation in technology, global investment, emerging economies of the developing countries and global market place - all this stimulated in creation of jobs and generation of wealth. Due to these facts the global marketplace became more challenging than ever before. Organizations needed executives / managers who were agile, flexible and can work beyond boundaries. It wanted they understand the theory of management and business and apply to the real world. Further, they also wanted that their executives to be pro-active to the new threats and opportunities so that they can drive growth and success in

the future. Here, Management education (MBA) came to rescue of the businesses around the world. But as of today the scenario is completely changed - it is evident that changing business scenarios due to rampant change in technology, the emergence of fourth Industrial revolution has triggered new horizons for business. We need today a Socio-Technical approach in optimising organisational performance, as automation, IoT, Digitisation is going to eat up many marginal jobs and at the same time it is going to make up for new skilled Information systems, jobs in big data, cloud computing, robotics - were their trajectories are already on upside growth phase. The consequences what we could see is job redundancy, job dis-satisfaction, job cut outs which is going to bring in change in organisational behaviour. The studies done by the Socio-Technical school of thoughts in the mid of the 20th century at the Tavistock Institute in London is evident even in today's scenario. The researchers with a background in the behavioural sciences (Sociology, Psychology,

Anthropology) suggested that *'what was needed was a fit between the technical sub-system and the social subsystem which together made up an organization.'* Tavistock/socio-technical theorists emphasize that *'both the social and technical systems must be jointly optimized.'* They say rational approaches *'ignore the psychological and social needs of the workers when introducing new technologies, and tend to over formalize the worker's activities and interactions in forcing a fit between the worker and the technology.'* Therefore technology and change in organisation behaviour should mutually adjust to one another until a balanced trade-off takes place. The approach one has to make towards investment in digitisation, automation has to be based on sound understanding on the Return on investment and at the same time it should derive value to the organisations' product and to all its stake-holders. Hence the higher education especially the MBA programs has to understand about the 4 (IR) and its impact on employment of Management graduates. To understand these behavioural changes it is paramount that today's management education system should be dynamic and pro-active and should provide graduates with bundle of skills, competencies and capabilities with technical skills to build a career that facilitates meaningful contributions to every pursuit of life, whether one wishes to be entrepreneur or working for a manufacturing or service sector. Its aim should be to generate significant Tangible and Intangible inputs to careers and their employing organizations. Tangible asset meaning an MBA graduate should become a tangible asset to the organisation with complete pack of attributes that he has earned and learnt from Management program. Intangible asset meaning – knowledge gained from Management program in order to put the Employers into profits by the optimum and most productive utilization of men, materials, Internet of technology thus bringing in a positive impact on economic front of the country as a whole. If this has to be seen on reality basis in today's world - students must develop generic skills that are communication skill, negotiation skills, they should be technology savvy (literate technologist to understand different aspect of Management Information System on real-time basis), working in team, time management, leadership and critical thinking. Also acquire knowledge of ethics, social responsibility, law, and public policy which are evident in their career success. To meet all this, in this new age of digital globalization, the pedigree of quality management education by enlarge depends upon the collective efforts of the higher education, regulating authority, the educational institutions, Universities, faculties and the students too. Management education can be really strong when all these pillars of education uniformly blend. However, above all this, the MBA program today has to meet Industry requirements so that there is a seamless synergy between Academia and Industry.

II. LITERATURE REVIEW

The research done by many authors reveal that management graduates are not Industry ready. These critics claim that on one side academia is not producing those students who can demonstrate the skills that corporate deems to be most important on the other side students are blamed for not building their capabilities though the subject knowledge which was imparted rightly. Here what is understood is Employers criticize both - the business schools as well as management graduates as they lack in transferring the content knowledge to real situations in this global work place Ainsworth & Morley (1995), and Carter et. al (1999). Further, many of the skills and abilities provided by earlier management education which is believed to be successful in launching career may not be applicable in the current ever-changing business scenario Tanyel et al. (1999). As the business environment changes so does the desired skills and abilities of MBA graduates must also change and get updated. Today's business environment is characterized as global, technological intense followed by cut throat competition and dynamic Tanyel, Mitchell, and Mclam (1999). Business models are changing constantly, making it difficult to run businesses profitably without the help of exceptional Talent. In every sector or division, organizations need creative and productive Talent to succeed. It is during these times, of change, the management graduates could bring most gain to the organisations - if they prepare themselves very early for higher education and be realistic about their roles for which their MBA program will qualify them as they will be the change agents. Thus, innovations in technology have created opportunities as well as problems for employers and businesses. The transfer of technology, information and communication technology (ICT) has made the world a global village and worldwide playing field. Businesses are running 24/7 throughout the clock. An organizations' core-competency as of today is how best and fast it provides service to its clients which enables them having an competitive edge over its counter parts – which relies upon how effectively and efficiently the technical skills are put into practice and seamlessly interfaced with technology. Successful integration and interface of technology dependence upon how quickly fresh management graduate accumulate new technical skills which are taught to them and this acquisition of new skills is facilitated when a management trainee is having sound basic knowledge. In order to get into the groove of this situation, Seedat Osman (2019), in his article 'Scaling up the MBA for relevance in the Fourth Industrial Revolution' says that beyond 2020, we expect to see more and more MBA courses that have a techno-managerial content. A curriculum that integrates theory and applied skills-that prepare students for Industry 4.0.

To look at Industry 4.0 we need to see what happened earlier to this- there was a strong connect between a specific technology and a specific market. For example, information technology was used by the electronic products such as TVs, computers, cellular phones, and so on, while mechanical things were applied in the automobile industry. What it meant was IT was completely independent and no way had bearing on automobile industry, while

mechanics was not related to electronics. Both had different markets as technologies were separate. Now, such separations are moving away rapidly and both the technologies are merging rampantly powered by advances in information technology such as artificial intelligence, big data, and so on. This is what we witness in Industry 4.0 (4IR) which emphasis on digital technology from the recent past to a whole new level through the interconnectedness - by using Internet of Things (IoT) to access real-time data, and the introduction of cyber-physical systems. *'Industry 4.0 offers a more comprehensive, interlinked, and holistic approach to manufacturing. It connects physical with digital, and allows for better collaboration and access across departments, partners, vendors, product, and people. Industry 4.0 empowers business owners to better control and understand every aspect of their operation, and allows them to leverage instant data to boost productivity, improve processes, and drive growth.'* Epicor.

Furthermore, literature suggests that at this point in time we cannot foresee which scenario is likely to emerge and the acceleration of innovation and the velocity of disruption are hard to both comprehend and anticipate. Physical products and services as we see are now enhanced with digital capabilities that increase their value for example AI is used to enable the cars to navigate through the traffic and handle complex situations. Also, with a combined AI software and other IoT sensors, such as cameras, it becomes easier to ensure proper and safe driving. New technologies make assets more durable and resilient, while data and analytics are transforming how they are maintained. These results prove that already it is having significant impacts on businesses that is with growing transparency in the businesses around, continuous engagement of consumers to understand their behavioural patterns and adapting to the tune of customers design, marketing it and delivering products and /or services to remain competitive – it is all about the reflection of the fourth industrial revolution. Lot of things have been written on Industry 4.0, but no one knows how it is going to penetrate and still it is too young, needs lots of brain storming whether it can be implemented in every business front. Therefore businesses need to understand and think deeper whether they have any problems which can be fixed by the components of Industry 4.0 and whether it can accelerate its business – if yes then go for it by adjusting the approach to business.

Now, the education system needs to take a call on setting up its support to the Fourth Industrial Revolution, and this means preparing students for techno-managerial skills. To take this (4IR) into stride an MBA program with blend of technological skills can serve as a catalyst in transitioning traditional business practices, its research techniques, its managerial approaches into best fit strategies suited for the tomorrow's workplace. This doesn't mean that the essence of traditional knowledge of business practices and learning is discarded but rather transformed into new embedded technological models which can quantify the whole business structure that will be beneficial to business

landscapes of future. Hence, the design of the MBA programs and the skill development has to be inclined in shaping candidates and be committed for the businesses of future. The core of MBA program today has to move one step ahead, apart from managing business and its people it has to manage the networks within a digital platform and interface. In this way a relevant MBA program designed for this purpose can offer 'creative and innovative supported digital learning'. Seedat Osman (2019), signifies that an MBA programs should present its relevance to the current and future business landscape and have a good fit strategy in a world of digital literacy through its interface and connect with the theory and practical business modules, managerial roles, leadership competencies and innovative assessment techniques which results in leading for the foundation of business management programs across any platform.

To combat with this scenario MBA programs need to be redefined and retuned with this digital trend and has to be strategized with 4 (IR) Industry needs.

Apart from this there is another determinant skill which plays a crucial role in Management Graduates' employment is soft skills. Robinson (2017), an associate director for the MBA programme at Cass Business School in London, writes in Financial Times, London, that People think an MBA is a golden ticket, when it is not. She says landing directly into a job after finishing business school (MBA) has never been straightforward. Findings suggest that students should prepare themselves for a changing MBA jobs market. Their subsequent conversations with employers revealed that graduates should be realistic about the roles for which their MBA degree alone will qualify them. It brought to light that the most important skills in that they were not core MBA subjects, such as finance and marketing, but more loosely defined qualities, or so-called soft skills, such as the ability to work with a wide variety of people which were cited by 76 per cent of employers in their survey. LinkedIn's (2018), workforce report found: Leadership, communication, collaboration with others and time management are the most in-demand soft-skills because now a days they are rare to find in a candidature. LinkedIn CEO Jeff Weiner calls there is a significant skills gap. Weiner in an interview with CNBC says, Interpersonal skills is where we're seeing the biggest imbalance. Communications is the number one skills gap. Arguing on the same lines Jackson (2010), propose that higher education institutions need to be blamed for deficiencies in soft skills and to overcome this many are now framing strategies for generic skills development which include skills such as communicating, team-work, time-management, problem-solving, persistence, resilience, that apply across all specific fields. Today, these essential skills of management need to have a sound fit and blend with the current and future business trends of digital technology to reap the benefits of 4 (IR) because there will be resistance for the change and many people may grapple with this problem. Therefore apart from being a good technocrat,

good soft-skills and negotiation skills are paramount in order to bring in successful change.

On the basis of above discussion three objectives were undertaken in writing this paper.

1. To recognize which domain / specialisation influences MBA graduates of Tier-2 and Tier-3 MBA colleges.

2. To understand the belief of employers' expectations and the Discipline knowledge that affects their organisation.

3. To foresee the sync of MBA program with Industry 4.0 and beyond.

III. RESEARCH METHODOLOGY

A simple structured questionnaire survey was administered through online and data collection was done from 126 MBA Alumni in Karnataka across tier 2 and tier 3 colleges, who had work experience of less than one year to know how they valued their Domain knowledge.

Further, we also surveyed 96 Employers to understand how they rated the 'Importance of Domain Knowledge' that affects their organisation as the expectations of the employer have ever changing as is the change in trends of the business. Importance of domain knowledge among the employers of MBA graduates was ascertained with the help of seven statements and respondents were requested to provide their opinion on the listed statements.

In both the cases, in-between the Alumni as well as Employers - we tried to find how Information System (ICT), Research & Business Analytics as a domain was rated compared to other domain knowledge.

Findings: **Reveals Rating of 'Domain Knowledge' as perceived by Alumni (MBA Graduates)**

DOMAIN KNOWLEDGE: Demonstrates strong proficiencies and knowledge in areas of expertise.	5 Very High	4 High	3 Neutral	2 Low	1 Very Low
Marketing	20 (15.9)	51 (40.5)	50 (39.7)	4 (3.2)	1 (0.8)
Accounting & Finance	11 (8.7)	59 (46.8)	50 (39.7)	6 (4.8)	0
Human Resource	16 (12.7)	53 (42.1)	51 (40.5)	5 (4)	1 (0.8)
Information and Communication Technology	8 (6.3)	36 (28.6)	74 (58.7)	5 (4)	3 (2.4)
Research & Business Analytics	18 (14.3)	37 (29.4)	61 (48.4)	8 (6.3)	2 (1.6)
Strategic Management	15 (11.9)	59 (46.8)	47 (37.3)	5 (4)	0
Entrepreneurship Development	19 (15.1)	58 (46)	42 (33.3)	5 (4)	2 (1.6)

➢ Statistics as shown in above table reveals that out of 126 Alumni respondents - with reference to 'Information and Communication Technology', only 8 (6.3%) respondents rated very high (rating of 5) on having good knowledge of 'ICT'. 36 (28.6%) respondents rated the same competency on higher side (rating of 4) while 74 (58.7%) respondents rated Neutral (rating of 3) and 5 (4%) of them rated on lower side (rating of 2) further, 3 (2.4%) of them rated that ICT knowledge was on a very lower side (rating of 1).

➢ The inference that could be drawn is that: MBA Graduates have specified very high importance on the domains such as Marketing, Finance and Accounting, Human resources, strategic management and Entrepreneurship Development compared to Information and Communication Technology and Research & Business Analytics. This signifies that Alumni across Tier-2 and Tier-3 MBA colleges are not in sync with what is needed by the Industries nor the MBA colleges are stressing on skill development in ICT and other related Information systems. This is where students fall out short of skills and not match with new business trend. Also not much is thought about MBA courses with specialisation in ICT, IS, Business Research and Data Analytics which is the call of Industry 4.0

Findings: Employers / HR Rating 'Importance of Domain Knowledge for their Organizations'

DOMAIN KNOWLEDGE: Demonstrates strong proficiencies and knowledge in areas of expertise.	Very High	High	Neutral	Low	Very Low
Marketing	52 (54.16)	23 (23.95)	13 (13.54)	8 (8.33)	0
Accounting & Finance	18 (18.75)	35 (36.45)	38 (39.58)	5 (5.2)	0
Human Resource	13 (13.54)	48 (50)	32 (33.33)	3 (3.12)	0
Information and Communication Technology	45 (46.87)	44 (45.83)	7 (7.29)	0	0
Research & Business Analytics	8 (8.33)	41 (42.7)	47 (48.95)	0	0
Strategic Management	6 (6.25)	22 (22.91)	66 (68.75)	2 (2.08)	0
Entrepreneurship Development	5 (5.2)	25 (26.04)	62 (64.58)	4 (4.16)	0

➢ Statistics as shown in above table reveals that out of 96 Employers who responded, with reference to 'Information and Communication Technology', 45 (46.87%) respondents (Employers) rated very high (rating of 5) on having good knowledge of 'ICT' is required for their organization. 44 (45.83)

respondents rated the same competency on higher side (rating of 4) while 7 (7.29%) respondents rated Neutral (rating of 3) and 5 (4%) of them rated on lower side (rating of 2). None of them rated low (rating of 2) and very low side (rating of 1).

➢ Employers have stressed more and rated on very high side on Information and Communication Technology and Marketing stream. This reveals that the most of the business in today's environment are run on the ERP platforms, ICT Platforms and many are Branding their business online where a knowledge about ERP's, ICT,   Research & Business Analytics is much essential and at the same time development of Market is core for any business therefore some exposure / hands on experience should be possessed by the Management Graduate at the time of employment.

Hence, this paper brings out two important features to light in the context of management graduate employment:

IV. CONCLUSION

Theoretically, it cannot be assumed that employability derives from curriculum set by the University / Higher education or autonomous institutions; it is the way in which students learn from their experience as they move through different walks of life right from their schooling to post graduation where he / she tries to learn and understand how the business world is. Achieving a high level of performance in employability ensures learners' true engagement. But the inference what can be drawn as per the findings is that Tier-2, Tier-3 MBA college students' focus is still onto traditional Management courses as new domains (specialisations) like the Information Systems, ICT Business Analytics etc. were not added in the MBA course. Though few institutes had these specializations, students did not opt for it.

Furthermore, industries are way ahead in configuring modern trends in technology but academia is not in sync. To align with this industry requirement, keeping informed about the modern Industrial trends are essential ingredients to be on the go for the academia so that it can be in tune to step up with the technological changes happening around to produce employable management graduates. Therefore ICT, Business Analytics and Information system as a Domain should be taken on top priority basis and be introduced in the specialisations courses of MBA.

Secondly, the change is inevitable and continuous learning is minimum requirement as of today to be successful. Innovations happen and they will keep on happening in Technology. This change can bring challenge and can put pressure on the employers, the academia, and the students - to upgrade and be in tune with the current trend. They need to embrace the changes   in-order to survive. This emphasizes that Business schools (MBA Program) will need to be ready to shape and configure the traditional rules of business in line with the new brave world of the 4ᵗʰ Industrial Revolution 4(IR). Furthermore, how well the

business schools and MBA programs takes in its stride this transition phase of 4 (IR) will determine whether the innovation in technology will symbolise a boon or will it be a burden for the society in this century and beyond.

Thus the 4ᵗʰ Industrial revolution is going to add another Ray of dimension to the MBA programs of 2020 and beyond, and to the academia as a whole. Demanding for good soft skills, negotiating and leadership skills, technological skills from both walks of life as an academician and as an management graduates too. This fosters' confidence to overcome any resistance that may happen in up-gradation of skills in Industry, Academia and employment. Furthermore, if there is no attempt made in putting our best foot forward to get re-oriented or to get re-skilled to adapt to the future trend in technologies in this Digital era, both the academia and students will fall short of skills and Industry may suffer. Thus the golden rule is every stake holder whether it is academia or the students needs to accept the new rules of business that is to be proactive and predict changes and be self driven to learn new things and not completely dependent upon the Institutions. Therefore the future landscape of the businesses which is known to be a digitization era and automation requires all the stake-holders to be creative and productive thinkers.

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Brand Attachment and Loyalty Intension: Mediating Role of Perceived Value

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Abstract— The study is based on Stimuli-Organism-Response model or Theory of Classical Conditioning. The results indicate that brand attachment significantly influence loyalty intension. Perceived value has a strong impact on loyalty intention as a mediator variable. The research produces guidance for Indian banking sector to structure effective and competitive relationship marketing strategies. The results add new insight into loyalty processes and extend the banking brand loyalty literature by suggesting value as mediating indicator for loyalty outcomes. The findings suggest that through brand attachment, banking industry builds perceived value of its customers and increase loyalty intention of bank's customers, thereby increasing profitability.

Index Terms— Brand attachment, loyalty intension, perceived value, Stimuli-Organism-Response model

I. INTRODUCTION

In order to build a strong relationship with their customers, banking sector is incorporating intensive changes to improve their bond with the customers and to be more socially responsive in respect to society. Indian Banking sector has improved tremendously to level up with the contemporary progressive world. In this run, they have realized that focusing upon customer attachment and the customer perceived value is utmost important to gain an edge over competitive players. In a bid to improve profitability and revenue inflows, customer satisfaction has been the key focus area of the Indian banking sector. Banks accordingly frame strategies which lead to increased customer satisfaction and thereby their retention. Customer's satisfaction can be acknowledged with the emotive response that is caused by a cognitive response such as quality of services and past experiences (Hakimi et al. 2018). Customers assess value of the services provided to them by the benefits which they derive from the perceived quality of product attributes, and the mental, physical, and financial sacrifices generated from product acquisition and usage (So et al. 2014). However, it is common for businesses that operate in a highly competitive setting to provide equivalent or higher promotional values than their competitors (Hwang, Baloglu, and Tanford 2019).

Previous study narrated the concept of brand attachment and loyalty in various ways. Brand attachment can make a customer think that the brand and the self are one and have cognitive links and as a result bridge between brand and the self is generated (Yao, Chen, and Xu 2015). A construct that has recently emerged in the marketing literature called Emotional Brand Attachment (EBA), deeply taps into the affective dominion and focuses on specific and different forms of emotions as a root to the development of brand loyalty. EBA which captures the strength and the deep emotional bonds between the brand and the customer (Thomson, MacInnis, and Park 2005) (Hemsley-Brown and Alnawas 2016), manifests itself via three variables: passion, affection and self-brand connection (Park et al. 2010; Thomson, MacInnis, and Park 2005)(Proksch et al., 2015) (Hemsley-Brown and Alnawas 2016). These three components contribute significantly toward building brand loyalty (Lastovicka and Sirianni 2011)(Hemsley-Brown and Alnawas 2016); enhancing brand defense (Park et al., 2010)(Hemsley-Brown and Alnawas 2016); attenuating judgments of unethical behavior (Schmalz and Orth 2012) (Hemsley-Brown and Alnawas 2016); and predicting customers' resource allocation, actual purchase behavior and brand purchase share (Park et al. 2010)(Hemsley-Brown and Alnawas 2016).

According to the existing literature, there is a significant relationship between brand attachment and brand loyalty. This present study is based on the Stimulus Organism Response (S-O-R) Model (Jacoby 2002)(Hemsley-Brown and Alnawas 2016) which originates in environmental psychology research by Mehrabian and Russell (1974). This model states that the environment (stimulus) influences the emotional statuses of customers from three dimensions: pleasure, arousal or dominance (organism). In this paper brand attachment (stimulus) is hypothesized by the perceived value which is sought to in turn influence loyalty intentions (response) of the bank's customers. Thus, perceived value (PV) plays a mediating role in the study. So, this study can explain the loyalty intentions of the customers to a large extent with the help of the mediating role of the PV than the direct relationship with BA.

Section 2 of the paper presents the literature review on S-O-R Model and other theoretical view points on the variables. In Section 3, the research model is presented and it also proposes the hypotheses regarding the direct and moderating effects on brand loyalty. The research method is elaborated in Section 4. Section 5 enumerates the empirical results. Lastly, the discussion on results, theoretical and

managerial implications, limitations, and directions for further research are presented in Section 6 and the conclusions in Section 7.

II. LITERATURE REVIEW

2.1 Stimulus-Organism-Response (S-O-R) Theory

S-O-R theory has originated from the Environmental Psychology Research by Mehrabian and Russell in 1974. In the classical S-O-R model, stimulus is defined as those factors that affect inner states of the individual and can be hypothesized as an encouragement that stimulates the individual (Eroglu, Machleit, and Davis 2001)(Chang, Eckman, and Yan 2011). According to Bagozzi (1986), when consumer behavior is depicted as an S-O-R system, the motivations are external to the person which consist of both marketing mix variables and other environmental inputs. In this study, the stimuli is brand attachment as it affect the emotional responses of the customers of the bank. Organism refers to 'internal processes and structures intervening between stimuli external to the person and the final actions, reactions, or responses emitted. The intervening processes and structures consist of perceptual factors, physiological factors, feeling, and thinking activities' (Bagozzi 1986, 46). Here, organism is the value that is perceived by the customers internally and the outcome, which is the response, is the loyalty of the customers towards their banks.

2.2 Brand attachment

Brand attachment represents the bond between an individual and the brand (Hwang, Baloglu, and Tanford 2019). Brand attachment is defined as "the strength of the bond connecting the brand with the self". In other words, Brand attachment is critical for companies because it can reduce consumer defections, gain consumers' forgiveness when facing negative information(Wu, Chen, and Dou 2016). Attachment to a brand can increase the willingness to communicate about it and can increase brand loyalty (Huang et al. 2017) People generally develop attachment to specific figures who can provide feelings of comfort and security. In case of the service sector, brand attachment refers to the strength of the emotional link that connects the consumer and the brand, involving feelings toward the brand (Japutra, Ekinci, and Simkin 2017).

By the viewpoint of the existing literature, brand attachment is the emotional state which describes the internal feelings of the customers which is influenced by the external environment.

2.3 Perceived value

It is well known that higher levels of perceived value lead to higher level of satisfaction to customers. The definition provided by Schechter (1984), "Perceived value is composed of all factors: qualitative and quantitative, objective and subjective, that jointly form a consumer's buying experience (Snoj, Korda, and Mumel 2004). "Perceived worth in monetary units is the set of economic, technical, service, and social benefits received by a customer's firm in exchange for the price paid for product's offering, and taking into consideration, the available alternative of supplier's offerings and price" as defined by Anderson et al. (1993); Anderson and Narus, (1998). According to Woodruff et.al., 1993; Flint et.al., 1997, and Ulaga and Chacour, 2001; Woodruff, 1997, perceived value can be defined as "The customer's assessment of the value that has been created for them by a supplier given the trade-offs between all relevant benefits and sacrifices in a specific-use situation" (Snoj, Korda, and Mumel 2004). It is generally supported that relational benefits add to the perceived value of a product or service because the relationship is strengthened when customers perceive benefits beyond their satisfaction with the core product or service (Tsimonis, Dimitriadis, and Omar 2019).

This article has defined the organism as the value perceived by customers of the bank. As defined earlier, organism is the internal practices and constructions which intervene external stimuli and the outcome.

2.4 Loyalty intentions

Loyalty is usually understood as forms of customer behavior such as retention of the brand, repeat purchase, share of category expenditure and portfolio size, which is directed toward a particular brand over time (Reinartz and Kumar, 2000). The retention of the customer is an essential element to enhance the firms' profitability (Hwang, Baloglu, and Tanford 2019) Loyalty is emphasized as it establishes a forever relationship between the firms and their customers. Brand loyalty is defined as consumers' favorable attitude toward a brand that results in intentions to repurchase and recommend (Anderson and Srinivasan 2003). Previous studies provided evidence that industrial brand loyalty is driven primarily by the sense of attachment linking industrial buyers to their supplier(s), and secondarily by rational and normative motives (Čater & Čater, 2010; Čater & Zabkar, 2009; Rauyruen & Miller, 2007; Pedeliento, Andreini, Bergamaschi, & Salo, 2015). However, despite the growing acknowledgment of the role attachment plays in fostering loyalty in business relationships, there are less contribution on this field of attachment that have been found to be strong antecedents to brand loyalty in customer contexts, also the previous scholars have recommended are also applicable in the b-2-b domain (Erevelles, 1998; Esch, Langner, Schmitt, & Geus, 2006; Gilliland & Johnston, 1997; Pedeliento et al., 2015).

The existing literature has concluded that creating emotional bonds between customers and brands is crucial for firms because strong brand customer bonds are assumed to generate brand loyalty (Kressmann et al. 2006; Park et al. 2010; Pedeliento et al. 2015; Thomson, MacInnis, and Park 2005).

III. DEVELOPMENT OF THE THEORETICAL FRAMEWORK AND RESEARCH HYPOTHESES

Brand attachment, unlike product attachment, also clutches diverse product alternatives and/or various product categories of the same brand (Pedeliento et al. 2015) as a result an individual feels emotionally attached to a brand, and this may affect his/her emotional responses to the whole range of products falling under the same brand, regardless of previous product experience (Pedeliento et al. 2015). According to the study it was certified that emotional attachment is a strong predictor for attitudinal brand loyalty and it also offers valuable suggestions to the marketers who are willing to exlpore the opportunities for the next decades (Thakur and Kaur 2016). As explained by Huang(2015), Achievement vanity, variety seeking and peer norms have a positive impact on the phenomenon of idol attachment, which in turn positively affects human brand loyalty (Huang, Lin, and Phau 2015).

According to the above discussion, it is clear that brand attachment is positively correlated to loyalty intentions.

H1: Brand attachment has a positive relationship with loyalty intentions.

Perceived value is commonly defined in the literature as "the trade-off between the expenses and sacrifices that consumers need to bear and the expected returns they are supposed to get" (Zeithaml, 1988, cited in Lei et al., 2008a)(Riley, Pina, and Bravo 2015). However, delivering superior value to customers is recognized as one of the most important function among business managers and academia (Ulaga and Chacour, 2001). Moreover, a lot of authors have given their opinion that delivering superior value should be considered as the utmost essential objective of marketing strategies of organizations (e.g. Deshpande et al., 1993; Jaworski and Kohli, 1993; Day, 1994; Slater and Narver, 2000). This study tries to find the relationship between brand attachment and loyal intentions with the mediating role of perceived value.

Age affects individuals' attitude and behavior; gender also produces distinctive attitude and behavior in men and women (Yeh, Wang, and Yieh 2016).

H2: Perceived value mediates the relationship between brand attachment and loyalty intentions.
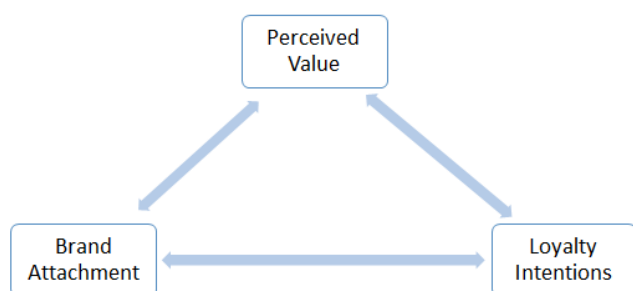

Fig.1: Research model

IV. RESEARCH METHODOLOGY

4.1 Sampling

The sample was collected from the customers of public and private sector banks within the ambit of Jaipur district. An online as well as manual survey was conducted for the study. A total of 350 questionnaires were dispersed. Out of which 205 questionnaires were selected for the study. In other words, 56.57% questionnaires were usable.

4.2 Measurement

The study was completely based on the survey of the customers of public and private sector banks of India. The questionnaire consists of 16 items ectracted from various scales. Perceived value was measured by seven items extracted by Cheong (2013); Petrick (2002); Xinting et al. (2013); Thomson et al., (2005). Brand attachment was measured by four items were taken by Thomson et al., (2005). Lastly, Loyalty intention were measured by five items taken by Rubin (1970); Hatfield (1986); and Sternberg (1986); Carroll & Ahuvia (2006); Thomson et al., (2005). All the items were measured on 5-point Likert-scale from strongly agree to strongly disagree. The survey also collected demographic information of respondents.

4.3. Data analysis

The data were analyzed in several steps. First, the sixteen items were distinguished into three factors (variables) using exploratory factor analysis (EFA). EFA was implemented using SPSS 21 software. Second, confirmatory factor analysis (CFA) was conducted to build consistency and validity internally by assessing the combined reliability and validity measures. CFA was conducted through SPSS AMOS 21. The results were analyzed using various measures. The measures include normed chi-square ($\square^2$/df), critical function index (CFI), standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA) and goodness of fit index (GFI). A better fit can be tested with the help of guidelines i.e. $\square^2$/df between 1 to 3, CFI >0.95, SRMR <0.08, RMSEA <0.06. Last, mediating role of perceived value between brand attachment and loyalty was analyzed using 'PROCESS Procedure for SPSS Version 3.2'. The mediating effect is measured using co-efficient, r-square, t-value (95%), p-value (<0.05), LLCI and ULCI. Then total direct and indirect effects of X on Y was analyzed.

V. RESULTS

The demographic profile of the respondents is depicted in Table 1. The majority of the respondents from the sample are male (62%). Most of the respondents trust on public sector banks (approx. 75%) as compared to private sector banks (approx. 25%). The age of 49.8% of the respondents was above 36 years.

Table 1: Demographic Profile of Respondents (N=205)

Variables	Categories	Frequency	Percentage (%)
Gender	Male	127	62.0
	Female	78	38.0
Types of Banks (Mostly used)	Public sector banks	154	75.1
	Private sector banks	51	24.9
Age	15-25	7	3.4
	26-35	44	21.5
	36-45	102	49.8
	46-55	47	22.9
	56 & Above	5	2.4

5.1 Exploratory factor analysis and factor extracted

In a principal component exploratory factor analysis with the help of varimax rotation, a three-factor solution emerged (based on fixed factors to be extracted = 3). These factors were labeled perceived value (eigenvalue = 38.505), Brand attachment (eigenvalue = 9.122) and Loyalty intentions (eigenvalue = 6.750). Examination of the scree plot confirmed the presence of three major factors. Items with significant factor loadings on their main dimension are exhibited in Table 2 below and cross-loading items were eliminated from the item set. Items were then removed one at a time based on modification indices in the measurement model (Bagozzi & Yi, 1988) and item-to-total correlations. A $\chi2$ difference test of the two measurement models was carried out and the reduced model was accepted when $\chi2$ improved significantly. The final set of 16 items reflect the dimensions perceived value (7-items), brand attachment (4-items) and loyalty intentions (5-items); exhibited in Table 2. The three factors extracted can explain approx. 54% of the total model.

Table 2. EFA results and Complete Text of Scale Items

	Factor Loadings	Variance	Communalities	
Perceived Value (PV)		21.693		
My loyalty towards my bank increases when I am satisfied about that brand of the bank.	0.648		0.529	(Cheong, 2013)
My bank has status	0.632		0.575	(Petrick, 2002)
My interactions contained large amount of information about bank	0.628		0.500	
My bank is well thought of	0.607		0.514	(Petrick, 2002)
My bank has outstanding quality	0.591		0.529	(Petrick, 2002)
I rarely take chances by involving myself to unfamiliar banks even if it means sacrificing services.	0.577		0.479	(Xinting et al., 2013).
I feel tender toward my bank.	0.550		0.594	(Thomson et al., 2005)
Brand Attachment (BRATT)		16.576		
Sometimes I feel I can't control my thoughts they are obsessively on my bank.	0.686		0.598	(Thomson et al., 2005)
I would feel deep despair if I am said to shift my bank.	0.636		0.517	(Thomson et al., 2005)
I experience great happiness with the brand of my bank.	0.533		0.611	(Thomson et al., 2005)
I find myself thinking about my bank frequently during the day.	0.516		0.682	(Thomson et al., 2005)
Loyalty Intention (LOY)		16.108		
People who are important to me have influence on choice of selecting bank.	0.669		0.525	(Rubin, 1970; Hatfield, 1986; and Sternberg, 1986)
I am concerned with long-term outcomes in dealing with my bank.	0.666		0.528	(Thomson et al., 2005)
I feel emotionally attached with my bank.	0.599		0.566	(Rubin, 1970; Hatfield, 1986; and Sternberg, 1986)
I'll 'do without' opening a bank account rather than opening an account with other bank.	0.562		0.429	(Carroll & Ahuvia, 2006)
When I have to open a new account, I don't even notice competing banks.	0.512		0.524	(Carroll & Ahuvia, 2006)

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Note: Rated on 5-point Likert-scale type from 1 (strongly agree) to 5 (strongly disagree)

5.2 Measurement model, reliability and validity

Confirmatory factor analysis (CFA) was conducted to measure the reliability and validity. The reliability was measured with the help of Cronbach's Alpha = 0.948. Table 2 demonstrates the results of CFA and the complete text of scale items. The standardized regression coefficients show significance in all individual t-values with no alarming estimates in the measurement model, such as negative error variances, standardized coefficients exceeding or very close to 1.0, or very large standard errors associated with any estimated coefficients (Reisinger and Turner, 1998). The initial run of the CFA model presented fairly good fit indices (normed χ2=1.442; SRMR=0.054; CFI=0.958; GFI=0.684; RMSEA=0.047). The convergent and discriminant validity were examined based on established guidelines (Fornell and Larcker, 1981; Hair et al., 2010). As presented in Table 3, all of the multi-item constructs presented high composite reliability coefficients and convergent properties. The average variance extracted (AVE) for each construct was below the 0.50 without exceeding the squared correlations between pairs of the constructs, providing support for discriminant validity of the measures. The study findings also provide support for nomological validity, which confirmed significant correlations and paths between the constructs in the theoretically predicted ways (Huang, Lin, and Phau 2015; Hwang, Baloglu, and Tanford 2019; Levy and Hino 2016; Pedeliento et al. 2015; Taghipourian 2016; Thakur and Kaur 2016). All the path coefficients are significant at 0.05 or better in the expected direction.

Table 3: Reliability and Validity Test

	CR	AVE	Perceived Value	Brand Attachment	Loyalty Intention
Perceived Value	0.833	0.418	**0.646**		
Brand Attachment	0.767	0.454	0.806***	**0.674**	
Loyalty Intention	0.745	0.371	0.724***	0.800***	**0.609**

Note: CR= composite reliability. AVE= average variance extracted. Correlations are in parentheses (all p < 0.001).

The model (Fig 2) explains the correlation between the perceived value, brand attachment and loyalty intentions after performing EFA. The items are extracted from all the variable to a large extent. The CFA model as per SPSS AMOS 21 is depicted below.
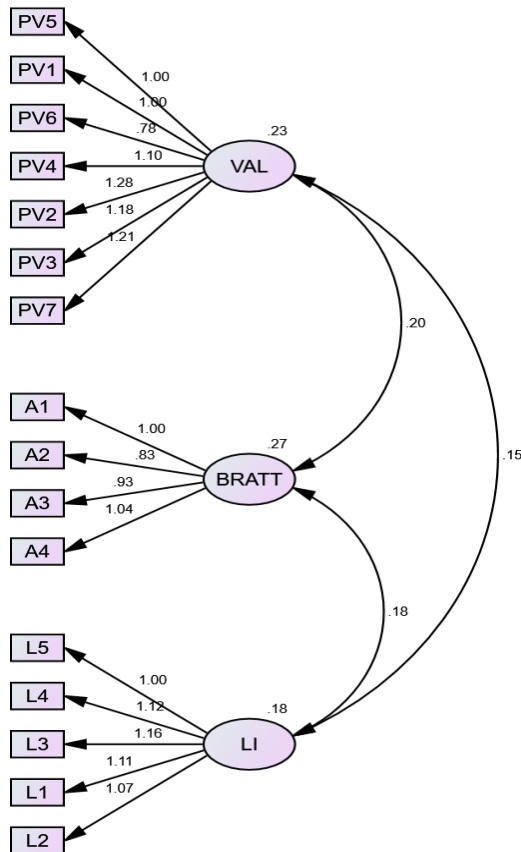

Fig 2: CFA Model results

5.3 Perceived value as a mediator role

Regression analysis was used to investigate the hypothesis that perceived value (PV) mediates the relationship between brand attachment (BA) and loyalty intention (LI). Results indicated that BA was a significant predictor of PV, B = 0.6047, SE= 0.0560, p < 0.05, PV was a significant predictor of LI, B = 0.2842, SE = 0.0643, p < 0.05. This result support the mediational hypothesis. BA is not only a significant predictor of LI after controlling for the mediator, PV, B = 0.5631, SE = 0.0644, at 95%, consistent with partial mediation. Approximately 41% of the variation in LI was accounted for by the predictors (R^2 = 0.4095). The indirect effect was tested using a percentile bootstrap estimation approach with 5000 samples, implemented with the PROCESS Procedure for SPSS Version 3.2. These results indicated the associated with LI scores that were approximately 0.17 points higher as mediated by BA positively. Table 4 illustrates the mediating effect of PV between BA and LI.

Table 4: Mediating effect of Perceived Value between Brand Attachment and Loyalty Intentions

	Co-eff.	R-Sq	t	p	LLCI	ULCI
Brand Attachment→Loyalty Intentions	0.5631	0.3524	10.5106	0.0000	0.4575	0.6687
Brand Attachment→ Perceived Value	0.6047	0.3651	10.8045	0.0000	0.4943	0.7150
Perceived Value → Loyalty Intentions	0.2842	0.0000	4.4191	0.0000	0.1574	0.4110
Brand Attachment→Perceived Value→Loyalty Intentions	0.3912	0.4095	6.0786	0.0000	0.2643	0.5182

VI. 6. DISCUSSION

The current study provides an understanding of value by incorporating the brand attachment and loyalty intention with the help of Stimuli-Organism-Response (S-O-R) model. The study proposes that perceived value mediates the relationship between brand attachment and loyalty intention. The results generated reveal strong support for the proposed model. The research findings highlight the importance of investigating customers' perceptions towards

their attachment and loyalty to their banks. The study provides meaningful insights for researchers and banking sector to consider for enhancing relationship marketing strategies.

6.1 Discussion on model variables

Brand attachment directly and significantly influences loyalty intentions of the customers according to the existing literature as discussed earlier. Previous studies established the importance of brand attachment on loyalty intentions (Huang, Lin, and Phau 2015; Hwang, Baloglu, and Tanford 2019; Pedeliento et al. 2015) but did not capture perceived value as mediator role. This study effectively integrated perceived value as a meaningful variable and revealed a linkage between brand attachment and loyalty intention.

6.2. Theoretical implications

The study enhances the understanding of loyalty intention by introducing value in the brand attachment to loyalty process. The banking sector is based totally on the services provided by them to their customers. By introducing value as a theoretical framework, the research highlights the role of brand attachment on the loyalty behaviors in banking environment. Rawls (2009) stated that it may be too uncompromising to build a unifiable way of all customers to feel fair in a society as individual interests and goals will constantly be argued; however, the study results reveal the potential of incorporating communication and benefits in banking sector. The study found that perceived value enhances the understanding of banking sector to its customers. Value links brand attachment to loyalty intention of banking customers. This study illuminates the potential value of exploring other both the variables, as the variable reveals novel insight into the loyalty process. Moreover, the study extends the role of brand attachment, which was previously found to influence in financial services (Park et al., 2010), to loyalty intention in the banking context.

6.3 Practical implications

With the aim of developing strong loyalty outcomes, management of the banking industry should consider value in constructing an effective and long-lasting relationship with their customers. Brand attachment is found to be strongly related to loyalty intention outcomes. Increased perceived value is more likely to lead customers to feel attached to the brand, and positively influence loyalty intention of the customers. Thus, banking sector should allocate a reasonable and fair behavior to customers based on their involvement (Lacey and Sneath, 2006). More importantly, banks should train their employees to interact with their customers in fair, attentive, open, and honest way. The employees should respond to the requests of their customers in a friendly and timely manner while offering trustworthy information. The stratagems to build loyalty should involve communicating with customers in a friendly manner and trustworthy dialogue, as well as continuous monitoring these communications (Berezan et al., 2015).

The findings suggest that Indian banking sector should construct strategies to enhance the attachment of their customers to increase their loyalty intention rather than simply offering fair value to its customers.

6.4. Limitations, future research and conclusion

Although the study revealed valuable and meaningful insight it also has some limitations. The research findings were resulting from the customers of banks in Jaipur, Rajasthan; therefore, the generalizability of the results may be limited. Future research is recommended to involve the customers at large from other parts of India or the whole of India which would further strengthen the study findings. For this study, the research only included customers from public and private banks excluding foreign banks. However, foreign banks have also assumed significant importance in Indian banking sector. Another limitation of the research is that the survey relied on convenience sampling. Thus, the findings derived from data which may not correctly reveal the complexity of loyalty intention.

As we compare previous research, they did not attain a significant impact of the evaluations of benefits on emotional commitment or loyalty intentions (Baloglu et al., 2017), the current research explored significant influence of brand attachment on loyalty intention by introducing perceived value on the customers of the bank. The unpredictable results may be caused by the difference in the measurement or the sample. Thus, future research may bring additional value by comparing different samples or measurements as a mediator. The imitation of the current conceptual model for local banks, regional banks in other states, or international banking sector may extend the current research findings and reveal meaningful results. The relationships investigated could be extended by inculcating other variables at a time.

Loyalty will always be of utmost significance for Indian banking sector, and values related are designed to build loyalty. The current research indicates it is not enough for brand attachment to have loyalty alone. It is through perceived value that banking sector can increase the loyalty intention of the bank customers. Finally, the desired outcome of loyalty intention is profitability of the banking sector. Considering the variables in this research may enhance operators' ability to ensure that their efforts to increase loyalty intention of the customers of the Indian banking sector.

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Real Time Face Detection and Recognition System Using Haar Cascade Classifier and Neural Networks

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Abstract— Home protection and privacy have become one of the most critical aspects in today's world. As technology progresses at an exponential pace, the times are not far ahead for each house to be fitted with sophisticated security systems to deal with regular burglary and theft. But as one side of the tech progresses, so do its detrimental counterparts. DES encryption can be an indicator of how easily an encrypted piece of information can be deciphered. Not long after its release, DES encryption was referred to as 'unsafe' and with today's modern application, anything like DES might be an open invitation to hack. With many developments in the field, the technology has, in many respects, surpassed the use of biometrics (finger prints). Face recognition, nowadays, is present in almost every smart device that has some piece of information stored that holds importance to its users. With facial recognition gaining popularity, many tech companies have come with their own patent to make a technology related to Facial Recognition on the market. This paper suggests a somewhat related concept as to how home protection can be improved by using a face detection and recognition algorithm (Haar Cascade Classifier).

Index Terms— Face Recognition, Haar Cascade, KNN Algorithm, LBP.

I. INTRODUCTION

The method of facial recognition is not a modern area of technology, it dates back to the early 1960s when Woody Bledsoe, along with Helen Chan and Charles Bisson, worked on a device to identify human faces.

Face Recognition is a process in which the device first recognizes the presence of a face in the picture. When it is detected, the later stages help to find a match for the picture associated with those already present in the database. A traditional face detector doesn't get to the depth of the picture, it just checks for the similarities. This can also prove fatal, since it would take a lot of work to circumvent this kind of device. Face recognition systems may be required as human biometrics (fingerprints) begin to fade away after a certain age.

This project takes into account the current safety system scenario and proposes a system that can be detected and defined with greater precision and time. Every day, the technology industry is gaining new heights with ML and AI. The secret to any security system accuracy is to introduce the ML-based algorithm and to train the system accordingly, we will be able to reduce the chances of having false positives and negatives.

Now, while most face recognition systems use the LBP (Local Binary Pattern) algorithm, our system operates on the Haar Cascade Classifier. Instead of generating some graphical information from the image, such as LBP, the Haar Cascade Classifier looks directly at the related facial features based on rectangular blocks.

II. OBJECTIVES

i) To verify faces of the photos or videos taken with the existing photos in database.

ii) To enable 3D Face security.

iii) To ensure safety.

iv) To extract the Face properly.

v) To extract feature of Face.

vi) To unlock a secure system with proper recognition of face.

III. BACKGROUND

Previous Work

Current methods in the field of image recognition work either by using LBP as a primary algorithm or by using algorithms that include the use of colour segmentation or matching models for facial recognition and Eigen-Fischer for facial recognition [IV], [VI]. These algorithms have been compiled using MATLAB and then implemented on a droid phone.

Skin-based facial detection is very popular and a useful technique. In this process, each pixel is defined as either a skin or a non-skin based on its colour composition. Although this approach works well, it has some flaws. In order to minimise the time of computation, the image is always scaled down by a few factors. This could have an effect on overall results. This approach still uses an RGB classifier that is very sluggish compared to its new generation counterparts.

IV. RELATED WORK

Our work is inspired by the Viola-Jones Object Detection System [X], which analyses the picture in order to differentiate a face from a non-face. In this context, the object detection system uses the AdaBoost algorithm to pick the best features and train the classifiers to be used. The algorithm uses a linear combination of "weakly-approved classifiers" to create a classifier which is a good acceptable classifier.

$$h(\mathbf{x}) = \text{sgn}\left(\sum_{j=1}^{M} \alpha_j h_j(\mathbf{x})\right)$$

Each weak classifier is a threshold function based on the feature f_j.

$$h_j(\mathbf{x}) = \begin{cases} -s_j & \text{if } f_j < \theta_j \\ s_j & \text{otherwise} \end{cases}$$

Based on the algorithm (Viola-Jones)[X] described above, additional references include Js Zhang and X. Xiao and their face Recognition algorithm based on multi-layer weighted LBP [VI]. In addition, references used in our work give priority to the Haar Cascade as opposed to the LBP [IX][X] method, which lacks the accuracy needed for the protection framework. The home safety feature of our project is influenced by N. A. Othman and I are. Aydin supports improved security work in smart homes and cities using IoT (Internet of Things)[VII]. Here, multiple modules such as raspberry pi, etc. are used for image capture and analysis. Later, when a match is found, a notification is sent to the respective user via a telegram application.

Another piece of work suggested by D. Hey, Pertsau and A. Uvarov is a more sophisticated variant of the Haar[II] algorithm. Their framework modifies the GPU OpenCV algorithm. This (GPU programming) can be done using the CUDA (Compute Unified Device Architecture). The modified algorithm makes the device not only to process HD streams,

In real time, quicker, but also lowers the total Processor load. Other similar works are N. It's Erdogmus and S. Marcel retrieves paper on how a face recognition device can be spoofed by using high-grade 3D face masks.

The related work referred to above uses the Hair Cascade Classifier for identification and recognition of the face, but lacks any module that supports the ability to recognise the face[II],[III],[V]. It is also mandatory for the protection system to function, both in terms of identification and recognition, which is available in our proposed system.

V. LITERATURE SURVEY

Some essential literature reviews are as follows:

V Latham *et al.* suggested the latest successful face search findings of Multiple CovNets or Deep CovNets. Recent findings, as shown by Yi Sun et.al, have shown that the methods that usually exist address the FR issue in two phases: extraction of the properties (for a better picture we must build or learn from each face of an image picture) and identification (calculates identical characteristics between the two face with a rep). Although CovNets shows positive FR performance, a well-designed architecture in CovNet remains unclear, since a specific classification project lacks theoretical guidance.

Cox *et al.* reported that Brunelli and Poggio have determined geometrical characteristics such as mouth width and position, noise condition face size and chin form. They reported a recognition rate of 90% in a 47-person survey. However, we find that 100 per cent identification of the identical dataset is created by a rather simple method matching framework. The interrogatory database of 95 pictures of 30 manually extracted functions describing each face observed the mixing distance technique introduced by Mr Cox.

Pentland *et al.* defines database (95 percent of 200 of the 3000 recognition) which incorporates best performance. Breakdown results are complicated since several images of the people appeared to be the same. The closest stored graph using elastic graph matching, applied a dynamic link architecture to define the distortive, invariable entity. With a sample of 87 individuals and 150 years old research images of different expressions and faces, we have seen strong findings. A 23-transuter parallel method uses a computer-cost methodology that takes around 25 years to compare 87 saved items. Eigen faces are thus an algorithm that is rapid, easy and functional. The pixel intensity for training and test images may therefore be decreased, because a high correlation is needed for the optimal performance. Another means of identifying the face is by visuals.

Wikott *et al.* used better methods for the Facial Recognition Technology (FERET) database and contrasted 300 of the same men's sides against three hundred separate sides. You reported a consciousness score of 97.3 percent. In restricted conditions for example local binary models and local step quantization, handmade findings have been respectable in the FR. Furthermore the efficiency is significantly reduced when used in pictures taken under uncontrolled conditions such as multiple face postures, voice and lighting.

Turkaand and **Pentland** said that there is also a 2-dimention method for image processing. They suggested a way to classify the face portraits by projecting the principal elements of the initial trainers' photos. The resulting Eigen faces are ranked, as opposed to recognized individuals. High-level identification is usually based on multiple processing layers, for example the Marr processing framework for fitted objects from images to surfaces to 3D versions.

V Nagpal *et al.* suggested such approaches used by deep neural network analysis only for the features derived by the FR. Their paper suggests that pixel values be moved to

CovNet by utilizing a haircascade (frontier face) as an input to the detection of the neonatal network.

Thet face identification is better achieved by **Tom Holland** *et al.* who has a range of measurements for any section of face. hair cascades feature. All features in their report were also applied and their accuracy rates were 96 percent.

Danial *et al.* reported that **Brunelli** and **Poggio** were evaluating physical characteristics such as mouth width and position, noise location facial size and chin form. They have a detection rate of 96 percent in a 69-person survey. However, we find that 100% identification for the like data set is focused on a very simple matching framework. The interrogatory database of 95 pictures of 30 manually extracted functions describing each face observed the mixing distance technique introduced by Cox et al.

Christopher *et al.* said face detection improves the protection of a project tremendously as the face detection functionality is quite difficult to compromise. Haar Cascade Detection provides new facial detection protection that is not broken yet.

| Title	Author	Proposed Methods
A overview of Face Detection Strategies	**V Latham** *et al.*	1. Haar Cascade 2. Frontal Face 3. LPBH
Ultimate Face Detections And Recognitions	**Cox** *et al.*	1. Eigen Face 2. Fisher Faces 3. Haar Cascade
A overview of Face Detections Techniques	**Pentland** *et al.*	1. Eigen Face 2. Haar Cascade
Face Detection advance methods	**Wikott** *et al*	1. LPBH 2. Fisher Faces 3. Haar Cascade
Haar Cascading Face Detections	**V Nagpal** *et al.*	1. Haar Cascade 2. Frontal Eyes
Frontals Face Detection Algorithms	**Tom Holland** *et al.*	1. Texture Method 2. Haar CAscade
Haar Cascading Face Recognition process and algorithms	**Danial** *et al.*	1. Haar Cascade 2. LPBH 3. Fisher Faces
A overview of Face Detections Algorithms	**Christopher** *et al.*	1. Image Segmentation 2. Haar Cascade
Facials Features analysis and studies	**Brendon** *et al.*	1. Edge Detection 2. Haar Cascade

VI. MODULES
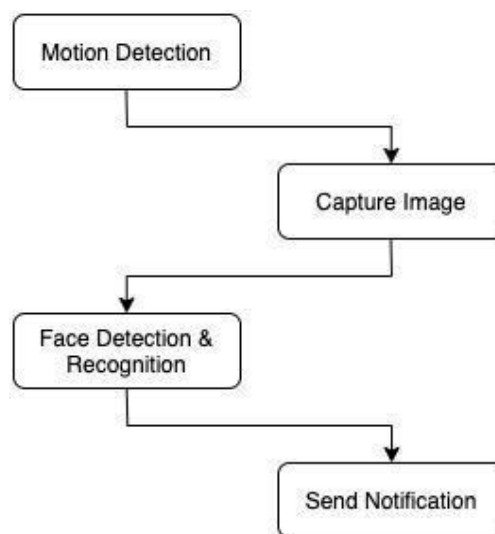
Figure 1. Module Flow Diagram

There are a total of four modules in which this method can be divided. Each of them is equally relevant to the other. Motion detection module is correlated with any motion in the vicinity (by human or any other object). The entire device remains idle when no motion is observed in the vicinity. As soon as the PIR sensor senses motion, the camera begins operating with other modules. The Image Capture Module deals with the acquisition of photographs using a camera module. The picture is then submitted for processing by additional modules. First, the picture will be examined for the faces. The module will not proceed any further if there are no faces present in the picture. The recognizer module comes into play after the face has been detected successfully. The recognition module uses the KNN (K-nearest-neighbor) algorithm to carry out the recognition[I]. After a good match, the notification module will send a message to the administrator indicating that an entry has been made. This is done to counter any suspicious entry. The notification module can also request a PIN authentication if the recognizer is not confident that an entry request is being made. Fig.1 displays the flow diagram of the modules. The diagram shows the hierarchical flow of the modules proposed by our method.

Detecting the Motion

To detect the presence of any nearby object, we are trying to use the PIR sensor (passive infrared sensor). This sensor is capable of detecting any human activity between 5m and 12m. This is required to determine whether a person has entered or left the field. This module triggers the machine to start the process of image capture when some motion is detected.

Capturing the Image

The camera module present in the device captures the image of the object identified by the PIR sensor. Depending on the distance of the object from the camera, the lighting

conditions and the quality of the picture obtained from previous attempts, the camera can take more than one photo.

Detecting and Recognizing Face

The machine learning module is now called into action to detect and identify the face present in the image from the camera module. The Hair algorithm is used to detect a face. The Hair Cascade Classifier extracts unique features from the image, taking into account positive (images of faces) and negative images (images without faces). Each function (Edge, Line and Four-Rectangle) is a single value obtained by subtracting the sum of the pixels. This measures all of the important features in the picture and discards the irrelevant features.

The KNN algorithm (K-nearest-neighbor) is used for face recognition. The KNN does not make its own decisions, the way it works depends entirely on the training of the machine. It is a memory-based algorithm that learns by storing the representation of training examples.

Sending Notification

This last module analyses the outcome and sends a notification to the administrator. Either access has been given or refused, it shall be reported to the administrator. This means that every unauthorised person enters the premises. If the system partially recognises an individual, it will automatically send a message asking for a PIN authentication.

VII. APPROACH

Once a face is identified, the next step will be to decide whether or not the human ID (image) at the door is registered. This step is the Face Recognition Step, where the data already uploaded by the approved users is used to enable their entry. The product of the Face Detection Module is an xml file containing a list of human features at the entrance. The newly generated xml file is compared to the current xml file of the approved users. The two files are compared to decide whether or not the newly generated file data is already present in the system. The KNN (K-Nearest Neighbor) algorithm is used to compare the features.
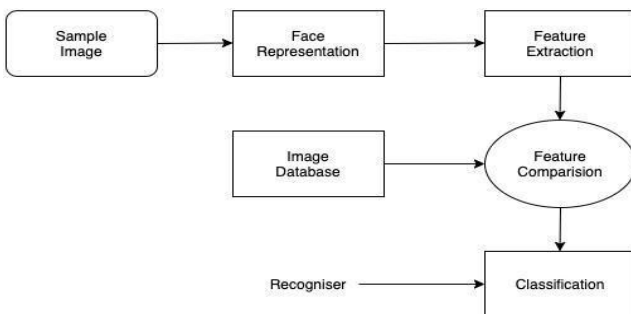

Figure 2. Image Identification and Recognition

KNN is used to detect related facial features in this situation. A vector representation of the features is generated and then compared using a distance metric (Euclidean Distance). If similar features are found with the utmost expertise, it indicates that the person at the door is an approved person who has access to the door. Else, the human being is classified as an approved individual who does not have access to the door and is identified as a visitor.

If the person at the door is an approved staff member, the door will be opened for him and the admin will be informed of his entry into the building. Furthermore, his ID will be disabled once he is inside the building. This means that his ID (face features) will be locked down before he stays inside the building.

If the person at the door is identified as a visitor by the system, the admission of the person depends on the action taken by the administrator when prompted by the system. If the admin allows its entry, the guest framework will create a temporary ID. The temporary ID will remain locked until it is inside the building. The temporary ID will be removed from the database as soon as the visitor leaves the house. The admin can also have a time bound, which restricts the device from removing a temporary ID and preserves it until the time is up.

An intellectual algorithm focused on a neural network designed to identify patterns in different datasets. For conversion of neural networking machine vectors, real life details like images, text sounds, pictures etc. are used. A multi-layer neural network consists of several nodes in each stratum. Depending on the model type, the neural network attempts to assess the weight of all data in a node. The weight defines the importance of the input results. The weighted value is determined and the output of the node is measured according to such threshold biases.

Certain active functions for triggering the output and input are used. Every **f**-function can be rendered complicated by a neural network. A simple function classifying,

$$z = f(b) \qquad (1)$$

is to classify the inputedadatum x in class y, while the neuralsanets classify a default parametera, aβ and thus
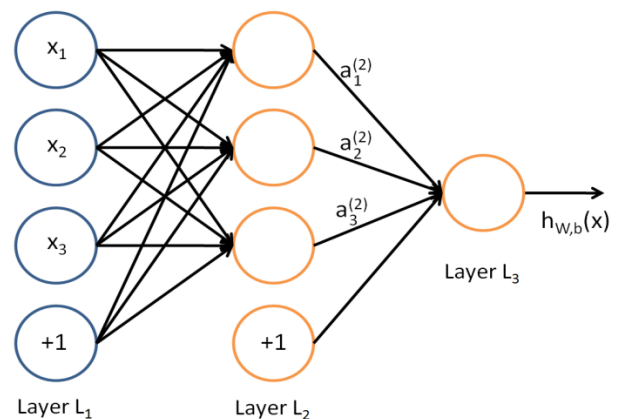
$$z = f(a\beta) \qquad (2)$$

Figure 3. Small Neural Networks

This can be expressed by the network of these functions:

$$f = f(x)f2(x)f6(x)f3(y)f7(z) \ldots \qquad (3)$$

The first layer in the row is called f1 and the second layer is called f2 etc. The neural network depth is defined by length by chain. The finishing layer is classified as the output layer. Fig2 displays the picture of the neural network. During the exercise, the output of the target layer is not apparent such that the main layer is called the secret layer. The DNN is the artificial neural network's multi-hidden (ANN) layer and a more abstract feeding method.

VIII. ALGORITHM

Based on the research, we proposed an algorithm for Face Recognition.

Before applying the algorithm, we need to follow these steps.

STEP 1: 1024 outputs with reluaactive function and dropoutawith 0.6 are provided by the 1st layer that is densed layer.

STEP 2: 1024 outputs with reluaactive function and dropouta with 0.6 are provded by the 2nd layer that is densed layer.

STEP 3: 600 outputs with reluaactive function and dropouta with 0.6 are provided by the 3rd layer that is densed layer.

STEP 4: 18 outputs with soften maxaactive function and dropout with 0.6 are provided by 4th layer that is output layer is densed layer.

Pixel dimensions are uploaded in database

We have to upload all the measurements of dimensions in pixels to out Facial Database.

Using HAAR CASCADE, recognize facial dimensions of all image.

Recognization will be done based upon Haar Cascade functions which will indicate all the parts of face such as Nose, Eyes, Mouth.

Croping the facial part from the image.

It is very much important to crop only thr Face portion from the entire image before detection.

Break the data in the ratio of 9.6 :1 and cross authenticate it.

It will be helpful if we segment the facial portion in the proportion of 9.6:1 which will further gives more segmentation.

Train the Neural Networks with the measurement of e-poch= 60.

Neural Nets will work properly only when te developers will train it with all the basic and advanced features.

Using test and train outputs, plotting the graphs.

After training Neural Nets, we need to perform all the testing purposes and based on that we need to put all the graphs of a 3-Dimensional axis.

Calculate the modded average(mean).

We have to calculate the mod of all the values and then take the average which will give the most appropriate result.

Write down the final result.

Finally, we have to note down the result which will be almost accurate and plot it in histogram.

IX. RESULTS

To date, the images used to validate the proposed system have produced 2% more hit rates than the current LBP systems. The overall result could be changed progressively depending on the number of images trained. The proposed system needs high-end PC rigs to produce a better outcome as it will gradually increase the computational speed resulting in faster image training. This is perhaps the most prolific downside in this method as a typical home-based PC lacks the processing power needed to train images for the required data collection. A line graph comparing the two (LBP and Haar) algorithms was shown. The graph clearly shows how well Haar performs over the current LBP. As the number of objects is increased for identification, the LBP will not work. Whereas, the consistency of the hair is retained.

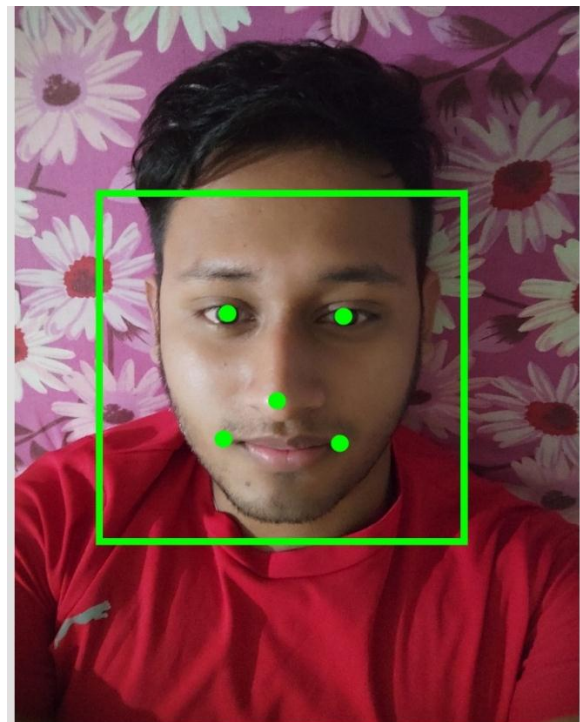We have performed the experiment and got that it can detect and recognise face very properly.

Figure 4. Result Image

A table, pointing out major differences between proposed (Haar) and existing algorithm (LBP), is shown in Table 1.

Table-1: Key Differences between Haar & LBP

Algorithm	Advantages	Disadvantages
Haar	1. High Detection accuracy (about 1-2% better at detecting faces). 2. Low false positive and false negative rate.	1. Computationally complex. 2. Limitations in difficult lightening conditions.
LBP	1. Computationally simple and 3x faster than Haar cascade. 2. Provides slightly better results in poor lightening.	1. Less accurate. 2. High False positive and false negative rate.

X. CONCLUSION

Briefly put, the process of detection and recognition using our methodology is effective in the accurate identification of human faces. The method is able to work marginally better than the LBP algorithm and has a good scope for potential implementations. The whole system is also doing its hardest to exclude any unnecessary costs. The motion sensor used keeps the machine idle, resulting in lower overall power consumption. The proposed device would be able to detect high-level 3D spoofing if it is fitted with a depth sensor and is trained accordingly. The primary objective of this project is to strengthen and remove any discrepancy in existing security systems and to achieve results as precisely as possible.

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Analysis of Effectiveness of the Browsing Behavior of Web User using Sequence Weight Knowledge

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Abstract— A number of web users worldwide regularly follow the web to share their information, converse various topics, share, stay connected and obtain information. As a result, enormous amounts of data are generated by the web users and then one could employ this data to obtain useful predictions of certain web user related behavior. There are many platforms where web users could communicate and exchange information. These platforms comprises of social networks, and digital communication networks. In this research paper, the effectiveness of the browsing behavior of web user is analysed using sequence weight learning. The outcome shows that the proposed personalized recommendation framework using the Competence Scoring process for sequence weight learning able to achieve significantly higher accuracy. The investigation result of web uses also shows the personalized framework predicts future items reliably and could be employed to automatically recommended next-items to indented web users.

Index Terms— Web user behavior, Sequence Weight Learning, Sequential Pattern Mining

I. INTRODUCTION

User behavior analysis over web makes user information view and searches the rules of user behavior from massive web user behavior data. It helps enterprises better understand the web users' preferences, developing the value of web users and ultimately bringing more benefits to enterprises. In the development of the technological data, the multi-dimensional mass storage data acquisition and storage technologies has become maturing the structured and un-structured web user behavioral data which has a large increase, making web user behavior assumption and application research that is important.

The data mining for sequential data, having lots of research areas for the constructive information gathering from unknown, employ and reliable samples related to sequential database. Now a day the website growth increases and the complexity for web users to browse effectively. Therefore the web form of data in different format has been growing rapidly in previous years. This bulk quantity of data has produced in highly volume of hyperlinked documents which contain text, audio, video etc. which is not possible to store in memory [1,2].

In the present scenario, the websites are having drastically growth in size with new process for processing of customer requirement. The online applications are having lots of data about material and supplier. Since the website data in the size rapidly growing and produces the resulting network of information with lacks of structure. Due to this reason, the website web users are getting now and again mismanaged and lost in that related is information overload that continues for expansion of data. The detection of most related information is needs to be fetching by involving the

new search with indexing of the content in the websites. The collection of some meaningful knowledge is most useful that is also available on the web form. As per the concern of individual web users' needs and its interests in the product selection by personalizing and provide relative information and its services [3-5].

II. WEB USER BEHAVIOUR ON WEB

A numeral of web users worldwide regularly follows the web to share their information, converse various topics, share, stay connected and obtain information. As a result, enormous amounts of data are generated by the web users and then one could employ this data to fabricate useful predictions of certain web user related behavior. These predictions could be employed in a variety of domains, including products marketing, finance, social dynamics, public health, and politics. The consequences of this are that an increasing number of researchers have been attracted to do study on this subject [6].

Following points discusses the short overview of web access platforms:

A. Social Networks

The social networks are the well-liked platforms for socialising, interacting and sharing information on the web. Societal Network platform consist of Twitter and Facebook; while Question & Answers (Q & A) forum includes Quora and Stacks Exchange. In addition, digital newspapers, such as the Daily Newspaper and The weekly Newspaper allow web users to send their comments and interact with other web users.

Following are the common features of these social platforms,

- the existence of mechanisms to interact and propagate information

- being there a social structure

In earlier days, two most successful and the largest social networks are Facebook and Twitter:

- **Facebook:** In this platform, or social network, the people could make `friend' to every other and communicate with every other. A mutual abstract model for representing the 'Facebook' assemblage is a social graph where people are nodes and their relationships are edges of the graph.

- **Twitter:** In this social media platform, the people `follow' every other and be follow by others/ or follow somebody.

B. Digital Communication Networks

The Internet services have provided people the ability to communicate worldwide through e-mail and instant messengers. Top furthermost brands like Google, Microsoft and Yahoo are the type of such email services. The Facebook messenger, Whats-App and Kiki are examples of instant messengers.

III. MODELS OF WEB USER BEHAVIOUR ON THE WEB

The web user behavior on the web could be considered as a procedure of communication and interaction amongst web users on a web. This is one of the modest models of communication is responded in the earlier work. This model consists of a transmitter, a message, a channel in which the communication travels, noise or interference, and a receiver [7,8,12].

The models of web user behavior are split into two large groups which are-

(1) A Dynamic models

(2) Graph-based models

The dynamic model is based upon the control assumption and system assumption whereas graph-based models employ graph assumption and social networks assumption.

3.1 Dynamic Model

A dynamic model characterizes the behavior of an object on time. Generally such models are measured as a set of states ordered in a sequence. In case of web user behavior on web, such objects are peoples and the dynamic models represent their behavior. Every internal cerebral state could be written as a single dynamic process:

$$\dot{x}_k = f_k(x_k, t) + \xi(t)$$

$$y_k = h_k(x_k, t) + v(t)$$

where, the function f_k models the dynamic evolution of state vector x_k at a time denoted with k. Both ξ and v are white noise processes with known spectral density matrices.

The explanation denoted by y_k is a function h_k of the state vector x_k.

In the study of sequential data mining, the concept of dynamic model has been functional for various domains. Such system consists of input, an output and state variables that are generally associated with differential equations.

3.2 Graph based Model

The graph based model presumes that the graph is employed for modeling web user behavior. Typically, the nodes of such a graph are connected with people and the edges connecting the nodes are related with some sort of communication or connection among the people. The modeling of web user behavior as a graph allows capturing structural properties of the network formed by the group.

A graph-based model of a social media *Twitter* network have been proposed and then built. In the research study, the researchers proposed a graph namely

$$tt = (U, E)$$

where the nodes U linked with people and the edges E is linked with the relationships of following web users or web users being followed by other web users.

The Time-Varying Graphs (TVGs) have been established to describe a wide range of dynamic networks. The nodes of a Time-Varying Graphs are denoted as a set of entities U and edges are a set of relation denoted with E in among these entities. In addition, an alphabet L accounts for any possessions of a relation. This could be denoted as,

$$E \subseteq U \times U \times L$$

The meaning of labels L is a domain specific and left opens. It is having a distinct label L and the set E permit multiple relations among entities.

The relations amongst entities are defined on a time span T

∈ T called the life-time of the system. The temporal

domain denoted with T is N for discrete time system for continuous time systems. The dynamics of the system could be described as a Time-Varying Graphs, in which

$$tt = (U ; E; T ; \rho; \zeta),$$

where $\rho : E \times T \rightarrow \{0, 1\}$, called occurrence function, indicates whether a given edge is available at a given time. Whereas $\zeta : E \times T \rightarrow T$, called Latency function that indicates the time it takes to cross a given edge if starting at a given period (the latency of an edge could vary with time).

The sequence ST (tt) = sort(∪{ST (e) : e ∈ E}), which is called characteristic dates of tt, correspond to the sequence of dates when appearance or disappearance of an edge occur in the system. As such events could be capable of evolution of the graph tt. The evolution of tt is described as the sequence of graphs

$$Stt = tt1, tt2, .., ttn−1, ttn$$

where tti corresponds to static snap-shot of a graph at time t

= i. In general case, tti f = tti+1.

Time-Varying Graphs concept is a useful mathematical ideal for capturing temporal properties of a societal network sites.

IV. EXTRACTING FEATURES FOR PREDICTION

Prediction of web user behavior on the web involves building predictive models of web user behavior that depends on historical data. In this paper, an algorithm is employed for building web user behavior model. The most important requirement for such models is being able to produce a truthful prediction [13-15]. The process of identification of features for predicting web user behavior is mentioned below :

4.1 Identifying Features

There is a great number of probable ways to construct and compute features. These features are essential for producing a perfect prediction and some of them are employing. In this Sub-section of research study, a set of features for Twitter trends prediction is analysed. The investigator employed three types of features which are -

- Content
- Node
- Structure

The *content* features are extracted from the data; for example, the number of persons. The *node* features are associated with the information of web users. The *structure* features are related to the metrics on the topological structure of the network.

The features related to Structural features, Usage of network and Profile features the author extracted for building a predictive model. These features are :

- Structural features (in which number of edges, internal density of social network usual total degree formed by a community)
- Usage of network (like chat days, audio-video days)
- Profile features (includes number of countries, cities, gender, age of web users)

All over again, the structural features are high significant for the prediction. A model for predicting how web user connected in on-line location-based societal networks was proposed by the researcher [9,10]. The researcher classified the features into social features pointed for friends-of-friends, place features computed for place-friends and global features. The place features include, the amount of check-ins, the numeral and the fraction of common places among two web users.

4.2 Complexity of Feature Extraction

To identify the features that considerably inspiration the realization of a sequential sample task is one side of furthermost sequential sample mining work. The complexity of calculating such features could be analysed using Big 'O' notation. To do this, several transformations of feature space model are introduced [16]. These transformations are as following:

- **Standardisation:**

The features could signify comparable objects then be measured in different units. For instance, two dissimilar features represent the same dimension but the first one is in seconds and the second one is in minutes. The standardisation prevents this from happening.

- **Aggregation:**

Aggregation involves several features aggregation.

- **Normalisation:**

Employed to eliminate the requirement of a feature on the size of the feature

- **Non-linear expansions :**

In case of the problem is very hard and complex, the available features do not enough to derive respectable results in the form of accuracy of prediction;

It is observed that some transformations transform the dimensionality of a problem while others do not. For example, *Standardisation* & *Normalisation* doesn't change the dimensionality of a difficulty while *Aggregation* decreases the problem dimensionality.

On the basis of above, choosing a process for feature selection task depends on the -

- Total number of features
- Size of data
- Algorithm computational complexity

V. SEQUENCE WEIGHT KNOWLEDGE FOR NEXT ITEMS RECOMMENDATION

The personalization of weights is initially assigned to all sequences in the Sequence Database as an off-line operation using the aforementioned learning progression. The author define the personalized *count* and *support* to obtain into account the learned sequence the weights so that the web user-specific sequence knowledge is efficiently exploited by the proposed framework to personalize the sequential mining:

It is necessary to check the sample count. In this regard, the every sequence si □ Sequence Database has a learning weight $w(si,sq)$ with respect to web user sequence sq, the count of sample x in sequence database is:

$$Count\ (x,s_q) = \sum_{s_t} w(s_i,s_q)$$

The above equation sums the weights of all sequences that contain the sample x, such that a higher $count(x, sq)$ means a higher support for sample x in the sequence database.

Now next task is to count the sample support. The support of x in Sequence Database is defined as:

$$Support\ (x, s_q) = \frac{Count\ (x, s_q)}{\sum_{s_t} w\ (s_i, s_q)}$$

where the denominator is the entire sequence the weight in the sequence database.

The above support definition satisfies the monotonically-decreasing property: given samples A and B, if $B \square A$, then $support(B) \square support(A)$,

as B must be part of all sequences containing A. Therefore, it is readily appropriate to any of the conventional Apriori-inspired sequential sample mining algorithms to mine the high-support samples. An an example of such sequential sample mining algorithms is Consequence weight learning, the admired sample-growth approach in which a sequence database is recursively predictable into a set of smaller databases, and sequential samples are grown in every projected database by exploring merely locally frequent fragments [17].

In the sequential pattern mining, samples with personalized *support* not less than the specified minimum support δ are productivity as the web user-specific frequent samples Fq:

$Fq = \{x|support(x, sq) \geq \delta,\ \delta > 0\}$

In the above equation, the author employed sequence the weight knowledge to eliminate all the web user-irrelevant records in Sequence Database which are not related to the target web user (since the author will not include x in Fq if $support(x, sq) = 0$). As such, the author could significantly progress the mining efficiency. The frequent sample set Fq is then employed in our target task to recommend next-items to the target web user [18], where the majority recent items of the object web user are considered further valuable for predicting the next-items.

Algorithm 1. Personalized Sequential Mining-based Recommendation

INPUT: The target web user u_q's sequence, s_q, and the database Sequence Database of other web user sequences **BEGIN**

// sequence the weight learning step

for all sequence $s_i \in SEQUENCE\ DATABASE$ **do**

Compute $b_{i,q}$ (t) // backward-compatibility

         $f_{i,q}$ (t) // forward-extensibility

         $c_{i,q}$ (t) // Competence Scoring

end for

// the Sequence Database with sequence the weights personalized to web user

     Apply a sequential mining algorithm to get personalized frequent samples,

Fq to compute the personalized support

// next-items recommendation step (target task)

     Employ the algorithm to compute the personalized support of every candidate next-item in frequent samples Fq and recommend the items with highest support to web user u_q

END

VI. EXPERIMENTAL EVALUATION

The author presents a two part evaluation of proposed personalized sequential mining-based next-items suggestion framework. In the first part, the author evaluates the effectiveness of learning sequence with respect to the sequential weight mining. In the second part, the author evaluates the framework's efficiency in terms of prediction accuracy of the next-items recommendation.

6.1 Evaluating the Framework Efficacy

We have chosen MSNBC dataset to assess the effectiveness of the framework as it has to a great extent more sequences. The learning of web user-specific (personalized) sequence the weights ought to decrease the time taken for sample mining, because by eliminating all the web user-irrelevant sequences (i.e. the weights are

equal to 0) in Sequence Database. We merely need to handle a much smaller personalized hypothesis space consisting of sequences that is extra relevant to the target web users [19,20]. On the divergent, without exploiting personalized sequence the weights, sequential sample mining algorithm will be performed inefficiently since it has to go through all the transactions in Sequence Database. To test a dataset an analytical tool MATLAB 2016a is employed over the dataset.
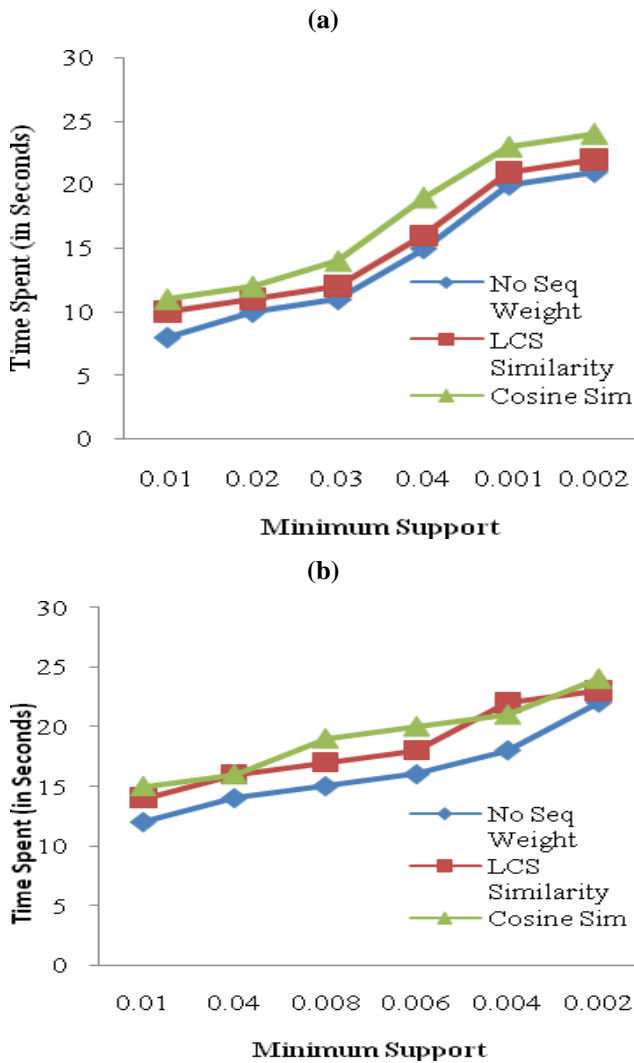
(a)

(b)

Figure (b) : Improvement in time taken as a result of Personalized Learning Framework (database size from 50000-100000 sequences)

	Applicability	Recall	Precision	F1 Measure
No seq. the weight	40.00%	0.188	0.35	0.32
Recognition	42.45% (0%)	0.182 (0%)	0.33 (0%)	0.33 (0%)
LCS relatively	55.3% (15%)	0.24 (32%)	0.40 (15%)	0.382 (20%)
Cosine sim.	46.0% (10%)	0.24 (20%)	0.36 (10%)	0.388 (20%)
Competence Scoring	80% (80%)	0.50 (40%)	0.60 (50%)	0.524 (140%)

Table 1 : Performance of algorithms with % improvement over and above sequential weight mining with no sequence weight learning

Figure 1(a) shows the time taken to mine sequential weight for dissimilar minimum support values when there is no personalized sequence of weight learning, versus with sequence the weight learning using the related process.

Indeed, the framework considerably condensed the time for the sequential sample mining, particularly with our Competence Scoring the weighting procedure. Figure 1(b) compares the total time taken for both learning sequence of the weights and running the sequential weight mining algorithm. Taking into account the sequence in weight learning instance, the web user-independent learning process is applied. This completely ignores the target web users and computes sequence the weights based on their items' recognition, added significantly to the time taken, making it fewer striking compared to sequential sample mining without sequence the weight learning.

6.2 Accuracy of the Next-Items Recommendation

For different processes for next-items recommendation using MSNBC and book-loan datasets has compared. We need to do experiment with sequences having sufficient items (at least ten items in our experiments). For every sequence, we release the primary five items (known portion) and hold-out the remaining items because the ground- truth for evaluation. The author allow every process to recommend up to ten items with the highest support values and evaluate results in terms of recall, precision and F1-measure, all of which are standard evaluation metrics for recommendation systems [21,22]. As there are test sequences for which certain processes don't give any recommendation, we also measure the applicability of every process in terms of the percentage of test cases for which recommendations are given. The author set the min-sup for MSNBC and book- loan as high as possible to 0.1 and 0.05, respectively, so that the majority of the less frequent samples are effectively filtered off by the sequential sample mining, while maintaining a minimum applicability of around 40% for the recommendation.

(a) Performance on MSNBC dataset

The results for the MSNBC and book-loan datasets are presented in Table 1. The experimental results clearly demonstrate that the process for learning of sequence the weights which are more related to the target web users could indeed yield significantly more accurate next-items recommendations. In particular, sequence knowledge learning using our proposed recommendation Competence Scoring produced the greatest improvement in performance among the competing process; it provide recommendations for almost 95 percentage of the test cases (a vast improvement in *applicability*), and considerably increased the recall, precision, F1-measure (i.e., proportion of test cases where the top-1 recommended item is correct). Particularly, for the MSNBC dataset, 70.6% of the test cases contained the first recommended item when Competence Scoring was employed, compared to just around 45 percentage for the competing process. Similarly for the book-loan dataset, our proposed Competence Scoring process was able to outperform all the competing procedure in terms of the various evaluation metrics.

VII. CONCLUSIONS

The approach of sequential mining for web user behaviour allows one to extract *semantic* groups of features linked with web users, their relationships, messages, temporal, and structural features. The proposed approach for feature extraction shows that using structural and temporal features is advantageous for the accuracy of a forecasting but extracting such features could significantly enhance the time of a feature extraction. As a consequence, a guideline for selecting and constructing an efficient feature set based on the classification is proposed.

The proposed approach for feature mining shows that using temporal features is advantageous for the accurateness of a prediction but extracting such features could increase the time of a feature extraction. The research results thus show that our personalized framework predicts future items reliably and could be employed to automatically recommend next-items to indented web users.

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Comparative Analysis of Dry-EDM and Conventional EDM in Machining of Hastelloy

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Abstract— Dry EDM is a modification of the conventional EDM process in which the liquid dielectric is replaced by a gaseous medium. High velocity gas is supplied through it into the discharge gap. The flow of high velocity gas into the gap facilitates removal of debris and prevents excessive heating of the tool and work piece at the discharge spots. It is now known that apart from being an environment–friendly process, other advantages of the dry EDM process are low tool wear, lower discharge gap, lower residual stresses, smaller white layer and smaller heat affected zone.

Keeping literature review into consideration, in this research, an attempt has been made by selecting compressed air as a dielectric medium, with Hastelloy as a work piece material and copper as a tool electrode. Conventional experiments were also performed. Experiments are performed using Taguchi DoE orthogonal array to observe and analysis the effects of different process parameters to optimize the response variables such as material removal rate (MRR) and tool wear rate (TWR)

Index Terms— EDM, DRY EDM, MRR, TWR

I. INTRODUCTION

Cleaner production has become a global topic due to global environmental problems caused by the consumption of natural resources and the pollution resulting from the production of technical products. These have led to increasing political pressure and stronger regulations being applied to both the users and manufacturers of such products. Sustainable development initiatives were well defined and implemented on the political level, but there was a severe lack of implementation practices to bridge the gap between science, policy-making, and implementation. Adopting sustainable manufacturing practices offer the possibility for 'difficult to machine' materials machining companies to improve their economic and environmental performance simultaneously.

The corrosion-resistant Hastelloy alloys are widely used by the chemical processing industries. The need for reliable performance leads to their acceptance and growth in the areas of geothermal, solar energy, oil and gas and pharmaceutical. The benefits of Hastelloy process equipment include high resistance to uniform attack, outstanding localized corrosion resistance, excellent stress corrosion cracking resistance, and ease of welding and fabrication. The material is difficult to machine using the traditional machining methods. Electrical discharge machining of Hastelloy is the widely used energy-based technique to advance and gain favour as an alternative to traditional machining methods. The low MRR always restricts the application range of this method. Several researchers have tried to improve the MRR of EDM of Hastelloy, such as combined with ultrasonic machining and developed a new electrode, but the effect was not obvious. A high-speed dry EDM was proposed in our previous study, which used non-polluting air as dielectric. Dry machining is considered as the best method to eliminate the use of cutting fluids in manufacturing enterprises and thus reduce the machining costs and ecological hazards. The MRR of AISI 304 stainless steel in this promising dry machining method could be as high as 5162 mm3/min, which improved the MRR by 2nd to 3rd order of magnitude compared with that of conventional dry EDM.

II. LITERATURE REVIEW

Kunieda and Yoshida attempted air as a dielectric medium for EDM machining in 1996. They have used steel as a work piece, copper as tool electrode and compressed air as a dielectric. They found that the material removal rate is much higher with tool electrode as a negative polarity compared with the positive polarity. In contrast, in the case of EDM in a liquid, there is higher material removal rate when the polarity of the tool electrode is positive. They compared machining characteristics between EDM in air with a negative tool electrode and EDM in oil with a positive tool electrode. They also found that the tool electrode wear ratio is much lower when the polarity of the tool electrode is negative compared with the case in which the polarity of the tool electrode is positive.

Kunieda et al. Have used a piezoelectric actuator to improve the dry EDM characteristics by controlling the discharge gap distance. They have used copper-tungsten pipe of 1mm in diameter as tool electrode, carbon steel as a work piece and compressed air as dielectric. They found that with increasing gain of the driver for the piezoelectric actuator, the probability of short circuiting decreases, by resulting in considerable increase of the material removal rate. They also found that tool wear ratio was 0.29%, and it took 43 minutes to machine the grooves with a depth of

0.8mm. Without the piezoelectric servo, the tool wear ratio was 1.3 times higher and the machining took 1.7 times longer.

Tao et al. Have experimentally investigated the dry and near dry EDM process in 2008. A two phase gas-liquid mixture was used as the dielectric medium in near dry EDM. The effect of discharge current, pulse-duration, pulse interval, gap voltage and open circuit voltage was investigated at constant values of gas pressure and tool rpm by using a 25-1 fractional factorial designed experiment. It was found that copper tool and oxygen gas dielectric with a high current and low pulse off time were suitable for rough machining with a high material removal rate (MRR). The highest material removal rates (MMR) of 1.8 mm3/min have been reported using kerosene-air mixture used as dielectric.

Govindan and Joshi have worked on performance of dry EDM using slotted electrodes in 2011.They have used copper as tool electrode, SS304 as work piece and oxygen as dielectric medium. They tried with different slots on electrode in their experiment and reported with four slots as a effective number of slots for highest material removal rate (MMR). They have registered the highest average material removal rate (MRR) of 1.497 mm3/min. They conclude that, the use of electrodes with peripheral slots helps flush debris particles more effectively and hence promotes improvement in material removal rate (MRR).

Govindan and Joshi worked on experimental characterization of material removal in dry electrical discharge drilling. They have used copper as tool electrode, steel as work piece material and oxygen as a medium. They have mentioned two phenomenon of tool wear rate (TWR) that is erosion of electrode material and deposition of material on the electrode. They have found minimum tool wear at oxygen pressure at 94.5%, radial clearance at 88.5% and spindle speed at 88%. In their experiment tool wear rate (TWR) was almost close to zero and none of the input parameter influencing tool wear rate (TWR).

Grzegorz Skrabalak and Jerzy Kozak carried out study on dry electrical discharge machining. They compared surface roughness during DEDM milling with single hole and 2-channel electrodes. They also presented basic characteristic of the DEDM milling process and comparison of this green machining method with kerosene based EDM milling.

III. PROCESS PARAMETERS

The process parameters which will influence the experiment of optimizing while machining of the Super alloy are listed below

i. *Discharge current* - It points out the different levels of power that can be supplied by the generator of the EDM machine and represents the mean value of the discharge current intensity.

ii. *Pulse-on time* - It is the duration of time (μs) the current is allowed to flow per cycle. Material removal is

directly proportional to the amount of energy applied during this pulse-on time. This energy is controlled by the discharge current and the duration of the pulse-on time.

iii. *Duty cycle* - It is a percentage of the pulse-on time relative to the total cycle time. This parameter is calculated by dividing the pulse-on time by the total cycle time (pulse on time plus pulse-off time). The result is multiplied by 100 for the percentage of efficiency, called duty cycle.

EDM MACHINING CHARACTERISTICS:

The effectiveness of EDM process is evaluated in terms of its machining characteristics. The short product development cycles and growing cost pressures have forced the die and mould making industries to increase the EDM efficiency. The EDM efficiency is measured in terms of its machining characteristics viz. material removal rate, surface roughness and tool wear rate. The most important machining characteristics considered in the present work are:

i. *Material removal rate (MRR):* Material removal rate is a desirable characteristic and it should be as high as possible to give least machine cycle time leading to increased productivity. Material removal is the difference of weight of work-piece before machining and after machining. It is calculated by the formula as given below.

$$MRR = \frac{Wi - Wf}{\rho w \, t} \quad mm^3/min$$

Where, Wi is the initial weight of work-piece in g; Wf is the final weight of work-piece after machining in g; t is the machining time in minutes and ρw is the density of work piece material.

ii. *Tool Wear Rate (TWR)*: Tool wear rate is the difference of electrode weight before and after machining and is expressed as

$$TWR = \frac{Et - Ef}{\rho e \, t} \quad mm^3/min$$

Where, Ei is the initial weight of electrode in g; Ef is the final weight of electrode after machining in g; t is the machining time in minutes and ρe is the density of electrode.

IV. OBJECTIVE

The objective of this research is to study the effect of different process parameters on Material removal rate and tool wear rate of conventional as well as dry-EDM.

The quality of EDM is dependent on various process parameters. If any of the process parameters is changed, it directly affects the quality of EDM. Hence in this project we varied four process parameters namely current (A), pulse on time (ton) and duty factor (%).

V. EXPERIMENTAL DETAIL

Machine Specifications

Sr. No	Description	SZNC 20-4025	Unit
1	Work Tank Dimensions	600 x 400 x 300	Mm
2	Table size	400x250	Mm
3	Z-Axis travel with ball screw	200	Mm
4	X and Y-Axis travel with ball screw	150	Mm
5	Max. Job Height	165	Mm
6	Max. Job Weight	100	Kgs
7	Max. Electrode weight	80	Kgs
8	Best MRR(Cu to Steel)	140	mm3
9	Min. Electrode Wear	0.1	%
10	Best Surface Finish	0.5	Ra
11	No. Of Filters	1	No.
12	Dielectric tank capacity	200	Litres

Fig 1: EDM Machine

Workpiece Material and Electrode Selection

The experiments were conducted on Hastelloy. The workpiece used for experiment was 60 mm in diameter and 10mm in thickness. The material was cut into slabs using wire EDM.

Material composition

Element	Composition %
Nickel	56
Chromium	22
Molybdenum	13
Tungsten	3
Iron (Fe)	3
Silicon	0.08
Manganese	0.5
Carbon	0.01
Vanadium	0.35
Copper	0.5

Dimension of work piece was 60mm in diameter and 10mm in thickness. The electrode used was of copper of dimension 20mm*20mm*5mm.

Fig. 2: Workpiece   **Fig. 3: Tool**

Design of Experiment

After carrying out the literature survey we carried a lot of screening experiments to get a range of each process parameters

The experiments are designed based on Taguchi L9 orthogonal array for different parameters such as three levels of current, pulse on time and duty factor. The process parameter and their levels are shown in Table.

Input parameter	Level		
	1	2	3
Current I(A)	5	10	15
Ton(μs)	10	30	50
Duty Factor (%)	40	60	80

Expt. No.	Current (A)	Ton (μs)	Duty Factor (%)
1	5	10	40
2	5	30	60
3	5	50	80
4	10	10	40
5	10	30	80
6	10	50	60
7	15	10	80
8	15	30	40
9	15	50	60

VI. EXPERIMENTAL RESULTS AND ANALYSIS

Experiments done on conventional as well as dry EDM by using L9 orthogonal array. The machine voltage was set to 40V and using compressed air at 2 bar constant for dry EDM.

From results we can see that MRR increase as Ton, current and duty factor increase. Current is the most significant factor in the process.

This is because the number of electrons striking the work surface in a single discharge increases thus eroding out more material from the work surface per discharge.

Fig. 6: Machined Workpiece   **Fig. 7: Machining**
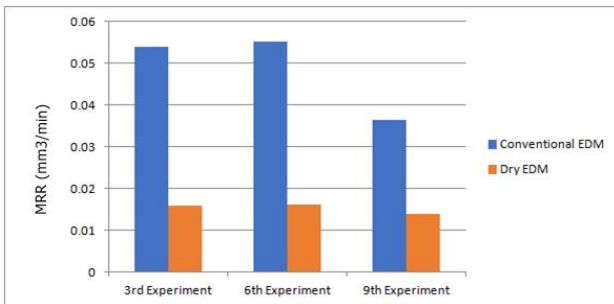

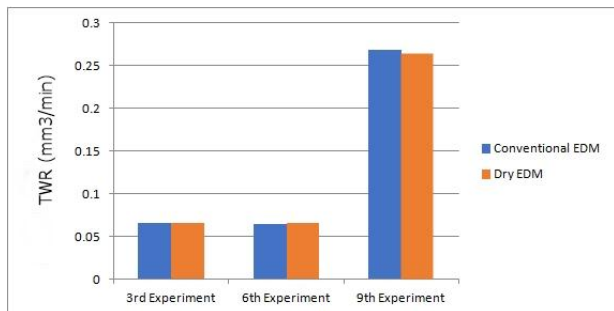**Fig. 4: MRR comparison**

Fig. 5: TWR comparison

From the graph of MRR it is observed that MRR of conventional is more as compared to Dry-EDM. This is due to difficulty in flushing. The debris stay accumulated in same place and results in lower MRR.

As the current increases the maximum amount of discharge energy is used to remove material from work piece which deposits eroded material on the tool so it decreases the tool wear rate (TWR).

VII. CONCLUSION

1. In this research, the effect of process parameters on the response variables (MRR, TWR) of Hastelloy was investigated experimentally in conventional and dry EDM.

2. Dry-EDM shows lower MRR as compared to conventional EDM due to difficulty in flushing.

3. TWR decreases in Dry-EDM.

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A Review on Series Vectorial Compensator

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Abstract— In this paper represent the basic introduction and review on new facts devices of the Series Vectorial Compensators. It is the new series FACTS devise which is implemented in the power system for verify the performance of the devise. However, most of the FACTS devices use DC capacitors which are likely to high temperatures while a SVeC using a direct AC/AC power-conversion principle has a simpler pulse-width-modulation (PWM) controller without large DC-link energy storage components. A idea of SVeC is to manage working power on a transmission line with a easy structure interjecting a series capacitive reactance that is set automatically through a duty cycle control. SVeC physically has not designed in the market, but various benefits can be found.

Index Terms— FACTS, SVeC

I. INTRODUCTION

In power system there are main four element of power system (i) power generation (ii) power transmission (iii) power Distribution (iv) power consumption/load. We also need monitoring, operational and control the system. Power System over the globe are becomingly increasing complex and the requirements for providing stable, secure, controlled, economic, quality power, especially so in the deregulated environment are becoming vitally important. There is an overwhelming need to increase transmission capacity on transmission lines and control power flow in specific corridors, while ensuring system reliability during any failure scenario [1]. Recent advances in power electronics have led to the development of Flexible AC Transmission System Devices (FACTS) be effectively used in power systems to enhance the performance. Use of Flexible AC Transmission systems controllers in a power system has the following benefits:

- Control the power flow in a transmission line
- Increase the load capability of lines
- Limits the short circuit currents and overloads, prevents Blackouts
- Reduce reactive power flow and Prevents loop power Flow.
- Decrease overall generation reserve requirement of Interconnected areas.
- Improve HVDC converter terminal performance.
- Wind power generation system

The classification of the FACTS controller done on the basis of their types of arrangement in power system In general FACTS controllers can be divided into four categories[1]:

- Shunt Controllers
- Series Controllers
- Combined Series-Series Controllers
- Combined Series-Shunt Controllers

Shunt Controllers:

A shunt controller may be of variable impedance, variable source or a combination of these. In principle, all bypass controllers inject current into the system at the connection point. The variable shunt impedance connected to the line voltage causes a variable current flow and therefore represents the injection of current into the line. As long as the injected current is in quadrature phase with the line voltage, the bypass controller only supplies or consumes variable reactive power. Any other phase relationship will also involve real power handling. Bypass Controller Example: 1. Static Synchronous Compensator (STATCOM) 2. Static Variation Compensator (SVC) Series Controllers All series controllers inject voltage in series with the line.

Series Controllers

All the series controllers inject voltage in series with the line. This driver could be variable impedance, like capacitor, reactor, etc. or variable source based on main frequency power electronics, sub synchronous frequencies and harmonics to meet the desired need. The variable impedance multiplied by the current flow through it represents a series voltage injected on the line. As long as the voltage is in quadrature phase with the line current, the series controller only supplies or consumes variable reactive power.

Combined Series Controllers

This could be a combination of series controllers that they are controlled separately in a multi-line transmission system. Serial controller examples: 1.Synchronous Series Static Compensator (SSSC), 2. Thyristor Controlled Series Capacitor (TCSC) 3. Series Vector Compensators (SVeC)

Combined Series-Series Controllers

This could be a combination of series controllers which are controlled in a separate manner in a multiline transmission system. In addition, it can act as a unified controller in which the series controllers provide independent series

reactive compensation for the transmission line and also transfer real power between the lines through the power link. The real power transfer capability of the unified serial series controller, called the interline power flow controller, makes it possible to balance the real and reactive power flow in the line and thus maximize the utilization of the transmission system .Example of Combine Series-Series Controllers

1. Interline power flow controller (IPFC).

2. Thyristor-Controlled Voltage Limiter (TCVL)

3. Thyristor-Controlled Voltage Regulator (TCVR)

Combined Series-Shunt Controllers

This could be a combination of separate series and shunt controllers, which are controlled in a coordinated fashion, or a unified power flow controller with series and shunt elements. In principle, series combination controllers inject current into the system with the shunt part of the controller and series voltage in line with the series part of the controller.

However, when the series and shunt controllers are unified, there can be a real power exchange between the series and shunt controllers through the power link. Examples of combined series shunt controllers: (1) Thyristor Controlled Phase Shifting Transformer (TCPST) 2.Unified Power Flow Controller (UPFC)

Comparison between FACTS Devices for Power System Stability Enhancement

FACTS Device	Power System Stability Enhancement	Load flow	Voltage Control	Transient Stability	Dynamics Stability
UPFC	YES	High	High	Medium	Medium
TCSC	YES	Medium	Low	High	Medium
SVC	YES	Low	High	Low	Medium
SSSC	YES	Low	High	Medium	Medium
SVeC	YES	High	High	High	High

Table 1 Comparison between FACTS Devices for Power System Stability Enhancement

Series Vectorial Compensators (SVeC):

SVeC is a novel series FACTS device one of the disadvantages of these FACTS devices is that DC capacitors are used and they are quite vulnerable to high operating temperatures. To conquer this drawback, a new FACTS device, series vectorial compensator (SVeC), using direct AC/AC power conversion principle without large DC-link energy storage components is proposed. The SVeC has a simpler pulse width modulation (PWM) controller utilized to control active power flowing in a transmission line[3].

Although the SVeC has not been actually manufactured in the power market yet, its many theoretical benefits can be found.

Dynamic characteristics of a SVeC versus a thyristor controlled series capacitor (TCSC) as well as a SVeC versus a SSSC were compared in respectively. Several specifications of a SVeC such as transformer rating, capacitor, converter, power loss, and estimating power circuit cost are also compared with a SSSC to demonstrate the benefits of a SveC
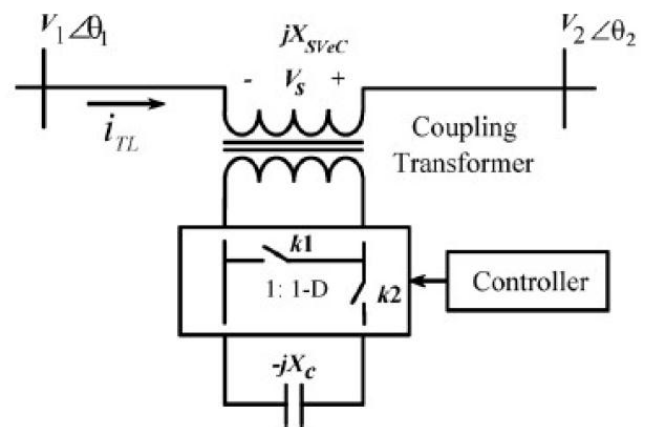
Single Line Diagram of SVeC[11]

Fig 1 Single Line Diagram

Fig1 a single line diagram of the power circuit of the studied SVeC. This device includes a series of injection transformers connected to a bank of capacitors through an ac PWM controller. When switch K2 is closed, the compensation capacitors are effectively connected in series with the transmission line. In contrast, when switch K1 is closed, the transformer terminal is shorted to isolate the compensation capacitors from the transmission line. The net amount of SVeC reactive compensation is determined by the total switching period. The duty ratio of the converter is defined as the ratio of the switch activation period to the total switching period[5].

The external of the SVeC is represented by the reactance XSVeC and the voltage source(Vs) in series with the transmission line. The main purpose of using SVeC is to provide a variable reactance XSVeC in series with the transmission line. This reactance is adjusted through variations of the duty cycle of the controller. By means of varying its equivalent reactance of the transmission line, the power flow of this line is controllable [6]. The equivalent series reactance can be defined as

$$X_{SVeC} = -n_2(1-D)_2X_c$$

Where, n is the turn ratio of the coupling transformer, D is duty cycle, and is the reactance of the capacitor bank. The value of the voltage source in series with transmission line.

Power circuit of a three-phase SVeC:

The power circuit of a three-phase SVeC shown in Fig.Consists of (a) series injection transformers Ta, Tb, and Tc; (b) Compensation capacitors Ca, Cb and Cc; and (c) switching Devices k1a, k2a, k1b, k2b, k1c, and k2c. The switches k1a, k1b and k1c are closed when switches k2a, k2b and k2c are opened and vice versa. The switches shown in the converter may be realized using gate turn-off thyristors (GTOs) or integratedgate commutated thyristors (IGCTs).avoiding the short-circuiting of the capacitor For the sake of simplicity, the snubber circuits across the switches, protection and control circuits are not illustrated in Fig.

During the period when the switches k1a, k1b and k1c are closed, the compensation capacitors are effectively connected in series with the lines, reflected through the coupling transformers. During the complementary switching period, the transformer terminals are short circuited by the switches k2a, k2b and k2c, thereby isolating the compensation capacitors from the lines[7].
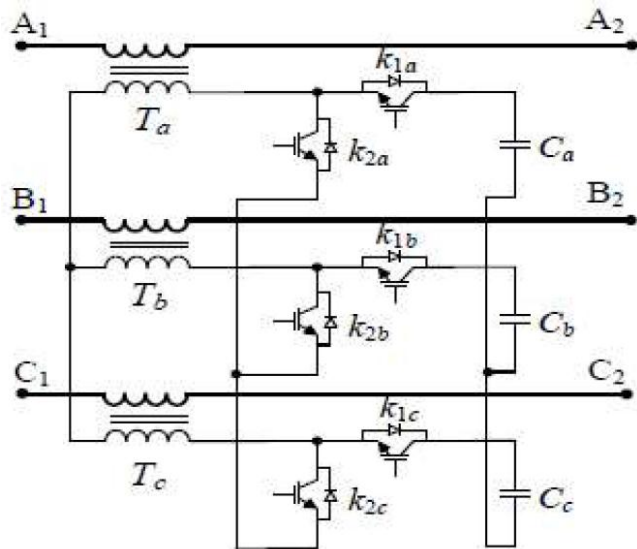
Fig.2 Power Circuit of SVeC

Advantage of Series Vectorial Compensators[4]:

- AC/AC power conversion without large DC-link energy storage components
- SVeC has a simpler pulse width modulation (PWM) controller to control the active power flowing in a transmission line, by simply vary the duty cycle.
- SVeC help with blocking high frequency voltages and currents associated with the surge.
- Number of Switches For the minimal three-phase configuration, the TCSC requires six thyristors, while the SVeC each need 6 IGBTs/GTOs.
- SVeC can controllers the change of switches duty cycle in hundreds of microseconds.
- For PWM control, the SSSC requires a synchronous type PWM, which is not the case for the SVeC.
- SVeC has better in damping power system oscillations.

The main differences between the SVeC and the TCSC and SSSC controllers are the following[2]:

Protection: In occurrence of sudden surges, low-pass filters in the SSSC and SVeC help with blocking high frequency voltages and currents associated with the surge. In addition to these filters, the switches are protected against large surges with Metal Oxide Varistors (MOVs). Furthermore, to protect these controllers against over-currents due to nearby short circuits, the controls are designed to drive the output voltage towards zero in microseconds, so that the power in the controllers during the faults are practically zero, in spite of the high currents. In the case of the TCSC, it is required to wait for the next current zero crossing to initiate control action[8].

Number of Switches: For the minimal three-phase configuration, the TCSC requires six thyristors, while the SSSC and SVeC each need six IGBTs/GTOs, for an optimized SVeC configuration based on 2 switches per phase.

Controls

To modify the firing angle of the thyristors, the TCSC requires several milliseconds, due to the need for current zero crossings. On the other hand, the SSSC and SVeC controllers can change the switches' duty cycle in hundreds of microseconds; however, a response delay can be introduced through filters. Furthermore, for PWM control, the SSSC requires a synchronous type PWM, which is not the case for the SVeC; this leads to a greater complexity in the SSSC control infrastructure [9].

II. CONCLUSION

After the literature review of the all FACTS devices we conclude that the Series Vectorial Compensators (SVeC) is the very efficient and very easy controllable as compare the other series FACTS devise and the SVeC applied to the power system and improved the performance of the power system.

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Employment Management using Electronic Human Resources Management and Its Impact in the IT Organizations

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Abstract— One of the workforce industries that has grown big and made its presence felt over the last 2 decades or more is the IT (Information Technology) industry. This particular industry has created 'N' number of jobs for different age groups. However, the challenges increase with the business growth and two of the major challenge that this industry is currently facing are: How to Hire the right people? and How to Retain the right people? On an average the annual employee turnover in the IT industry in the last decade or so is touching between 25% to 30%, which means that one out of four people hired are leaving the organization over a regular period of time and the organization is not able to retain them. When the Employee Retention becomes difficult to achieve, then it calls for a fast-paced Recruitment process through which the employee turnover can be addressed. This is also to ensure that the business is functioning properly without much losses. The only way to speed up the Recruiting process is by automating it. In this paper, the author has taken the steps to explain the Employment Management process by using E-HRM (Electronic Human Resources Management). To explain the modalities, the author has taken the core model of Recruitment and has linked that with E-HRM to analyze the overall performance of Recruitment in the IT sector. A data set of seventy-five (75) HR professionals working in IT sector was collected which is in and around Bengaluru region. Final outcome is used to arrive at a detailed overview of the adoption of E-HRM, the impact around it and also to know how the Employment activities are managed overall.

Index Terms— E-HRM, HRIS, Human Resources, HR, Electronic Human Resources Management, Human Resources Information System, Employment Management, E-Recruitment

I. INTRODUCTION

Working on the IT recruitment means dealing with the technology professionals and attracting them in the organization. With the growing number of IT companies' presence in the city like Bengaluru, the competition of talent becomes very competitive and there are many areas where the Recruiter has to pitch in front of candidate. Even if the recruiter does everything perfect; there are high chances that candidate would not join the organization as they might be having multiple offers with them. This also indicates loss to the organization's business as lack of timely hiring of tech professionals would lead to the revenue loss for the organization. All these situation calls for attracting larger pool of talents and thereby broadening the talent pool and be more selective in the hiring of resources. It is also to ensure to have a good backup of the talent pool in case of candidates declining the offer during the final stages of their joining a new organization. In order to accomplish these goals, the organization has to put a strategy in place, which would help the entire recruiting process more dynamic and aggressive. One of the strategies for this purpose is by having a E-HRM system in place. Here, and for this purpose, it is the E-Recruitment tool and methods that is in consideration. The role of E-Recruitment starts from posting the job to the website, followed by reaching out to the potential candidates and helping them to connect with the company recruiters. It just not ends there

as E-Recruitment also helps to connect with passive candidates who are not active job seekers, but still can be reached out through many of the internet social platforms used for social recruiting. The whole exercise of this Employment Management that starts from recruiting is managed with the help of an E-Recruitment tool, which helps to strengthen the organization's recruitment process and practices.

II. DATA COLLECTION

The process of data collection was through a questionnaire which was measured with the help of a Likert scale. The rating scale chosen was between 1 to 5 with 1 as 'Strongly Disagree' and 5 as 'Strongly Agree'. The number of respondents were equal to about 75 (seventy-five) HR professionals who were carrying a minimum 5 years of experience and maximum of 20 years of experience in the IT recruiting area. They are all using the E-Recruitment for managing their organization's Recruitment process. This particular experience level also indicates the maturity and experience level of the respondents who would provide a genuine feedback on the overall recruitment process and also to justify how effective is the E-Recruitment process in their organization. The Cronbach alpha value and Pearson's correlation were calculated. The Cronbach alpha value of the Questionnaire was found to be 0.89 and to know the relationship between the two variables, the Pearson's correlation was used.

The questionnaire consisted of various sections, which included collecting basic information of HR professionals like: Full Name, Job Title, Company, Department. The location by default was considered as Bengaluru as that is the area focused for the data collection and also considering the amount of availability of the resources in this particular city. The primary focus areas of the questions were:

- The kind of E-Recruitment tool that was in use and if it was any of the leading E-HRM tools like SAP, Oracle, ADP or similar ones

- Whether a E-Recruitment tool is used in their organization for the recruitment process

- Whether the overall recruitment process has improved after implementing an E-Recruitment tool in their organization

- Whether or not any improvement in reducing the recruiting cost, saving time by having an E-Recruitment tool in their organization

- Last but not the least if there are any scope of improving the overall recruitment process in their organization

III. DATA ANALYSIS

Problem Statement: To analyze the performance of the Recruitment in general and if it is helping the organization to save cost, time and effort in the Recruitment sector by having an E-Recruitment tool in place.

Responses received and as shown in the table and graph:

Rating Scale	No. of Responses
1	1
2	2
3	8
4	33
5	31
Grand Total	75
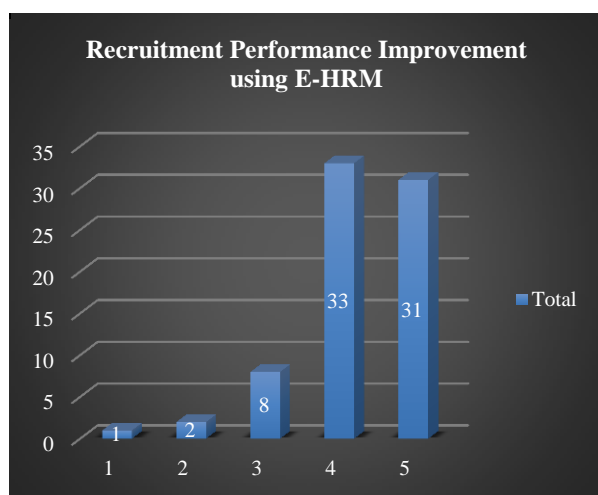
According to the responses received from the HR professionals working in the IT organizations, those responses were further evaluated and the results were captured in the form of the table and a graph as shown above. It was found that at least 85% of the HR professionals had either "Agreed" or "Strongly Agreed" to the questions that by having an E-Recruitment tool in place their overall recruitment process and performance has enhanced. This strongly indicates creating a positive impact of the presence of E-Recruitment aka E-HRM that the organizations are having in place that helps on improving the overall Recruitment process and thereby saving cost for the company, time and effort of the recruiters.

It was also observed that there is a small percentage of nearly 10% of the HR professionals having a moderate view on their hiring process using E-Recruitment, which again does not mean of carrying any negative perceptions or feedback against E-HRM. On the contrary, there are at least 5% of the population who are into a dis-agreement mode and that is due to the fact that those HR professionals are either not using an E-Recruitment tool in their organization and it is because their organization is a small entity or their organization has not funded in the lines of investing in an E-Recruitment tool to run their recruitment process and measure its effectiveness.

The Correlation of Pearson's Coefficient for E-HRM in Recruitment is as below:

Statement: Due to the presence of E-HRM / E-Recruitment	Recruitment performance improvement and cost effectiveness during job posting for all the open positions.
R value (usage of E-HRM)	0.912
p value (usage of E-HRM)	0.01*

*p value < 0.05

The above table indicates the relationship between usage of E-HRM tool for Recruiting and how it has given a positive impact not just by improving the overall performance, but also helped to reduce the overall cost in recruitment. This is not just for one organization, but applicable for multiple IT organizations.

IV. RESULTS AND CONCLUSION

It is obvious from the data analysis that E-HRM has a significant role in the Company and out of that E-Recruitment has made the Employment Management exercise in the IT companies' lot easier. A lot also depends on the users who are using the E-Recruitment i.e., users in terms of Recruiters, Candidates and Interviewers. It is their effort that makes the recruitment job easier. E-Recruitment is a go-to tool for recruitment especially in the IT sectors as the whole process is very dynamic and unpredictable. To keep the momentum going and to maintain the required speed and efficiency in the IT recruitment, it is important to have an online tool that is fast and globally accessible.

Some of the benefits listed under E-Recruitment are:

- It helps to reach out to the potential candidates faster

- All the data captured about the candidate profile and interview are made available to locate at one place

- Transparent communication medium that enables the recruiter to reach out to the stakeholder and vice versa easily

- Helps to tap on the operational cost and provides an idea of how things are moving and if it is in a right direction

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Emission Reduction from Thermal Power Plant by Using Optimization Techniques

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Abstract— Reduction in the emission of the gases from the thermal power system operation is the very huge task for the pollution control department of power plant. There are so many methods are used for the reduction of the emission from the power plant. All the methods require so many equipment and additional arrangement for the reduction in emission from the power plant. On the other hand if we reduce the emission with arraigning load in proper schedule than there are no additional arrangement and equipment require. In this method we can use the optimum output in terms of emission from the different power plant. Overall emissions reduce for the given output of power with same equipment by load dispatch scheduling.

Index Terms— Load Dispatch, Emission, Scheduling

I. INTRODUCTION

Power generation system is the mirror for any developing country. Any development in country is directly related with the development in the power system generation and increase in the power plant. There are different types of power plants are used for the electrical power generation. In India major part of total electrical power generation is form the thermal power plant. Now with the development number of power plant must be increased to fulfill the requirement of load. But due to this increase so many problems arise. Major problem is the pollution from the power plant. In thermal power plant there are so many factors related with the pollution. Green house gases emission from the thermal power plants take main part in air pollution. CO2 gas creates major effect on the environment among the all flue gases generated from the thermal power plant. So reduction in the amount of CO2 emission from the thermal power plant is the major task for the pollution control board and authority with the same electrical power generation. Now there are many filter and accessories are used from the reduction in the CO2 emission from the thermal power plant. All these arrangements require additional equipment so overall cost is also increased with this additional modification. Now in advance management system emission can be reduce by the proper load arrangement among the all power thermal power plant units which are connected in the same grid. In this paper this load dispatch used for the reduction of CO2 gas emission from the thermal power plant. Optimization methods are used for reduction of emission in thermal power plant. The objective is to optimize generation schedule for eco-friendly aspects using optimization technique. With this main goal is to reduce emission of green gases like CO2, SO2 and NOx. So we can get best fit value of generation which gives optimum value of total cost of generation, total emission of the green house gases. Emission can be reduced without any physical arrangement just by load scheduling with higher efficient working of power plant.

Problem Formulation

A three-generator system has been considered for the load dispatch for the reduction in CO_2 emission. General equation for the emission calculation for the individual power plant unit is as per given below.

$$F(1) = \sum_{i=1}^{NG} (a_i P_{gi}^2 + b_i P_{gi} + c_i) \, \text{Kg/h}$$

Where a_i, b_i and c_i are CO_2 coefficients and NG is the number of generators and F1 is total CO_2 emission from the each thermal power unit. Our requirement is to minimize the value for the F1 for the each plant at given. At different value of load generating output of plant may be differing but the overall value for the F1 must be minimal. So our problem is to minimize the value of F1 with load. For the above there are so many methods has been used. Some of them used here for the optimization and then compare for the selection of best method.

II. METHODOLOGY

Different methods for the minimization of emission is as per given below. Classical Method, Weight Method, Genetic Algorithms, Evolutionary Method. Computerized program developed for the above methods with Mat lab language. Data for the generator is as per the given below. Here we consider three units for the calculation and their maximum and minimum capacity is as per table.

Table: 1

No. of Generator	Generator rating in Mw.	Maxi.Value in Mw.	Min.value in Mw.
1	210	240	90
2	210	238	85
3	120	100	20

CO_2 emission coefficient for the each three plants are as per given in table 2.

Table: 2: CO_2 emission coefficient for the plant

Sr.No.	ai	bi	ci
1	0.265110	-61.01945	5080.148
2	0.140053	-29.95221	3824.770
3	0.105929	-9.552794	1342.851

Table: 3: Loss coefficient for the given plant

Sr.No.	di	fi	gi
1	0.000134	0.0000176	0.000183
2	0.0000176	0.000153	0.000282
3	0.000183	0.000282	0.00162

III. RESULT

Comparison of result for above methods are given below

Method	CO2 Emission
Evolutionary	8426
Genetic	9391
Wait age	9168
Classical	8925
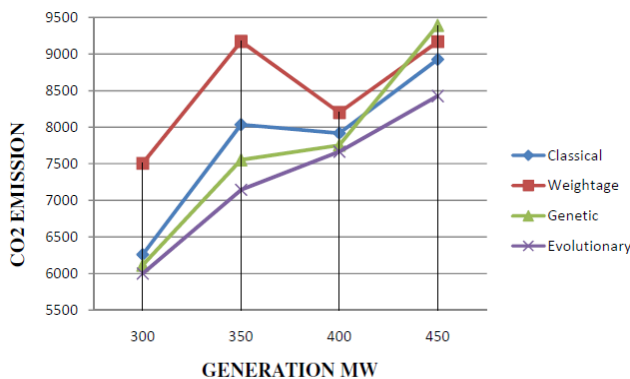
Qualitative comparison on of GA, wheightage, and EP

	Genetic	Wheightage	Evolutionary
Influence of population size on solution time	Exponential	Linear	Linear
Influence of best solution on population	Medium	Most	Medium
Average fitness cannot get worse	False	False	True
Tendency for premature convergence	Medium	High	Low
Continuity (density) of search space	Less	Medium	More
Ability to reach good solution without local search	Less	Medium	More
No. of search point	Multi-point	Multi-point	Single-point

Reduce emission of green gases like CO2, SO2 and NOx. Compare the results given by all method at the power generation and select the best value for the load dispatch, CO2 emission, SO2 emission and NOx emission.

From the matlab programming find the optimum value for the generation economy and emission rate of different gases. For this we have to plot the graph and locate optimum point. We can compare this result with normal condition. By this we can calculate total reduction in emission of gases.

IV. CONCLUSION

The Result shows that Emission is low with the help of evolutionary technique. In all methods total output is never change but the emission of CO_2 gas is reduced with the proper selection of their generating station. Best result shows the lesser emission of CO_2 gas form the generating unit at same load. This will reduce the overall generation of CO_2 gas for the Power system. Using load dispatch scheduling we can reduce more emission and running cost of thermal power plant.

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A Review of AC-DC Converter for High Input Power Factor

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Abstract— In this paper different types of AC-DC converter topologies are reviewed based on their PSIM Simulations. Cuk converter based topology for AC-DC converter having only one control switch with easy control and high frequency transformer provide isolation between source and load. Interleaved converter based topology having two controlled switches working like two phase operation which works at 1800 phase shift and doesn't provide isolation between input and output. Z-source converter based topology having only one controlled switch is working with input impedance network in which two capacitors and two inductors of equal value. Based on the comparison of all the topologies, Modified Cuk converter based topology is working with a one inductor and capacitor which is controlled by two switches and it provide isolation between input and output, by using high frequency transformer provides good input power factor.

Index Terms— AC-DC Converter, Power factor

I. INTRODUCTION

There are many types of AC-DC converter available in markets which convert conventional AC into DC. From that many converters I have chosen four converters which can give low ripple DC voltage and current and with very high input power factor. For this type of advantages I have considered cuk converter, Interleaved converter, Z-source converter and Modified Cuk converter which give low ripple output and high input power factor. This types of converter can be used for DC power supply, Battery charging Application and many more appliances

II. AC-DC CONVERTER TOPOLOGY

A. CUK Converter

The general schematic of the PFC Cuk converter has been shown in Fig.1. with DC output voltage at the converter's DC end, This figure shows the schematic consisting of a DBR, a PFC isolated converter. The unregulated dc voltage from the output of a diode bridge rectifier is used as a power source for the isolated PFC based Cuk converter[10]. This converter consists of a high frequency switch, an input inductor Li, an output inductor Lo, two intermediate capacitors C1, C2 and a high frequency isolation transformer (HFT).
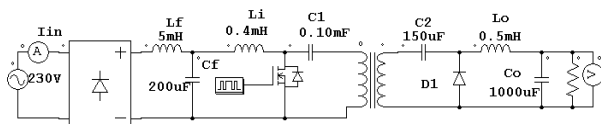
Fig. 1. General Schematic of PFC based CUK Converter

The energy transfer from input to output side occurs via the intermediate capacitor C1, C2. The input inductor Li charges through the high frequency switch when it is in ON condition and releases its energy through the capacitor C1.

This, in turn, charges the magnetizing inductor of the HFT. As soon as magnetizing inductor charges, the capacitor C2 at the secondary side of the HFT starts discharging through the output inductor and transfers the required energy to the load. When switch is turned off, the diode at the secondary side of the HFT becomes forward biased and output inductor finds the discharging path through the dc link and diode D at the output.

As in Fig 1. Cuk converter starts with the ON condition of the switch during which input inductor Li starts charging. The current in the inductor Li increases with the mains voltage which decides the slope of the inductor current for the particular instant. However, the output diode D has no current through it due to the polarity of the output inductor voltage. Therefore, the energy to the load side is transferred through the initially charged capacitor C1, the high frequency transformer, C2 and Lo. The current in the output inductor Lo increases as it starts charging through the energy given by C2. Input power factor and input as well as output current through inductor for cuk converter have been shown in Fig.2. & Fig.3, respectively.

When the gate pulse to the switch is stopped and diode D1 comes into conduction. The inductor Li releases its energy through the intermediate capacitor C1 and high frequency transformer. During this period, capacitors C1 and C2 start charging through the inductor Li. The current to the load is provided by the output inductor Lo which discharges through the load.

At the last the semiconductor switches and D1 are "off" and the dc link capacitor regulates the charging current through the load. The magnetizing inductance of the HFT is discharged completely as shown in Fig. 3(a), however, switch resumes its normal operation cycle i.e. ON condition. Therefore, cuk converter circuit is perfectly compatible with the IEC 61000-3-2 power quality (PQ)

standard and hence it is suitable for High input power factor [10].
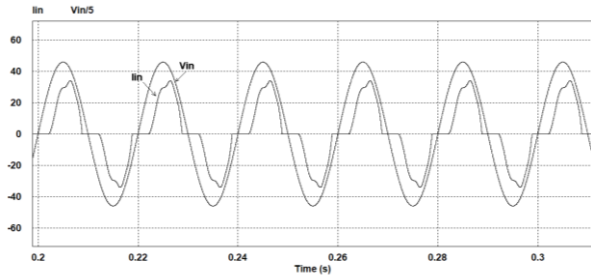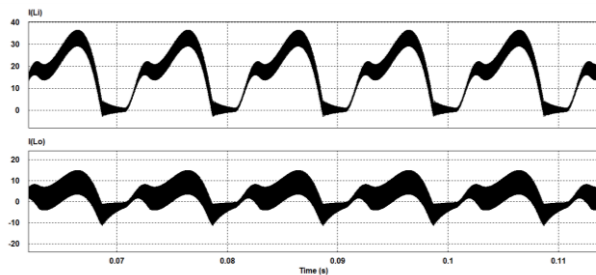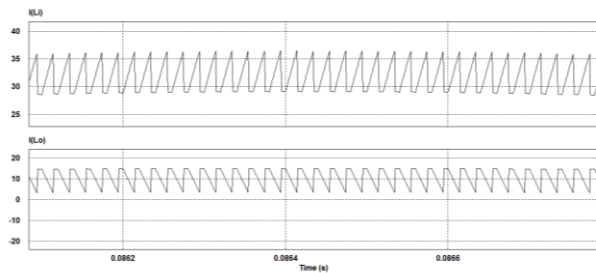

Fig. 2. Source Voltage and source current waveform having PF= 0.9

(a)

(b)

Fig. 3. (a) current flowing through Input and Output Inductor L1 & Lo (b) Ripple current through Input and Output Inductor L1 & Lo.

B. Interleaved Converter

AC-DC boost converter stage is to control the waveform of the input current to a sine-wave form following the waveform of input voltage to improve the power factor and configuring by harmonic distortion through the power factor control were constructed to correspond to the regulation[11]-[12]. In addition, the PFC interleaving method is in the form of parallel converter with minimizing the loss of the major components. It can lead to similar effects by increasing switching frequency with using a phase difference having the same frequency. And it was the optimal design with a filter to mitigate the EMI noise due to hard switching [11].

Interleaving PFC constituting the two boost converters with a 180^0 phase difference is expressed by the two inductor currents IL1 and IL2. It may be reduced to the sum of the

input current ripple generated by the boost inductor and cancelled each other because of the phase difference [12]. The current of the output capacitor C1 is represented by a current flowing through the DC-DC converter stage and is represented the sum of the current flowing through the two diodes D1 and D2(I1 + I2), and to reduce the ripple current in the output capacitor Co. PFC power circuit configuration is the same as Fig. 4.
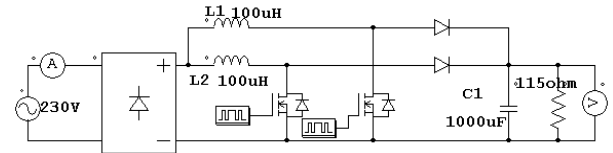
Fig. 4. Schematic diagram of Interleaved Converter

Design specifications to verify the interleaved boost converter is as follows. The boost inductance was reviewed and compared calculation inductance value for L1 and L2 with the PSIM simulation for current flowing through the inductor, it defined in the specification 100μH developed a structure capable of reducing the loss. The output capacitor is selected in consideration of the ripple current developed by the design specifications of 1000μF.
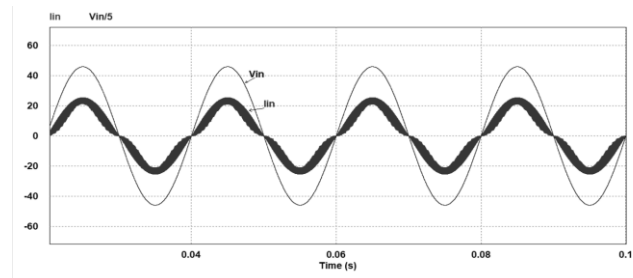
Fig. 5 Source voltage and Source current waveform with PF = 0.95
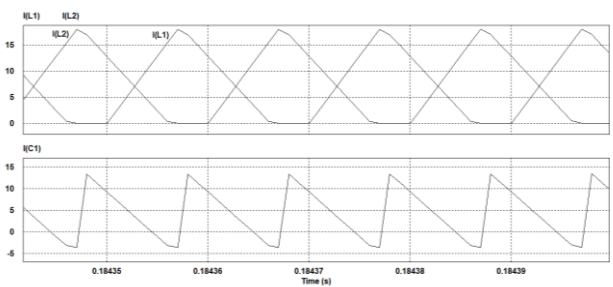
Fig. 6. Max Current through L1, L2 and filter capacitor C1
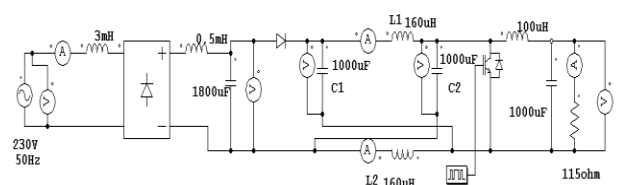
C. Z-Source Converter

Fig. 7. Schematic diagram of Z-Source Converter

Z-source inverter is a novel topology [15]-[17]. It overcomes the conceptual and theoretical barriers and limitations of the traditional voltage-source inverter and current-source inverter. Its operating principle and application for Battery charger and DC-DC converter system are illustrated in [15]-[16] respectively. The concept of Z-source can be used in direct ac-ac power conversion [18]-[20]. Similarly, it also can be extended to dc-dc power conversion.

Fig.8. shows schematic diagram of Z- source converter. In this Z-source inverter/converter topologies, the Z-network of the Z-source dc-dc converter is also symmetrical, that is, the inductors L1 and L2 and capacitors C1 and C2 have the same inductance (L) and capacitance (C), respectively. From the symmetry and the equivalent circuits, we have Vc =Vc1 =Vc2, Vl1 = Vl2 = Vl and .
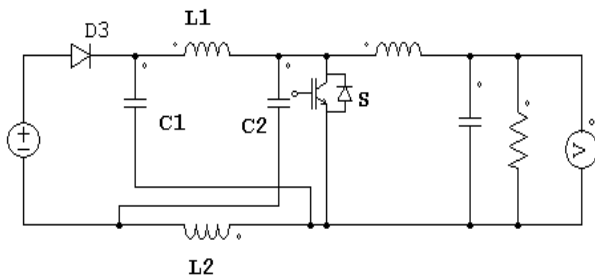
Fig. 8. Z-Source DC-DC Converter.

 In Fig.8. Z-source converter there is a one control switch and a Diode. The switch can be composed by a power transistor and an anti-parallel (or free-wheeling) diode, even a power MOSFET, to provide bi-directional current flow. Small inductors and capacitors are used for filtering purposes.

The proposed dc-dc converter can operate with PWM duty ratio control exactly the same way as that for the conventional dc-dc converters. In the voltage-fed operating mode, the active part of the switch S and the input diode are turned on and off in complement. By controlling the duty ratio D, the output voltage can be regulated as desired. In this circuit the diode D is forward biased and switch S turned off. The dc source charges the z-network capacitors, while the inductors discharge and transfer energy to the load. The interval of the converter operating in this state is (1-D)T, where D is the duty ratio of switch S2, and T is the switching cycle,

When the switch S is turned on and Diode D turned off due to reverse voltage appears across the diode. The z-network capacitors discharge, while the inductors charge and store energy to release and transfer to the load. The interval of the converter operating in this state is DT, so Vc = Vl , and V0 =0. And by controlling the duty ratio D, the output voltage of the proposed dc-dc converter can be bucked or boosted.
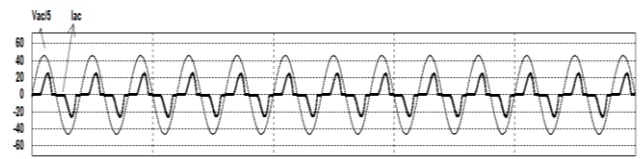

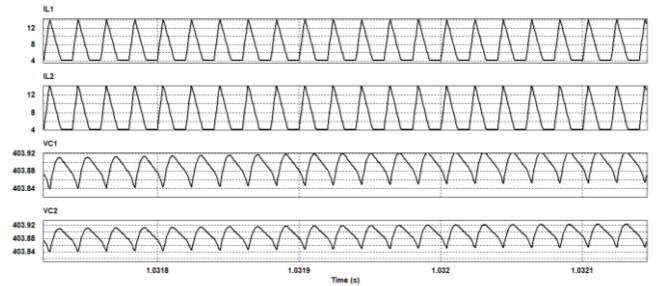**Fig. 9. Source current and Source voltage waveform with PF =0.**

Fig. 10. (a) Current through Filter Inductor L1 & L2, (b) voltage across capacitor C1 & C2 is 403V

D. Modified Cuk Converter

Active Power Factor Correction (PFC) is the process of shaping the input mains current, drawn by the charger, which has to be synchronized with the input supply voltage so that maximum real power is drawn from AC mains. Therefore, the proposed system configuration as well as the operating principle of this converter is described to obtain a supply current free from any harmonics having a high PF[26]-[29].

In order to maintain a high PF and sinusoidal nature of the supply current, input inductor L1 is designed to operate in DCM while at the output side Lo is having such a value which maintains the output current continuous throughout the operation. The capacitor C1 is a capacitor which is the main contributor to the current shaping feature and makes it perfectly sinusoidal [27].
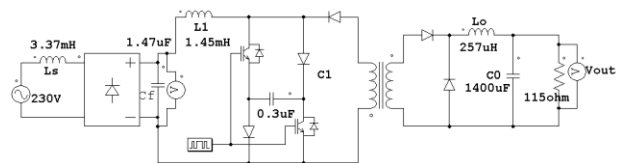

Fig. 11. Converter Topology for 1.4 kW PFC based converter configuration

In order to understand the phenomenon of maintaining high PF and improved harmonics profile at the input, the principle of the proposed PFC converter based battery charger has to be defined very well. The proposed system operates on the basis of the charging and discharging of the three components, an input inductor L1, a capacitor C1 and an output inductor Lo [14]. Therefore three operating stages are defined for the proposed PFC.

When both the switches are ON and inductor L1 is charging through the ON switches and diode D3 so, according to the dot convention, diode D4 becomes forward biased and

energy of the capacitor C1 is available to the output stage of the converter.

During OFF time of the switches, reverse processes happen. An input inductor L1 discharges through diodes D1 and D2 giving the favorable charging conditions to the storage capacitor C1 due to restricting the HFT (High Frequency Transformer) from drawing any significant magnetizing current from the input. At this stage, D5, the freewheeling diode, comes into the picture and provides the necessary energy to the load.

The final stage, an inductor L1 is fully discharged, current IL1 in the inductor comes to zero and the output inductor supplies to the load through freewheeling diode and operation of the converter for one switching cycle is completed.
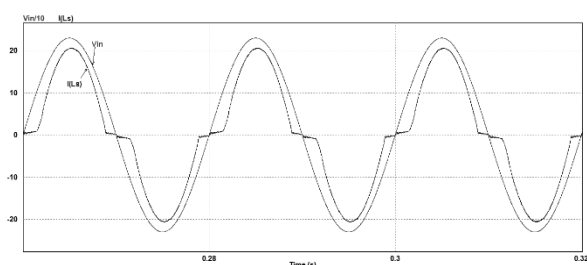
Fig 12. Source Voltage and current waveform having PF= 0.97

By using Modified cuk cunverter input power factor is 0.97
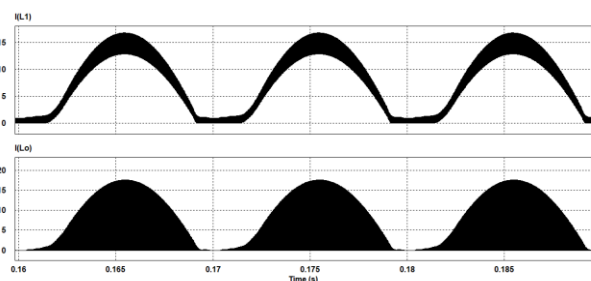
Fig 13. Current through Input Inductor L1 and output Inductor Lo

III. CONCLUSION

As per results shown from simulation of cuk converter, interleaved converter, z-source converter and Modified Cuk converter in PSIM software, the high input power factor can be obtained from a Modified Cuk based converter. This also gives galvanic isolation between input and output of converter, which helps to improve power quality of converter.

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Partial Replacement of Cement by Sugarcane Baggase Ash with Jaggery As A Admixture

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Abstract— Concrete is widely used for various purposes like constructions of roads, buildings, dams, etc... this trend in concrete is towards increasing strength and sturdiness of concrete to satisfy the demand of recent constructions. Sugarcane bagasse and its ash is one among the agro waste which may be a fibrous waste obtained from sugar mills as byproduct.

This paper deals with the replacement of cement by sugarcane baggase ash. The main purpose of this report is to suggest the locally available materials (Which are documented to people like, jaggery & sugar cane ash) to strengthen the properties of concrete & to scale back the price of construction. The admixtures (sugar & jaggery) are added into concrete to determine the properties improvements in concrete.

Index Terms— Compressive strength, Sugarcane, Baggase Ash, Jaggery

I. INTRODUCTION

Civil engineering practice and construction. Works around the world depend to a very large extent on concrete. Mortar is one of the construction material that made by mixing of cement, fine aggregates and water in the proper proportions.

Bagasse is the fibrous residue of sugarcane after crushing and extraction of juice. In sugarcane bagasse it made up of water (about 50 percent), fibre (above 48 percent) and also some small amount of soluble solids. Mostly, bagasse produced is burnt for energy needed for sugar processing the use of sugarcane bagasse ash (SCBA) as cement replacement material to improves quality and reduce the cost of construction material such as mortar and concrete payers.

Beside, by using this replacement in Portland cement also to avoid environmental pollution and to economize the use of cement. Each of these concrete contribute the strength to it possess. Seven percent of world carbon dioxide coming up from Portland cements industry. Portland cement manufacture can cause environmental impacts at all stages of the process. These include release of airborne pollution in the form of dust, gases, noise and vibration when operating machinery and during blasting in quarries, consumption of large quantities of fuel during manufacture. The CO_2 release from the raw materials during manufacture, and will damage the countryside from quarrying.

Since the prices of cement are increases, there is the need to search for local materials as alternatives for the construction of functional but low cost buildings in both the rural and urban areas. The important of this research is to help reduce the cost of cement and reduce the volume of solid waste generated from bagasse ash in concrete. So this will economize the using of Portland cement in construction.

Portland cement is one of the important gradients in mortar. From my reading of journal, the current cement production rate of the world is approximately 1.2 billion tons/year. In this bagasse ash have the pozzolanic properties, so they will impact technical advantages to the resulting concrete and also enable large quantities of cement replacement to be achieved.

The popularity of the concrete is due to the common ingredients, it is possible to tailor the properties of concrete to meet the demands of any particular situation. Among the various properties of concrete, its compressive strength is considered to be the most important and is taken as a measure of its overall quality.

The strength of mortar is defined as resistance to its failure against a system of loading. The strength of mortar is measured in various ways depending on loading pattern such as compressive strength, flexure test, bond strength and resistance to abrasion. In this test only include compressive and porosity test.

Compressive strengths are the resistance of the mortar to crushing. The compressive strength of cement mortar mainly depends on the type, quality and quantity of cement, the type, size, shape, strength and grading of aggregates, the water cement ratio, the degree of workability and compaction, the type ,quality and age of curing.

In this chapter will discuss about the problem statement of the research, objective of the study, the scope of study, significance of study and lastly is conclusion. All of this will make more detail to know about the research.

II. PROBLEM STATEMENT

Nowadays, the increasing of using Portland cement in making mortar will affect the environment when the pollution occurs. So with the replacement of sugarcane bagasse ash will help to reduce the problem. If many of construction use this type of materials, the request for use Portland cement will decrease.

As we know the amount of cement use more in construction that will make release of carbon dioxide that will affect the environmental pollution & the wastage of sugarcane bagasse will increase from year to year. Although Indians still do not practice this way of replacement sugarcane bagasse ash with cement, but it is not impossible that one day India will adopt this method because the current situation show the waste of sugarcane bagasse increase around the world.

III. METHODOLOGY

The following methodology was adopted for casting of cubes.
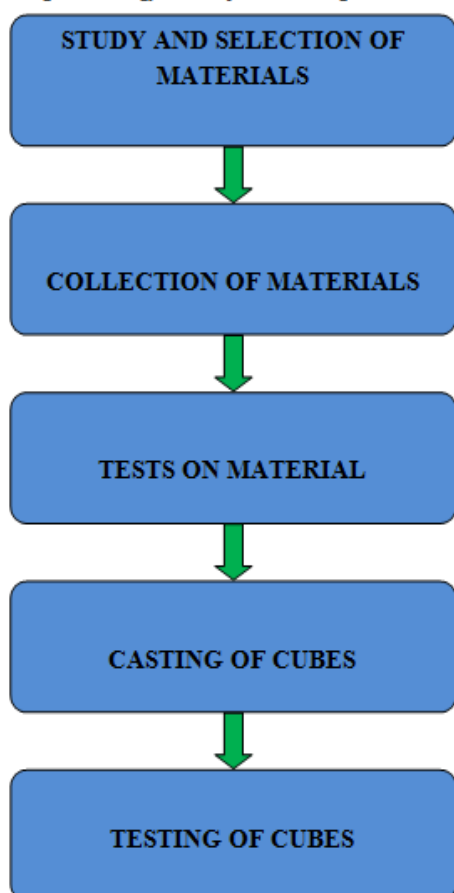
STUDY AND SELECTION OF MATERIALS

↓

COLLECTION OF MATERIALS

↓

TESTS ON MATERIAL

↓

CASTING OF CUBES

↓

TESTING OF CUBES

3.1 STUDY AND SELECION OF MATERIALS

A. Sugarcane Baggase Ash

Bagasse is the dry pulpy fibrous residue that remains after sugarcane are crushed to extract their juice. It is used as a bio fuel for the production of heat, energy, and electricity, and in the manufacture of pulpand building materials. Sugarcane bagasse ash is a by-product of sugar factories found after burning sugarcane bagasse which itself is found after the extraction of all economical sugar from sugarcane. Cement is replaced by ash as 5 & 10 % by the weight of cement.

Fig 1: Sugarcane Baggase Ash

B. Cement

Cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together. Ordinary Portland Cement of Grade 43 was utilized all through test examinations. Ultratech brand of cement was used.

Fig 2: Cement

C. Sand

Sand is a granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt. Sand can also refer to a textural class of soil or soil type; i.e., a soil containing more than 85 percent sand-sized particles by mass. Sand was sieved through 2.36 mm sieve.

Fig 3: Sand

D. Aggregate

Aggregates are the most mined materials in the world. Aggregates are a component of composite materials such as concrete and asphalt concrete; the aggregate serves as reinforcement to add strength to the overall composite material. Aggregates are also used as base material under foundations, roads, and railroads., aggregates are used as a stable foundation or road/rail base with predictable, uniform properties (e.g. to help prevent differential settling under the road or building), or as a low-cost extender that binds with more expensive cement or asphalt to form concrete. Aggregates were sieved through 20 mm sieve and retained on 12 mm sieve.

Fig 4: Aggregate

E. Water

Water is one of the most important elements in construction and is required for the preparation of mortar, mixing of cement concrete and for curing work etc. The quality of water used has a direct impact on the strength of the motor and cement concrete in the construction work.

Fig 5: Water

F. Jaggery

Jaggery is a sweetener that is **made** from sugarcane; it is also known as unrefined sugar, which is prepared without the separation of molasses and crystals and is mostly produced in India and Africa. The colour of the **gur** ranges from golden brown to dark brown in colour. Concrete made with admixtures like jaggery can be used specifically circumstances. Utilization of these admixtures will diminish the isolation and dying. Jaggery is produced using the result of sugar stick. Along these lines, jaggery is valuable to include as an admixture in the concrete piece.

Fig 6: Jaggery

3.2 COLLECTION OF MATERIALS

After the materials were decided, All the materials used were obtained locally.

i.   Sugarcane baggase ash was collected from local area.

ii. Cement was purchased from local shop.

iii. Sand, Aggregate and water was

iv. Jaggery was bought from local Kirana store.

3.3 TEST ON MATERIALS

i.   For Aggregate:- Sieve Analysis

ii. For Cement: - Standard Consistency Test

iii. For Concrete: - Workability Test, Slump cone Test

3.4 CASTING OF CUBES

We used M20 grade of concrete for our project. For casting of cubes, cubical moulds of size 15cm x 15cm x 15cm are commonly used.

Fig 7: Cube Mould

This concrete is poured in the mould and tempered properly so as not to have any voids. After 24 hours these moulds are removed and test specimens are putted in water for curing. The top surface of these specimens should be made even and smooth. This is done by putting cement paste and spreading smoothly on whole area of specimen.

3.5 TESTING OF CUBES

Compressive strength of concrete cube test provides an idea about all the characteristics of concrete. By this single test one judge that whether Concreting has been done properly or not. Concrete compressive strength for general construction varies from 15 MPa (2200 psi) to 30 MPa (4400 psi) and higher in commercial and industrial structures. Compressive strength is the ability of material or

structure to carry the loads on its surface without any crack or deflection. A material under compression tends to reduce the size, while in tension, size elongates. Compressive strength formula for any material is the load applied at the point of failure to the cross-section area of the face on which load was applied.

$$\text{Compressive strength in N/mm2} = \frac{\text{Maximum load at Failure in N}}{\text{Average area of the bed faces in mm2}}$$

IV. CONCRETE MIX DESIGN

1	Type of cement	OPC43 grade conforming to IS 8112
2	Maximum nominal size of aggregates	12 mm
3	Maximum water/ cement ratio	0.5
4	Workability	100
5	Type of aggregate	Crushed angular aggregates
6	Method of concrete placing	Manually

Table 1: Specification for mix design

V. CALCULATIONS

For our project we use M20 grade of concrete having ratio 1:1.5:3

i. Cement - Ultratech 43 grade OPC
ii. Sand - Locally available
iii. Water - normal water having ph value more than 6
iv. Aggregate - 12 mm
v. Jaggery - 0.75% by weight of cement

Each quantity in table below is in KG (for 3 cubes each)

Sr. No	Material	Quantity for 0% replacement of cement	Quantity for 5% replacement of cement	Quantity for 10% replacement of cement
1	Cement	5.04	0.252 Ash 4.79 Cement	0.504 Ash 4.53 Cement
2	Sand	8.406	8.406	8.406
3	Aggregate	12.48	12.48	12.48
4	Water	2.502	2.502	2.502

Table 2: Quantities of Materials (kg)

VI. RESULT

All the results below in the table are in N/mm2

Strength Replacement with ash	0%	5%	10%	0.75% of jaggery with 5% ash	0.75% of jaggery with 10% ash
At 7 Days	18.79	17.46	16.44	19.91	20.87
At 14 days	21.77	19.95	19.12	22.18	23.20
At 28 Days	27.37	23.24	21.24	23.30	24.86

Table 3 Compressive strength of concrete cubes (N/mm2)
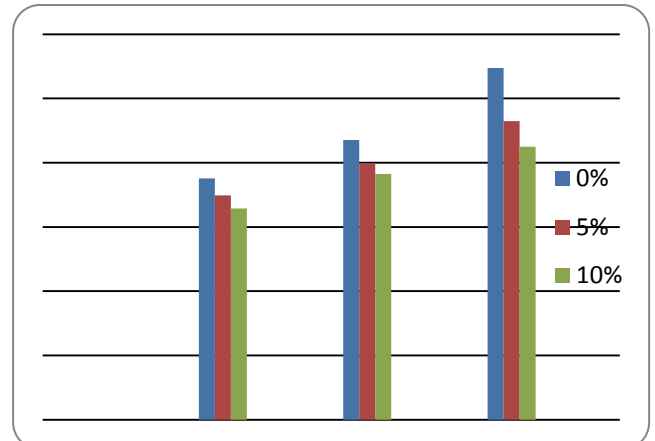
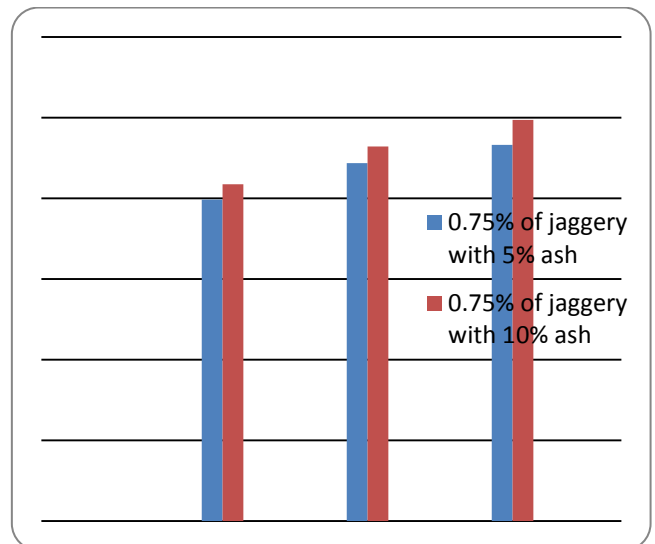**Fig 4: Graph Showing Compressive Strength without Jaggery**

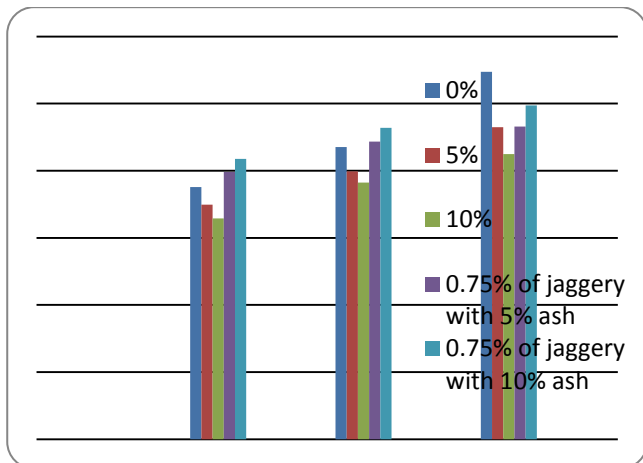**Fig 5: Graph Showing Compressive Strength with Jaggery**

Fig 6: Graph Showing Compressive Strength with and without Jaggery

VII.   CONCLUSION

Workability increases when the admixture was added. Strength of the concrete improved with little extra cost and utility in specified situations. Segregation and bleeding was very less due to the usage of these admixtures.

It can therefore be concluded from result that 10% replacement of cement by baggase ash results in a similar concrete properties and higher replacement could also be used with a slight reduction in the performance of the concrete

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Cancer Prediction Using Genetic Algorithm In Comparison To Other Machine Learning Algorithm

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Abstract— Cancer is one of the leading causes of death these days. There are number of reasons which cause cancer but classification and predicting of cancer at the right stage is very important. This research work mainly focuses on early prediction of cancer using different approaches of machine learning in comparison with genetic algorithm to predict cancer at early stage. Genetic Algorithm optimizes the neural network by involving connection weights. The Breast Cancer Wisconsin (Original) Data Set is taken from UCI machine learning repository and it is trained and tested by applying different algorithm like Random forest, Naïve Bayes, Artificial neural network and Genetic algorithm. Random forest is used as an ensemble learning algorithm which is applied on the microarray data of cancer to achieve good accuracy and reliable performance, For predictive modeling Naïve Bayes algorithm is also used based on weight concept by assigning weight on dataset of breast cancer taken from UCI machine learning repository and Artificial neural network uses back propagation algorithm which has different neurons in hidden layer to analyze output by calculating the error using weight adjustment method ,it reduces error between the required and actual output. From experimental analysis genetic algorithm provides topmost accuracy of 97% where as other algorithms like artificial neural network provides accuracy of 96%, Naïve bayes provides accuracy of 94% and Random forest provides accuracy of 95%.

Index Terms— Cancer, Genome, Genetic, Targeted Sequencing, Prediction, Machine Learning

I. INTRODUCTION

In the field of computer science, machine learning is a subset of Artificial intelligence. It is used in many areas such as business, medical sciences, research areas etc. In medical fields machine learning techniques can be best used for prediction, estimation, decision making. In machine learning there are two main learning approaches supervised and unsupervised learning. In supervised machine learning techniques data is divided into inputs or independent variables and outputs or dependent variable. Here the learning process is carried out by predicting values of the output from input values and for this purpose training set of data is employed that guides the process of learning[1]. Three different machine learning algorithms are used here for early stage of cancer prediction like Random Forest, Navie Bayes and Artificial neural network. Genetic algorithm is also used here to predict cancer and then comparison of results is made for both machine learning techniques and genetic algorithm [2]. Machine learning techniques help in extracting important biological information from DNA, RNA. Genetic algorithms have stochastic nature. Genetic analysis has become important in the field of clinical practices and different researches like sequencing of DNA etc.

A. Genetic Algorithm

Genetic algorithms used in machine learning to provide optimized solutions for making decision and obtain better result. These algorithms consider possible solutions from given population. Test methods of genetics have become accessible to be performed in small size labs after Human Genome completion. Genetics and selection are two mechanism of genetic algorithm on which population is based upon and their solution is given in the form of genes. Members from current population and mating two different solutions together produce new solution. This is done to get better solution and others are discarded [5]. It always finds a space for potential solution and is called probabilistic method of search. These algorithms are used in machine learning to find potential solutions that will solve the given. It is motivated from the principals of evolution and natural selection; it's a randomized searching method and also optimized technique.

B. Steps of Basic Genetic algorithms

There are different forms through which implementation of basic genetic algorithms can be done but researchers hardly use simple steps instead they use extensions as outlined below:

- It first uses initialization operator which tell from where to start the search and if new regions of search are need the recombination operator is used.

- Initial populations are considered first in which we have number of chromosomes that are made from genes then fitness function is used on every chromosomes and goodness is identified [6].

- Clustering problem is solved using crossover and mutation

- Elitist operation is applied by genetic algorithm in which new and previous population is compared

- All these steps of selection, crossover, mutation and elitist operation go step by step until we get satisfactory result as shown in Figure.1
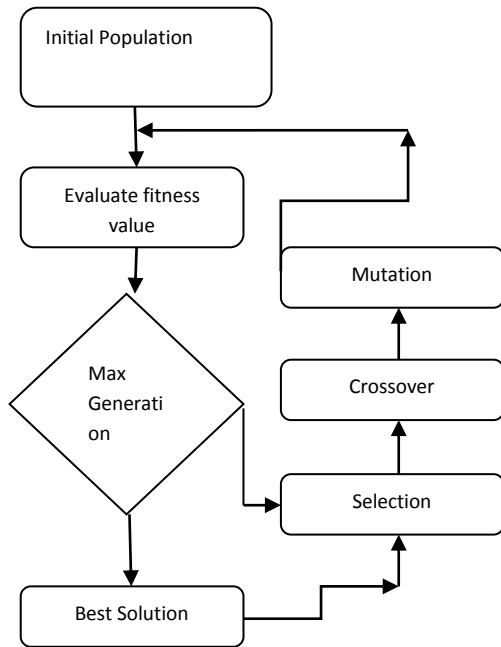

Fig.1 Flow diagram of GA

C. Genetic Algorithm Framework

There exists number of different variations when work with genetic algorithm and genetic programming. It is a meta-heuristic algorithm which is used to generate solutions with high quality, for optimization or for search problems [7]. Here given is simple form.

Algorithm1: Genetic Algorithm Framework

Begin

N=0

1. Set random initialization of population _set   p(n)

2. Identification of fitness value from population_set. p(t)

While n=n+1 **do**

3. Root element selection from parent_set p(n)

4. Apply crossover operation on parent_set to generate children (n+1)

5. Perform mutation operation (n+1)

6. Identify the fitness of population determine(n+1)

end while

until best individual found in the population_set

This process is called "generational" as it is partitioned into different generations which lead change in entire

population. Also offspring's main motive is to bring few changes in the string at each step and generate "mating pool" which uses recombination.

D. Optimization of Genetic Algorithm

The research uses genetic algorithm that is based on reconfiguration of gene to solve large problems.

Coding proposal: The research uses genetic algorithm that is based on reconfiguration of gene to solve large problems. Fitness function confirmation [7]: Error functions reciprocal is used to access individuals. Fitness function F= 1/Ei2

Where Ei is error function of network

$$E_i = 1/2 \sum_{k=1}^{m} \quad \sum_{j=1}^{n3} \quad (C_{jk} - C_j)2 \qquad (1)$$

In the above equation (1) is denoted as sample quantity of cluster, cj as actual output, Cjk as ideal output.

II.   LITERATURE REVIEW

Mehrnaz Ronagh,et al.(2019)[1] has proposed a technique of novel hybrid optimization for solving the problem of inverse scattering which make use of binary particle swarm optimization or binary genetic algorithm(BGA). This study is done to develop a algorithm for diagnosing the malignant tumor that is present in the breast. In this paper, for the calculation of electromagnetic scattering a tomography method is used for finite difference time domain method. Results shows that proposed algorithm is 4 times better than regular binary genetic algorithm and also FDTD/hybrid method easily construct heterogeneous and breast tissues so that an output can provide quantitative image. Proposed technique has reconstructed heterogeneous breast tissues that provide quantitative image also its capable of detecting the size and location of tumor.

Pragya Chauhan, et al. (2018) [2] has proposed a new technique to genetic algorithm based method which has helped to overcome the problem of average method of classical weight. Genetic algorithm based weighted average ensemble method is used with different type of models for prediction. Breast cancer is such a problem that can be solved using different machine learning models like decision tree, random forest, support vector machine etc. To improve the accuracy of breast cancer prediction there is need to combine multiple models together. In this research comparison has been made between different genetic techniques: Particle swarm optimization, Differential evolution and the result show that genetic algorithm shows better result for weighted average method also comparison is made between classical_ensemble and genetic algorithm based weighted average method in which genetic algorithm based weighted average method performs better.

T. Cithambaram, et al. (2017) [3] Brain tumor is a major problem that need to be cured by classifying it into two categories primary and secondary tumor. Primary tumor is one that originates inside the brain and secondary tumor is one that originates and spread from other parts. The aim of

this research was to develop interaction CAD system which helps in classifying different tumor. Research is done on the dataset of 350 post con MR images and publically available post contrast 280 images. Genetic algorithm is used to select optimal features. Implementation of two hybrid machine learning models named GA using support vector machine and GA with neural network. SVM enhancing overall accuracy by 79.3% to 91.7% and ANN provides accuracy from 75.6% to 94.9%.

A.H Beg, et al. (2016) [4] discussed that Clustering is a method used when we want to group similar records in one place called cluster and dissimilar in another but major difficulty comes in clustering when we do not know in advance that how many clusters will be needed in advance and also most popular method of clustering that is K-mean stucks at local optima. All these limitations are looked after by Genetic Algorithms that are based on clustering techniques. This paper has discussed different clustering techniques using genetic algorithm and applied in various fields .Genetic algorithm based techniques have been reviewed that make use of real life applications like Gas company, cellular network segmentation , medical fields etc. The review shows that two third of the techniques did not require users that will define number of clusters.

Ming Chen, et al. (2008) [5] has inferred that Data Mining is a way of examining a data that already exists and helps in generating new information from that data. Classification sometimes gets difficult in data mining. Classification is the major problem in data mining .In this paper, main focus is on gene reconfiguration by using optimizing classifiers of neural network that use Genetic Algorithm. Shift reverse logic crossover operation is used and improved genetic algorithm is used. BP algorithm is used it has slow speed and run into local minima easily buy genetic algorithm used overcome this problem of local minima. In this research first Simple Genetic Algorithm (SGA) is used for network structure and then for gene reinforcement genetic algorithm is used .The result shows that improved genetic algorithm will improve classifying veracity.

III. MACHINE LEARNING ALGORITHM

Machine learning Algorithms are applied by researchers for the prediction of cancer survivability rate. These algorithms are well accepted and work well for proper diagnosis and predication. An ensemble of Random Forest, Naïve Bayes and Artificial Intelligence can be used for predicting cancer at early stage.

A. Random Forest

It is an ensemble technique which integrates the series of K_learning model for the creation of better prediction model. Random forest algorithm uses decision tree classifier for randomization [3]. This helps in minimization of bias, tolerates outliers and also helps in avoiding over fitting. In this paper, random forest has been used for the prediction of cancer . The independent training sample $\mathcal{L}p = \{(X1,Y1), ..., (Xp,Yp)\}$ are identically distributed $[0,1]l \times R$

valued over random variables $(l \geq 2)$. It consists of random based regression tree.

$$\{rp(x, \gamma q, \mathcal{L}p), q \geq 1\}$$

Where $\gamma1, \gamma2 \ldots$ are identically independent.When random tree is merged it gives aggregate regression as given in equation 2

$$rp(X, \mathcal{L}p) = E_\gamma[r_p(X, \gamma, \mathcal{L}p)] \tag{2}$$

Where, $E\gamma$ is random parameter, $\mathcal{L}p$ is data set

Algorithm 2: Random Forest

1. Select coordinates at each node $X= (X(1)\ldots\ldots X(l))$, with probability of $qpk \in (0,1)$

2. Select the coordinate to find the midpoint at each side of node

3. Random tree $rp(X, \gamma)$ provides output above Ym, having Xm vector of random partition:

$$rp(X, \gamma) = \frac{\sum_{m=1}^{p}[xm \in Ap(x\,\gamma)]}{\sum_{m=1}^{p} [Xm \in Ap(x\,\gamma)]} 1Hp(x, y)$$

Where $Hp(X, \gamma)$ is given in equation below

$$Hp(X, \gamma) = \sum_{m=1}^{p} 1[xm \in Ap(x\,\gamma)] \neq 0$$

Random forest regression takes form $rp(X,\gamma) = E\gamma[rp(X, \gamma)] = E\left\{\frac{\sum_{m=1}^{p}[ym1[\,xm \in Ap(x,\gamma)]}{\sum_{m=1}^{p} [Xm \in Ap(x\,\gamma)]} 1Hp(x, y)]\right\}$

B. Naïve Bayes

It is a decision support model which uses Bayesian Network and Bayes theorem with independent assumptions among predictors.

For predictive modeling Naïve Bayes is the technique that analyze the data within each attribute and for the events that evaluate conditional probability [5]. During training probability for each class is calculated to estimate the modeling of instances in training dataset so that class labels can be assigned to problem instance Naive Bayes provides a method for the calculation of posterior probability P(c/x), P(c), P(x) and P(x/c). NB classifier defines the effect of predictor(x) on class (c) which is independent of other predictor values. Equation 3, 4 shows the class conditional independence.

$$P(c/x) = P(x/c)P(c)/P(x) \tag{3}$$

$$P(c/X) = P(x1/c)* P(x2/c)* \ldots * P(xn/c)* P(c) \tag{4}$$

Here, P(c/x) is target class posterior probability; P(c) is prior probability, P(x/c) Probability of predictor class, P(x) Predictor prior probability.

Algorithm 3: Naïve Bayes classifier

Begin

1. Take two independent events A and B : P (A,B) = P(A)P(B)

2. Evaluate result through : $P(y|x1,\ldots\ldots xn)=P(x1|y)P(x2|y)\ldots P(xn|y)$ $P(y)/P(x1)P(x2)\ldots P(xn)$

3. Equation of step 2can be expressed using $P(y|x1\ldots\ldots xn)=P(y) \Pi ni=1P(xi|y)/ P(x1)p(x2)\ldots P(xn)$

4. Remove the term as denominator remains constant by $P(y|x1\ldots\ldots xn) \ \alpha \ P(y) \Pi ni=1P(xi|y)$

5. Create classifier model by finding probability of set of inputs for all values of variable y :

$Y= argmaxy \ P(y) \Pi ni=1P(xi|y)$

Calculate $P(y)$ and $P(xi|y)$

C. Artificial Neural Network

Artificial neural network is based on Artificial intelligence that relates to the human brain function. These networks interpret nonlinear data and biological data is usually nonlinear. The benefit of using neural networks in such situations is that it has a good tolerance capacity for noisy data and also easily classifies patterns that are not even trained [21]. In this research, back propagation method is used to diagnose cancer. It has three layers input layer, hidden layer, and output layer. All these layers perform a different function like the input layer receives input and send it to the hidden layer; the hidden layer adds computational weight and provides net input which is applied to the activation function which provides actual output. Artificial neural network has been used in various areas like in prediction, economical modeling, medical applications, bioinformatics, etc.

- *Back-propagation:* In medical science, for prediction bases back- propagation (multi layer neural network) network is used. Here network travel from input neuron to output neuron as shown in Fig.2.
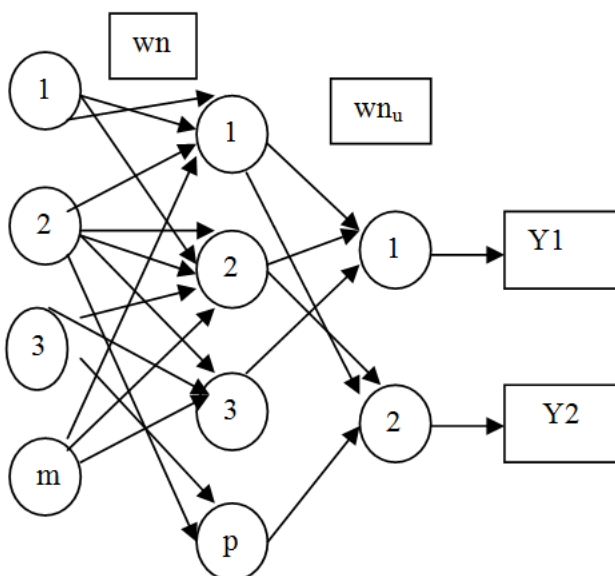

Fig.2.Three-Layer Artificial Neural [21]

Network representation with Sx_m Input Neuron, W_{ih} Hidden Neurons and W_{ho} Output Neurons[21].
Algorithm 4: Artificial Neural Network

1. Create weights arbitrarily for multilayer neural network.

2. Assume E is training example and C as actual output

3. Calculate feed-forward propagation for both hidden and output layer.

h_i, i= 1, 2, 3… p (Hidden layer neurons)

$h_i= W_{inbias} +\sum_{i=1}^{m} u_iW_{ih}$

4. Sigmoidal function as activation function: $F(x)=1/(1+e^{-x})$

5. Calculate hidden node activation values : $u_i=f(h_i)=1/(1+e^{-hi})$

6. Calculate both input weight and output node value O_j ,j=1,2,3….n

$Oj=Woutbia=s + \sum_{j=1}^{n} hiwh,o$

7. Activation value of output node : $U_0=f(oj)=1/(1+e-0j)$

8. After pass one, calculate the error using weight adjustment method of back propagation to reduce error between wanted and actual output.

$Error=0.5*(Odesired- Oactual)2$

Output neuron $\delta 0 = (Ci-U0) \ u0 \ (1=u0)$

Sigmoidal derivative $u0 \ (1=u0)$

9. Update network weight at each layer

Hidden to output layer $Wi*j=Wi,j+ p\delta0 \ ui$

Hidden to input layer $Wi*j=Wi,j+ p\delta i \ ui$

P is represented as learning rate

IV. MOTIVATION

Machine Learning techniques help in identification of cancer. A framework of identifying cancer helps doctors to save person from increasing effect of cancer by predicting it at early stage. To improve the performance of the cancer prediction framework, genetic algorithm and other machine learning techniques can be implemented on the dataset to achieve optimum accuracy of the result from these algorithms. In this research, the use of genetic algorithm in comparison with random forest, naïve bayes and artificial neural network is made on the basis of various performance parameters.

V. METHODOLOGY

The methodology of given technique is shown in Figure.3. The process of implementation is divided into three parts:

- Data Randomization
- Model Selection
- Checking the Performance using various performance parameters

Here, data from the dataset is divided into two sets training and testing set. By using different algorithms of machine learning and genetic algorithm on the same dataset performance is evaluated using different performance parameters like accuracy, precision, sensitivity, specificity and Fpr and best algorithm for the cancer prediction is selected on the basis of accuracy estimation. Following steps given in the Fig.3 are followed to find the accuracy.
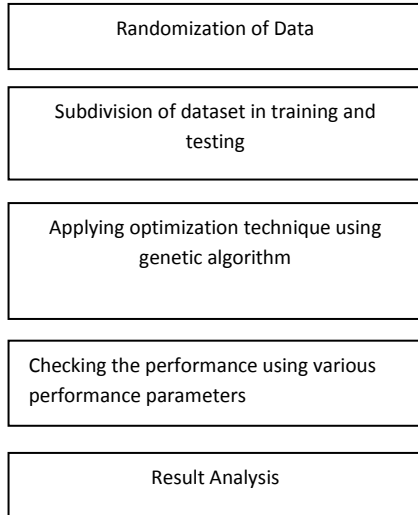
Randomization of Data

Subdivision of dataset in training and testing

Applying optimization technique using genetic algorithm

Checking the performance using various performance parameters

Result Analysis

Fig.3. Methodology Used

VI. PARAMETERS FOR COMPARISON

- Accuracy: The percentage of total number of predictions that were correctly predicted

$$Accuracy = TP + TN / TP + TN + +FP+FN$$

- Precision: The percentage of positive values that were correctly predicted.

$$Precision = TP/TP + FN$$

- Sensitivity: It specifies what percentage of positive cases are covered by algorithm

$$Sensitivity (Sens) = TP/(TP + FN)$$

- Specificity :The percentage of unpredicted values which are correctly predicted

$$Specificity (Spec) = TN/TN + FP$$

- Fpr : Combination of precision and recall

$$F1 score = (2 Precision*Recall) / (Precision + Recall)$$

VII. DATASET DESCRIPTION

In the research here, Breast Cancer Wisconsin (Original) Data Set is taken from UCI machine learning repository. Table 1 shows the core attributes. Breast cancer Wisconsin dataset consists of data with Multivariate characteristics in which number of instances are 699 and number of attributes are 10. Dataset also describes the malignant class and benign as positive and negative (1 and 0) respectively.

Dataset Description [25]

Attributes	Data Description
Sample code	Id number
Thickness of clump	Range(1-10)
Cell Size uniformity	Range(1-10)
Cell shape uniformity	Range(1-10)
Marginal Adhesion	Range(1-10)
Cell size Epithelial	Range(1-10)
Bare Nuclei	Range(1-10)
Bland Chromatin	Range(1-10)
Normal nucleoli	Range(1-10)
Mitoses	Range(1-10)
Cancer	Benign=0
	Malignant=1

VIII. RESULT

A. Random Forest

Random forest generates the classification for the cancer prediction with various parameters like true positive, true negative, false positive , false negative as mentioned in the confusion matrix given below:

- Confusion matrix: The confusion matrix for random forest is given below with certain values like: True negative value=106, False positive value=5, False Negative value= 2 and True positive value=58.

[[106 5]

[2   58]]

- Random Forest Performance measure

Random Forest Performance measure

	Random Forest
Accuracy	95%
Precision	95%
Sensitivity	97%
Specificity	90%
Fpr	5%

Table 2. Show the results for Random Forest for different performance parameters. Accuracy, Precision, Sensitivity, Specificity and Fpr are different parameters that are used to measure performance for both training and testing dataset values and the Accuracy for the Random forest is evaluated as 95%.
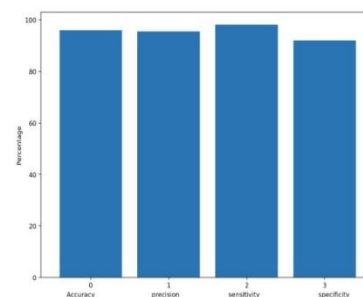
- Bar Graph for Random Forest

Fig.4. Random forest performance parameter Bar Graph

Fig. 4 shows the bar graph for random forest which provides the percentage level of various performance parameters.

B. Naïve Bayes

Naïve Bayes also generates the classification for the cancer prediction with various parameters like true positive, true negative, false positive , false negative as mentioned in the confusion matrix given below:

- Confusion matrix: The confusion matrix for random forest is certain values like: True negative value=99, False positive value=2, False Negative value= 8 and True positive value=62.

[[99 8]

[2 62]]

- Naive Bayes Performance measure

Naïve Bayes Performance Evaluation

	Naïve Bayes
Accuracy	94%
Precision	95%
Sensitivity	97%
Specificity	90%
Fpr	5%

Table3 show the results for Naïve Bayes for different performance parameters. Accuracy, Precision, Sensitivity, Specificity and Fpr are different parameters that are used to measure performance for both training and testing dataset values. The Accuracy for the Naïve bayes comes out to be 94%.

- Bar Graph for Naïve Bayes
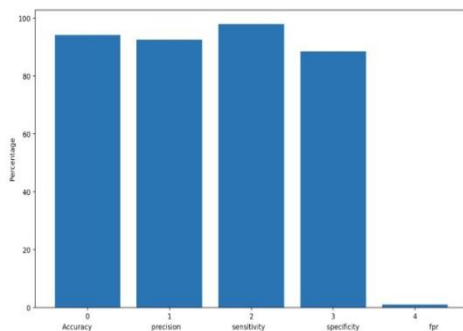
Fig.5. Naïve Bayes performance parameter Bar Graph

C. Artificial Neural Network

- Line Graph Values for Artificial Neural Network Accuracy is given in the Table 4.

Artificial neural Network Accuracy Evaluation

	Artificial neural Network
Training Accuracy	96%
Validation Accuracy	94%

Table 4 shows the results for Artificial neural network for its training accuracy and validation accuracy. The training accuracy for ANN is evaluated as 96% and Validation accuracy is evaluated as 94% as shown in line graph given below:
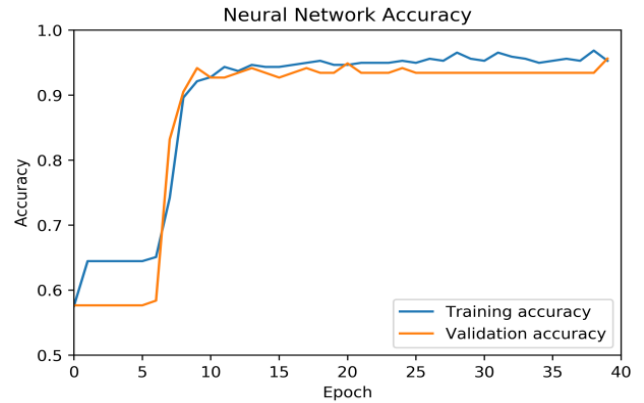

Fig.6 Neural Network Accuracy Line Graph

Fig. 6 shows the line graph for Neural network accuracy which depicts the   values in different colors for both training and validation accuracy where training accuracy is shown in blue color and validation accuracy in orange color.

- Loss Line Graph Values for Artificial neural Network Loss line graph values for artificial neural network are provided in Table5.

Artificial Neural Network Loss Evaluation

	Artificial neural Network
Training Loss	0.16
Validation Loss	0.18

Table 5 shows the results for artificial neural network for its training loss and validation loss. The training loss for ANN is evaluated as 0.16 and Validation loss is evaluated as 0.18. These values are graphically represented using line graph as shown in Fig.7 below:
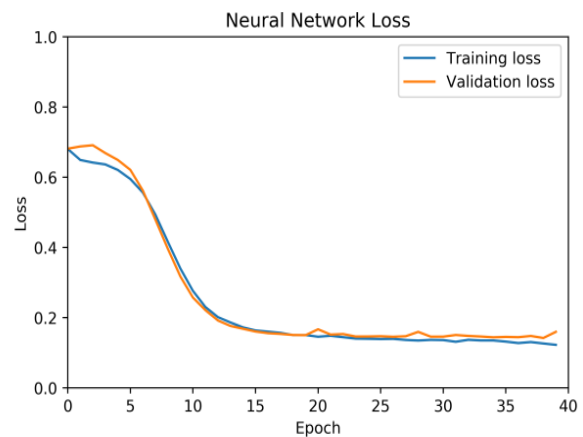

Fig.7 Neural Network Accuracy Loss Graph

E. Genetic Algorithm

Genetic algorithms have provided the optimized solutions for making decision and obtaining better results

The population size (an integer >= 1)

=> 3

The mutation rate (a decimal point '.', followed by a nonnegative integer, so that 0 <= mutation rate <= 1)

=> 2.4

The crossover rate (a decimal point '.', followed by a nonnegative integer, so that 0 <= crossover rate <= 1)

=> 1.3

The number of crossover points (either '1' or '2')

=> 2

The maximum number of generations (an integer >= 1)

=> 3

The number of times to run the GA with these parameters (an integer >= 1)

=> 3

For Run 1 and generation count 3, Population's initial best fitness values are 57, or 38.0 percent fit and

Population's final best fitness values are 51, or 34.0 percent fit. Its Average fitness delta is given by -1.333. Similarly for Run 2 and generation count 3, Population's initial best fitness value is evaluated as 53, or 35.3333 percent fit and Population's final best fitness value is given by 51, or 34.0 percent fit. Its Average fitness delta is given by -0.444. For Run 3 and generation count 3, Population's initial best fitness is given by 71, or 47.3333 percent fit and Population's final best fitness is given by 51, or 34.0 percent fit. Its Average fitness delta: -4.444.

Result for most fit individual with different Runs is given in Table 6.

Most Fit Individual

Run	Generation count	Most Fit individual Genotype values
1	3	-108, -29, 88, 85, 104, -80,
2	3	-110, -84, -66, 60, -70, 6,
3	3	23, -23, 113, 4, 81, 24,

IX. CONCLUSION AND FUTURE WORK

To work in the field of medical sciences many methods are available. The most important and challenging part with machine learning techniques is to provide accuracy and computational efficiency. The proposed research, prediction of cancer is identified using different algorithm of machine learning in comparison with genetic algorithm. Genetic Algorithm optimizes the neural network by involving connection weights. The Breast Cancer Wisconsin (Original) Data Set is taken from UCI machine learning repository and it is trained and tested by applying different algorithm like Random forest, Naïve Bayes, Artificial neural network and Genetic algorithm. Random forest is used as an ensemble learning algorithm which depends on the combination of several decision trees, it is applied on the n tree bootstrap_sample , For predictive modeling Naïve Bayes algorithm is used to analyze the data within each attribute and for the events that evaluate conditional probability and back propagation algorithm considers different neurons in hidden layer to analyze output by calculating the error using weight adjustment method which reduces error between required and actual output. From experimental analysis genetic algorithm provides topmost accuracy of 97% where as other algorithms like artificial neural network provides accuracy of 96%, Naïve Bayes provides accuracy of 94% and Random forest provides accuracy of 95%. This research work can further be enhanced by incorporating fuzzy in selection function to improve the accuracy.

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Predicting Student Performance in Academics using Machine Learning Approach: A Case Study

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Abstract— Student performance is of crucial importance at all stages and levels of education. Keeping the track of students' performance and its assessment is a crucial task of an education system. The ability to forecast student academic performance at early stages could be helpful to the educational institutes in many ways. Researchers are using Educational Data Mining (EDM) for analysing student academic data for finding drop-outs, learning patterns, grouping students as well as predicting performance. EDM can discover hidden knowledge and patterns that will support decision-making processes for improving the educational system. To facilitate these tasks, EDM utilize Machine Learning (ML) or Data Mining (DM) algorithms for constructing prediction models built from student academic records. These models present the knowledge in readable form, which are easily interpreted by the users. The objective of this research study is to provide the most suited classification model for students' academic performance prediction. The design of the study is divided into 5 different phases: data collection, data pre-processing such as cleaning, feature selection, model building, and evaluation as well as comparison. The case study presented in the paper contributes in 2 ways: firstly, it provides an analysis of the features and the effect of selected features on academic prediction. Secondly, in building models and comparing the performance of different classification algorithms belonging to different families namely; Decision Tree, Bayesian, Lazy Learner, Rules and Function. Based on the result obtained and the comparison per-formed using Precision, Recall, True positive, etc. it is found that the most suited algorithm is Naïve Bayes among all the implemented algorithms in the current scenario. It also gives a future direction for further study to enhance the performance using more features related to students and developing a multi-classifier system for performance prediction.

Index Terms— Data Mining, Educational Data Mining, Machine Learning, Feature Selection, Classification, Performance Prediction

I. INTRODUCTION

In today's information era, data is gathered from various sources and stored in huge repositories related to various fields like medicine, finance, marketing as well as in education. This stored data can be transformed and analyzed to obtain beneficial knowledge which can be used to resolve various issues related to a particular field. Similarly, almost all educational institutes store a large amount of data related to students, exam results, courses etc. Knowledge obtained from the analysis of stored data can enhance the quality of education, Decision support system (DSS) and education processes at all levels. EDM is an area that uses various techniques from fields like Statistics, Data mining (DM), etc. to analyze and extract valuable knowledge from data repositories of academic institutes [1]. DM uses various algorithms of Machine Learning to analyze the data and extract information. It is considered to be one of the significant applications of Machine learning (ML) [2]. ML algorithms work on different features like binary, continuous or categorical, stored in a data set and uses these features to perform analysis. These ML algorithms are divided into 2 categories: supervised and unsupervised learning [3]. In case of supervised learning, class labels are known and in unsupervised learning, the class labels are not specified [2][3]. The classification technique comes under the category of supervised learning algorithms. It is a technique that is being prominently used to analyze educational data.

Student performance is of crucial importance at all stages and levels of education. Keeping the track of students' performance and its assessment is a crucial task in an education system. The ability to forecast student academic performance at early stages could be helpful to the educational institutes in many ways. The main purpose of student academic performance perdition is to improve student rate of success, reduce the number of drop-out, etc. which helps the institutes of higher education is to increase the quality of academics. The academic performance of students depends on various factors like internal assessments, study hours, friend circle, school education, parent's education and so on. The objective of this research study is to provide the most suited classification model for students' academic performance prediction on the available student academic data. The case study, presented in the paper is a step in this direction and contributes in 2 ways: firstly, it provides an analysis of the features and the effect of selected features on prediction. Secondly, Building and comparing the performance of different classification algorithms belonging to different families.

The paper is arranged into following sections: Section 2: literature review, section 3 – problem statement, section 4- methodology, section 5- experiment and discussion and section 6- conclusion and future work.

II. LITERATURE SURVEY

Classification is a "Supervised" learning technique [2][3]. It is used to group instances belonging to a data-set based on pre-defined labels, further it is also used to perform prediction of new data values based on existing data. A literature survey has been carried out to study different methods of feature selection and classification techniques used for assessing the performance of students on the basis of their prior performances. Based on this, the discussion is divided into two parts:

1. The Performance-related factors: There are various features like average grade point, cumulative grade point, internal assessment percentage, as well as demographic information that is collected throughout the academic life of the students which influence their performance. These features are studied and analysed in various researches, affecting the performance of the students. The features affecting the performance of the students are known as high influential features. The highly influential features are extracted using different feature selection techniques. The feature selection techniques are divided into 3 main groups: filters, wrappers, and embedded/hybrid [4][6][7]. Table 1 presents a summary of the most influential features that are being utilized for predicting the performance of the students as per the literature survey.

Table 1. Summary of the frequent feature.

Feature/ attribute/ factor	Description	Reference
Univ. Adm. Score and No. of Failures.	University Admission Score of student and Number of Failures in the year 1st of university exams are highly influential features.	8
Att, GPA	Attendance of students and Grade Point Average are the top rank features.	9
IA	internal assessment makes the highest impact	10
PSM	Previous semester marks most influential attribute out of Attendance, Class test, Seminar and Assignment marks	7, 11,12
INT-GR, ATDN, SEX, PTUI, MOB, INS-HIGH, COM-HM, NET-ACS	Internal grade of the student, Attendance count, Student's Sex, Private tuition, Student having mobile, Institution at a high level, Computer at home, Student having net access	13
Branch, SSG, FINC, PSM, GP, ATT	Students grade in senior secondary, Family annual income, Previous Semester Mark, General Proficiency, Attendance	14
TransSchool, StMe, XMark-Grade, LOC-SCH, MED	Mode of transportation to school, type of secondary syllabus, marks/grade obtained at the secondary level, school location, Instruction medium.	15

For the study of literature, it is found that the features like student attendance, previous results, and internal assessments are high influential variables which affect the prediction accuracy. These features are mainly related to academics and are prominently used by the researchers in their studies.

2. The Classification methods: Table 2 presents a summary of classification algorithm, which are of frequently used for student performance prediction in the academics. Various research works are performed by researchers to find and suggest the most suitable algorithm that can be applied to forecast students' performance in the future. There are many variants available of classification techniques that are categorized into different families like Decision tree (DT), Bayesian, Lazy Learner etc [2][7][16].

Table 2. Summary of Classifiers implemented for predicting student performance by researchers.

Ref. no	Classification Techniques used	Key findings
8	rule learners: OneR and JRip decision tree: J48, Nearest Neighbour classifier Bayes: NaiveBayes, and BayesNet	Predicting performance of student at the university level based on pre-university & personal attributes of students. J48 gives the highest accuracy
17	Decision Tree, Rule Induction, Naïve Bayes, and Neural Network	It is a longitudinal study where no socio-economic data is considered for performance prediction. The results show that Naïve Bayes outperformed with reasonable accuracy.
9	Bayesian Network and DT	Bayesian Network is outperforming in terms of accuracy rate in comparison to the Decision Tree.
10	Neural Networks, Naive Bayes, Support Vector Machine (SVM) and DT	The results display that the effectiveness of tech. is enhanced after applying data pre-processing and fine-tuning of algorithms, and further, the SVM outperforms in a meaningful way.

11	Bayes Network Classifier and DT: J48, Random Forest (RF), and PART	The results displayed that RF algo. outperforms the rest of the classifiers implemented on the basis of classifier errors as well as on accuracy.
12	CART, ID3, and C4.5 decision tree algorithms	DT classifiers studied are the most significant classifier in predicting the student academic performance at the semester end exam.
18	Rule-based: Decision table and One Rule (oneR)	it was found that the Rule-based algorithm can be efficiently utilized in predicting performance as compared to other classification techniques
13	Multilayer Perception (MLP), Naïve Bayes, SMO, J48, and RepTree.	MLP displayed the best results with 75% accuracy. The paper also finds the features associated with students' academic performance. Further, to enhance education quality by identifying slow and weak learners and guiding them individually to enhance their performance.

From the above table it is found that the classification algorithms used in various studies performed by different researchers either belong to a single-family or to multiple families. All these algorithms have their own pros and cons. The results of different studies vary as they are based upon the dataset used, classification algorithm implemented and features set used for prediction. Further, the survey reveals that Decision Tree algorithms are frequently used in various studies.

III. STATEMENT OF THE PROBLEM

The aim of the case study is to predict the performance of students using Classification technique and to compare different classification techniques on the basis of their accuracy. Different Classification algorithms are implemented to categorize students into 5 different classes namely; 'Best', 'Very Good', 'Good', 'Pass', and 'Fail' on the basis of various features.

In the proposed case study, different feature selection algorithms have been applied on a dataset related to students consisting of academic data and some personal information, to find the most influential features/ factors affecting the students' academic performance. Further, the effect of feature selection is being studied on the classification algorithms to compare the performance of different classifiers belonging to different groups. The purpose of the study is to check the applicability and the effectiveness of different methods to categorize students into 5 different classes namely; 'Best', 'Very Good', 'Good', 'Pass', and 'Fail'.

The main objective of the study is to (i) provide an analysis of the features and the effect of selected features on the performance. (ii) Building and comparing the performance of different classification algorithms belonging to different families.

IV. METHODOLOGY

The methodology applied in the case study is presented in figure 1, it is divided into various phases starting with data-collection, pre-processing and ending with an analysis of results

Fig. 1.Phases of methodology [3][19]

Data set collection

For the case study, student data-set consisting of academic attributes and other related attributes has been referred from a department of a reputed institute. The collected student data set consists of more than 100 tuples with 22 attributes.

Data Pre-processing

The collected data has been pre-processed to remove anomalies. During the pre-processing stage the data is cleaned by removing missing values and formats are verified as well as checking for information correctness has been performed. The attributes are transformed by converting the values into nominal values. The pre-processed data is stored in the 'Comma Separated Values' (.CSV) file which is further converted into Attribute-Relation File Format (.arff) for experimentation.

Feature selection

Feature selection is a process of dimension reduction that selects a feature subset from all the available features of the given dataset [7]. With the reduced number of features, the performance of DM algorithms can be enhanced by increasing the prediction rate as well as increasing the speed of the algorithm. Feature selection process reduces the complexity of DM algorithms. Based on the techniques used in the process of feature selection, they are categorized into 3 groups: filter, wrapper and hybrid [12][13]. Out of these 3

groups, the methods belonging to the filter group are frequently used due to their simplicity and are also less expensive computationally [4][6][7]. For the case study, following filter-based methods are implemented:

Co-relation Based Feature Subset Evaluator (CFS): This evaluator gives a maximum score to subsets that include features that are highly associated with the class label but having the least association among themselves [6]. The approach measures the prediction capability of each attribute [14]. CFS method uses the homogeneous feature in the selection process with a pre-processing step of discretization [23].

Chi-Squared-Attribute-Evaluator: It compares the test of independence along with the test of goodness. Chi-Squared-Attribute-Eval roughly calculates a feature by evaluating the statistical chi-squared value [6] [14].

Gain-Ratio-Attribute-Eval: It is a simple individualistic feature ranking method [6], as well as a non-symmetrical measurement introduced for bias compensation of the info-gain [24].

ReliefAttributeEval: It is a weighted algorithm totally dependent on statistical methods. It calculates the influence of a feature by sampling a record repetitively [6]. It finds all those attributes that are statistically linked to the target [14].

Classification Techniques

Classification technique is a method of searching a collection of features that differentiate data into classes, with the aim of using the model build to predict the class label of unknown data [3]. The model build is based on set on the instance which belongs to the classes with known labels based on certain features. The classification techniques are divided into different groups/ families as described:

Decision trees (DT): It is a flow-chart type tree structure, where every node is a test on the feature, each branch is its outcome and the leaf node are class label [3]. The test features are selected on the basis of entropy reflecting the relevance/ importance of feature [12]. ID3, J48, M5P, Random tree are some of the techniques which belong to the DT family [2][25][26].

Bayesian: These are statistical classifiers, which can predict the probability of class membership i.e. a given instance belong to a certain class [3]. It is based on Bayes theorem.

They show more accuracy as well as speed when implemented with large datasets [3][2]. These are of 2 types Naïve Bayes and Bayes-Net [3][6]. NaiveBayesSimple, NaiveBayesMultinomial, BayesNET, etc. are the techniques of this family [25].

Lazy learners: It stores the tuples and performs the classification only when required. It finds the distance between the instances using distance measures like Euclidean distance to classify objects into similar classes or to predict the class of future instances. IBk is one of the k-nearest-neighbor classifiers which uses distance metric. 1Bk, Kstar, etc. are few techniques that belong to this family [25].

Rules: There exist many different methods that generate rules. PART gets the rules from DT. It constructs the tree with the help of C4.5. JRip implements RIPPER [2][26].

Functions: In this family, the classifier can be written in the form of a mathematical equation [25]. It consists of output labels corresponding to a set of input attributes. There is no. of techniques like SMO, Logistics, and MLP etc. that belong to this family.

Classification is a prominently used technique. The classification algorithms are categorized into the aforementioned groups/ families. In the case study, 5 different classification algorithms which are prominently used and belong to different groups/ families: J48 (Tree), Naïve Bayes (Bayesian), lBk (Lazy learner), oneR (Rules) and SMO (function) are implemented and evaluated on the basis of k-fold cross-validation method, where k=10.

Experiment and Results

For experimentation, WEKA - an open-source software tool [6], implementing an assemblage of machine learning algorithms is used. During the pre-processing stage, the data file is transformed from ".CSV" into ".arff" format which is loaded to WEKA. After loading, attribute subset selection has been performed to find the most influential features, for this purpose, an evaluation of 4 filter-based feature subset selection methods has been performed.

Algorithms are implemented on a data-set of more than 100 instances with 22 attributes. End Semester Percentage (esp) is assigned as a class label, which is divided into 5 classes on the basis of percentage marks. The features selected along with the search method used by the feature selection technique are listed in table 3 for reference:

Table 3.list of Highly Influential features selected by different techniques

Method of Feature Selection	Search Method	Highly Influential Attributes/ Features	Data Description
CfsSubsetEval	Best First	TWP, TNP, IAP, ARR, AS, SH, ME, ATD, FS	12ᵗʰ percentage, 10ᵗʰ percentage, internal assessment percentage, backlog, admission cat., family size, hrs. of study, the medium of language, attendance
CorrelationAttributeEval	Attribute Ranking	TNP, TWP, IAP, AS, ME, FS, ARR, ATD, SH, NF, TT, SS, LS	10ᵗʰ percentage, 12ᵗʰ percentage, adm. Cat., internal assessment percentage, medium, family size, backlog, attendance, hrs. of study, friends count, total travel time, secondary school, living status

GainRatioAttributeEval	Attribute Ranking	TWP, TNP, IAP, ARR, ME, AS, ATD, SH	10th percentage, 12th percentage, internal assessment percentage, backlog, medium, adm. category, attendance, study hours
ChiSquaredAttributeEval	Ranking	IAP, TWP, TNP, ATD, ME, FQ, SH, ARR, AS	internal assessment percentage, 10th percentage, 12th percentage, attendance, medium, father edu., study hours, backlog, adm. category

All these filter-based FS techniques implemented can measure the relevance of features [11] based on the internal data properties. FS generally optimizes the efficiency of the classifier by reducing the size of features.

Subsequently, after performing feature selection and selecting the most relevant features, classification algorithms belonging to a different set of families as discussed before are applied to train and test the models, selecting prominently used algorithm from a particular family. All classification algorithms are implemented in 2 ways: without feature selection and with feature selection, this is done to analyze and study the effect of feature selection on the algorithm. The classifiers are implemented with the CfsSubsetEval and ChiSquaredAttributeEval feature selection technique, with default parameter settings of the classifier and using 10-cross fold validation. CfsSubsetEval and ChiSquaredAttributeEval FS techniques are selected as they both use different methods for selecting the most relevant features. Further, for predicting the classes correctly the performance of the classifiers is measured on the basis of different metrics such as correctly as well as incorrectly classified instances, Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), True negative rate (TNR), True Positive rate (TPR), Accuracy, Precision, and Recall [3][25]. Comparative analysis of different Classification algorithms is also performed on the basis of these metrics. The measurement of algorithms according to these different metrics determine the prediction goodness as well as error measurement capability [6][16].

$$Accuracy = \frac{TP+TN}{(TP+TN+FP+FN)} \qquad (1)$$

$$Precision = \frac{TP}{(TP+FP)} \qquad (2)$$

$$Recall = \frac{TP}{(TP+FN)} \qquad (3)$$

$$F-measure = 2 * \frac{(Precision*Recall)}{(Precision+Recall)} \qquad (4)$$

TP - true positive, total no. of correctly classified instances, TN - true negative, the no. of negative instances that are classified correctly as negative. FP- false positive, the no. of positive instances classified incorrectly as negative. FN - false negative, the no. of negative instances that are classified incorrectly as positive [3][5][25][26].

Table 4, displays the comparative results of all 5 classifiers implemented, selecting one from each group. The comparison is performed on the above defined metrics. The classifiers are implemented without feature selection i.e., selecting all the attributes of the dataset. The classification model has been built with default setting and Classification is performed using 10-fold cross-validation.

Table 4.Evaluation of classifier without feature selection

Performance Metric	ID3	Naïve Bayes	1BK	oneR	SMO
Time taken to build model (in seconds)	0.03	0.0	0.0	0.0	0.09
Correctly Classified Instances	74	84	78	75	78
Incorrectly Classified Instances	40	47	53	56	53
MAE	0.1404	0.1561	0.1737	0.171	0.2614
RMSE	0.3746	0.3189	0.3746	0.4135	0.3484
TP Rate	0.649	0.641	0.595	0.573	0.595
FP Rate	0.167	0.174	0.184	0.225	0.199
Precision	0.651	0.641	0.601	0.536	0.595
Recall	0.649	0.641	0.595	0.573	0.595
F-Measure	0.650	0.641	0.593	0.552	0.595

The results show that the performance of Naïve Bayes highest whereas lBk and SMO are having similar performance when taking into consideration correctly classified instance. The difference is in the Recall and Precision values.

Similarly, Table 5 shows the comparison among the classifiers with feature selection, using the CfsSubsetEval feature selection technique. The classification model is built using most influential features and with default parameter settings. The model is trained and tested using 10-fold cross-validation. The model generates the outcome showing improvement in the case of SMO and ID3 classifier, but there is no effect on the results of oneR neither positive nor negative in comparison to when applied with all attributes i.e., without feature selection.

Table 5.Evaluation of classifier with CfsSubsetEval feature selection technique

Performance Metric	ID3	Naïve Bayes	1BK	oneR	SMO
Time taken to build model (in seconds)	0.0	0.0	0.0	0.0	0.03
Correctly Classified Instances	75	81	69	75	82
Incorrectly Classified Instances	40	50	62	56	49
MAE	0.1409	0.1866	0.2034	0.171	0.2595
RMSE	0.3742	0.3296	0.3922	0.4135	0.3455
TP Rate	0.652	0.618	0.527	0.573	0.626
FP Rate	0.169	0.201	0.250	0.225	0.194
Precision	0.657	0.585	0.523	0.536	0.621
Recall	0.652	0.618	0.527	0.573	0.626
F-Measure	0.653	0.601	0.515	0.552	0.620

Table 6, similarly shows the comparative results of all the classifiers models using the ChiSquaredAttributeEval feature selection technique. The results show that all classifiers are performing well with the ChiSquaredAttributeEval feature selection technique but the best results are given by Naïve Bayes followed by SMO, there is no change in the result of oneR.

Table 6.Evaluation of classifier with ChiSquaredAttributeEval feature selection technique

Performance Metric	ID3	Naïve Bayes	1BK	oneR	SMO
Time taken to build model (in seconds)	0.0	0.0	0.0	0.0	0.02
Correctly Classified Instances	74	92	78	75	87
Incorrectly Classified Instances	36	39	53	56	44
MAE	0.1327	0.1532	0.1781	0.171	0.2574
RMSE	0.3631	0.3029	0.3641	0.4135	0.3424
TP Rate	0.673	0.702	0.595	0.573	0.664
FP Rate	0.175	0.158	0.195	0.225	0.176
Precision	0.670	0.708	0.607	0.536	0.667
Recall	0.673	0.702	0.595	0.573	0.664
F-Measure	0.670	0.703	0.598	0.552	0.664

Table 7 presents, the comparative analysis of results of different classification models built using 5 different classifiers- ID3, Naïve Bayes, 1BK, oneR, and SMO belonging to different classifier families. The comparison is shown in terms of percentage accuracy when models are built without feature selection and when built with feature selection. There is an improvement in the accuracy of models built with ID3 and SMO when CfsSubsetEval FS technique is applied. Naïve Bayes shows the maximum value of accuracy percentage when ChiSquaredAttributeEvalis applied followed by SMO, while there was a fall in accuracy percentage in case of model built by ID3. There was no effect on the percentage accuracy of oneR with or without feature selection.

Table 7.Comparison on the basis of accuracy percentage with and without feature selection

Feature selection technique	ID3	Naïve Bayes	1BK	OneR	SMO
Without feature selection	56.89 %	64.122 %	59.542 %	57.252%	59.542 %
CfsSubsetEval	57.25 %	61.832 %	52.672 %	57.252 %	62.595 %
ChiSquaredAttEval	56.49 %	70.229 %	59.542 %	57.252 %	66.412 %

The results of the case study are able (i) to provide an analysis of the features. The application of 4 different feature selection algorithms selected high influential features and (ii) Comparison of the performance, with and without feature selection of different classification models built by algorithms belonging to different families, ID3 (Tree), Naïve Bayes (Bayesian), lBk (Lazy learner), oneR (Rules) and SMO (function). A comparative analysis on the basis of percentage accuracy between classifiers models with and without feature selection is shown in figure 2. From the results, it is found that there is significant effect of feature selection on the accuracy classification model. There is an enhancement in the accuracy of the models after feature selection of all the algorithms other than oneR, where there is no significant change.

Future Work and Conclusion

Classification- one of the most frequently used techniques of DM for student performance prediction. In the paper, different classification models were built using 5 different classification algorithms belonging to
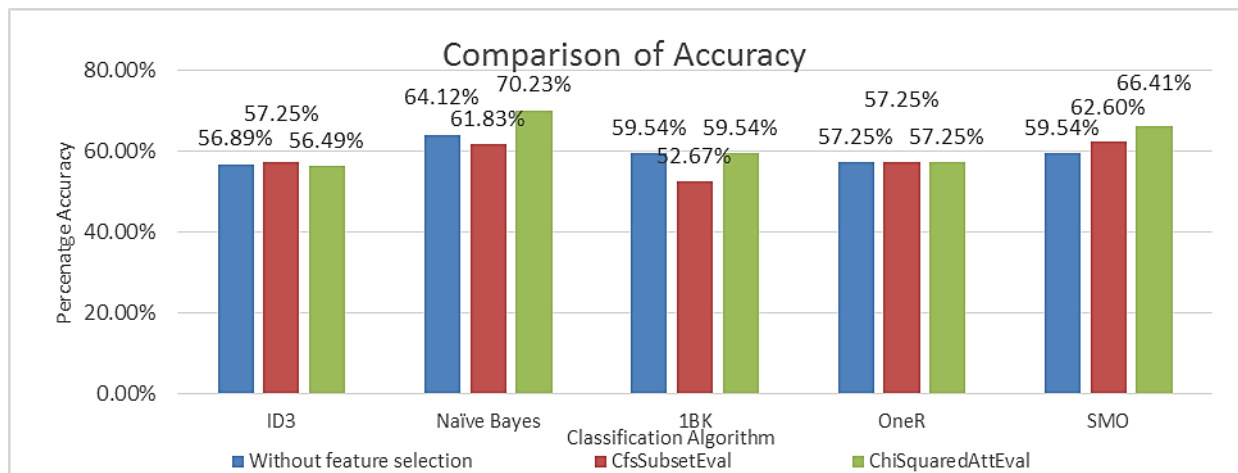
Fig. 2. Comparison on the basis of the accuracy percentage

different groups/ families: ID3 (Tree), Naïve Bayes (Bayesian), lBk (Lazy learner), oneR (Rules) and SMO (function). These models are implemented and evaluated on the basis of k-fold cross-validation method, where k=10. A set of evaluation metrics are used for evaluating these techniques, based on accuracy, TP rate, FP rate, Precision, Recall, and F-measure. From the comparison between different Classification techniques implemented in the case study it is found that Naïve Bayes showed highest performance accuracy on given dataset. The study is able to achieve the main objectives i.e., it is able to (i) study the applicability of classification algorithms on data coming from the educational setting to predict the performance of the learner. (ii) To study and analyze the effect of feature selection on the classification algorithms and comparing the effectiveness and performance of classification algorithms. The results presented in the paper are from individual single standalone algorithms implemented on small multi-class data-set, for future work, more features will be collected and used along with a larger data-set. Further, instead of using a single standalone classifier, multiple classification algorithms will be combined to create a multi-classifier that may optimize the accuracy of the classification models will be implemented. As a result, an improved predictive model would be built and implemented to predict student academic performance. The model will provide the academic institute, including its management and teachers, with an accurate evaluation of their students at the preliminary or introductory phase of the learning process to avert students from obtaining low grades or marks. Also, it will help in the distribution of resources in a better way which will result in enhancing the efficiency and performance of the educational system and its development.

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Study of Mechanical Properties of Sand Extracted from Overburden of WCL Mines – the Effective Sustainable Sand Solution

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Abstract— Ecological environment concerns are being raised against exploitation of natural resources. The lack of consensus are mostly related to preserve soil beds from erosion and the fact of having natural sand as a filter media for ground water. For a period of time, coal industry in India is facing shortage of river sand due to new mining laws and its increasing demand in infrastructure expansion. The present study concentrates on study of extraction of sand from the overburdens of opencast mines of Coal fields and its feasibility as a fine aggregate in concrete. The surcharge soil spread over in mines needs to be removed for separation of coal to an external dump till ample space is produced for back filling by obtaining of land nearby coal carrying area. Moreover surcharge waste needs to be managed at the time of closure of mine for land acquisition. In present project study of physical properties of extracted sand from overburden and natural sand from river bed is compared and effort is made to utilize the waste generated in tones into sustainable sand solution.

Index Terms— Natural sand. Extracted sand, overburden, sustainability

I. INTRODUCTION

Major constituent of coastline categorized as a "fine aggregate", resulting from the erosion of siliceous and other rocks forms a major building material. At a large scale there is scarcity of this building material and this is the situation in many progressing nations. According to statistics, the need of sand as fine aggregate for infra structure development in the country is about in million tonnes and it is growing at the significant rate per year. The resources for generation of natural sand are limited. As a matter of fact, the generation is not uniform in quantity and in quality. The state of uncertainty and unsatisfactoriness in supply, the rate of the material changes promptly leading to wrong practices. Uncontrolled exploitation of sand reserves leads to disturbing ecological balance. Complications of illegitimate excavation, environmental concerns, and variations in costs and quality of sand connected with each other are predomination across many nations. Open cast mining is a surface mining expertise of excavating hard strata or inorganic element from the earth by their separation from an open pit or earth's surface. Bhanegaon open cast mine, bears a sand patch at a depth of 8m to 10m. After that from overburden, sand is extracted by using sand segregation plant. In overburden 40%- 50% sand obtained and other are mud and gravel.

II. BRIEF REVIEW OF THE PAST WORK

ZhengfuBian, 2007[1], studied that the preliminary thing to treat extracted waste as lining for construction practices , and use it as building material, stuffing underground empty spaces , filling subsided basin to rejuvenate lands for forestation purpose and agricultural production and landscaping .A.Y.U.Stolboushki, 2016 [2] in his study utilized waste generated in the process of coal mining for production of bricks and fuel for their burning, carried out research of waste coal from processing plant abashevskaya and carbonaceous argillites from the lignite open-cut in korkino and found the possibility for compound use of waste coal as a raw material for preparing ceramic bricks, and as fossil energy for kilns. Parthasarathi, 2016 [3] studied the effect on workability of concrete due to partial replacement of fine aggregate with gold mine remains. The residues of gold mine are extremely fine particles with a fineness modulus of 0.28 and contain around 69% of around medium and fine sand. Due to substitution of natural sand with fine tailings there was variation in the quantity of medium and fine sand. The percentage variation of medium and fine sand in the sand resulting for 10%, 20% and 30% substitution levels were found to be 82%, 75% and 69% respectively. The workability acquired for concrete for 30% replacement was found to be very 1ow. However, the modified concrete was found to be applicable for binding, shallow sections and pavement using pavers K. Ram Chandar,(2016)[4], studied gradation results marked on a semi-log plot with respect to percentage passing on (Y-axis) and sieve size on logarithmic axis (x-axis) interpreted S-curve conforming to well-graded aggregate for sandstone. The fineness modulus of the sandstone obtained as 2.25 and found it to be substitution of fine aggregate. Flow properties of concrete increased percentage variation of replacement of sand. Increased content of fly-ash with constant sandstone percentage workability was found to be increased. Merbouh,(2017)[5] in his study of experimental investigation on study of mines waste as sand on properties of concrete, found that the flow property of all the concrete mix decreases with increased percentage of substitution of

sand by coal waste aggregate. Compressive strength of concrete increased till 4% coal waste used as sand in concrete.[7],[8] The skewed substitution of the sand by coal waste improved early compressive strength .Ibrahim, 2019[6] in his study of Recycling of Ash from coal as a substitute of cement found that the workability parameter decreased with the increasing percentage of coal ash as a cement replacement and further concluded that high fineness of ground CBA particles results in increased abortion of water. C.R. Santos(2015) results showed that it was possible to process the coal waste from the carboniferous region of Santa Catarina and obtain a recycled fine aggregate that can be used in civil construction.[9]

III. GENERAL INFORMATION OF BHANEGAON OPEN CAST MINE

WCL is scrutinizing to deal with its production by separating sand while digging out coal. It has begun segregating sand from soil dug out for mining coal. A like project for manufacturing bricks has also been initiated. Surcharge, overburden as it is called in mining terms, is the earth dug out while mining activity. The same is used for backfilling of cavities created. Apart from this, surcharge soil has no other utility.   Currently it has started segregating sand by mechanical means from the surcharge soil. Its splits sand particles from the earth. Along with this, rocks are also crushed into sand. The company has started supplying 500 m³ per day to Nagpur Improvement Trust to be used for a low cost housing scheme of government. WCL has got enquiry from agencies like National Highway Authority of India. WCL is looking forward to improve its overall revenues. It may lie between 5% to 105% of the public sector units' turnover regarding sand a source. It sum to about 200 million tons of overburden in per annum. Although it is used to backfill mines, but a lot amount of soil is left out in process. Due to the swelling of soil there is increase in the volume by 20% which can be used for making sand and remaining can be used for backfilling.

Fig. 1.Bhanegoan Open Cast Mine

Fig.2 Sand patch at open cast mine

1. Name of the subsidiary : western coalfields limited
2. Name of area   : Nagpur area
3. Name of mine   : Bhanegaon open cast mine
4. Date of opening   : 17-03-2015
5. Location   : Latitude N21⁰16'37"- N21⁰15'36"
                             Longitude E79⁰10'12"-E79⁰08'41"
6. Total land required   : 610.12 Ha
7. Excavation area   : 146 Ha
8. External overburden dump area   : 245
9. Area of quarry   : 1.5km*1.0km
    Minimum depth of quarry : 65 m
    Maximum depth of quarry : 215m
    Life of the mine   : 26 years

3.1 Sand from overburden of coal mines:

1. Characteristics

The surcharge soil spread over in open areas of coal mines need to be relocated for coal extraction to far away dumping yards in order to create l adequate space for back filling by acquiring of land near coal bearing area. Further, this surcharge soil needs to handle properly at the time of shutting of mine reclamation of land. As per mine closure rule, 80% of the extracted surcharge utilized for backfilling of the cavity created remaining percentage to be utilized for extraction of sand.

2. Demerits of Overburden

1. External overburden dump is w aste by products as is of no use to the company.

2. Huge quantity of land has to be acquired for overburden dump incurring huge cost to the company.

3. The external dumps always possess treat to nearby habitants lthat necessitates rehabilitation of villagers to a safe place which adds to additional capital investment.

4. Overburden dumps pollutes the environment, flora fauna of species nereby area adjacent to the mine

3.2 Sand Segregation Plant

The main function of this plant is the sepration of sand from overburden waste. Plant consist of various unit like resand bunkarhaving capacity 25cu.m, turn screening unit, sand processing unit, , rotating bucket , conveyor belt having width 800mm. which is used for passing the material from one unit to another unit, wing wheel 2m length. Overall length of plant is 40m.

WORKING OF SAND SEGREGATION PLANT

Introduction: sand segregation plant is used to separated sand from overburden waste. The main function of segregation plant is toremove mud and bigger sizes stone.The first stage involves separation of bigger size stone available in overburden waste. The overburden contains both sand as well as mud.

1. 2. After removal of bigger size stone the remaining overburden is passed to next unit called as screen.

2. 3. In this unit 2 type of mesh is provided that is one for course and other for fine Particles. In this process course and fine particle are properly shake. 4. In next stage the overburden waste is passage to sand processing unit. This unit is provided over the RRC platform. In this unit water is applied to the overburden waste by force, due to this action mud is dissolve with water and is collected in tank which is provided under the mesh. Then by the use of pipe which is connected to the tank mud and water is kept outside of plant. After this remaining material called as (segregated sand) is collected in bucket. Then clean wet sand is passed to drying platform by the use of conveyor belt which is 800mm in width and sand is collected from delivery end.

Merits of Segregation of Sand from Overburden

3. Depletion in natural river sand can be stopped.

4. Sand is a national asset and recovery of sand from waste overburden is best out of waste product.

5. Land occupied by overburden can be freed for mine exploration, afforestation, cultivation or any other economic activity that adds revenue to the company.

6. The land degradation can be minimised.

7. Indirect employment can be generated by installing a processing plant.

8. Uninterrupted supply of sand can be ensured throughout year without any seasonal affects.

9. Supply of sand can be regulated as per requirement.

10. The recovered sand will be supplied to government agencies as cheaper price than the prevailing market price.
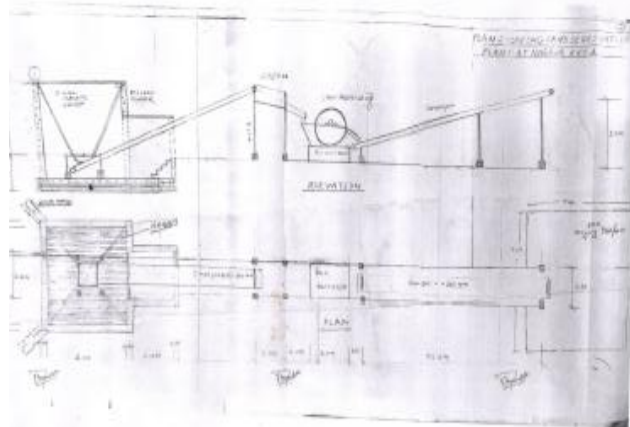

Fig.3Layout of Sand Segregation Plant

Fig.4 Components of Segregation Plant

IV. MATERIALS

4.1 Natural Sand

Natural sand has an ideal shape for use as fine aggregate in concrete. The natural sand particles are well rounded and are usually nearly spherical. spherical particles decreases the percentage of voids within the concrete mixtures so no additional paste is required to fill these voids. Well-shaped natural sands are ideal for workability of mixtures. Natural sand does not require more water to enhance the workability of the mixture so that amount of bleed water in the concrete will not be increased.

4.2 EXTRACTED SAND

In Bhanegaon open cast mine, while extracting coal they got a sand patch at a depth of 8m to 10m. After that from overburden, sand is extracted by using sand segregation plant this is called as the extracted sand.

V. EXPERIMENTAL PROGRAM:

Fine Aggregate in a concrete is structural filler, it is a granular material used to produce concrete and when the particles of the granular material are so fine and they pass through a 4.75mm sieve. In the project locally available natural sand and the extracted sand had been used for experimental purpose and physical properties of fine aggregate had been determined as per IS 383-1970[10].

Tests performed on natural sand and extracted sand:

1) Particle Size Distribution

2) Bulking Of Sand

3) Silt Content

4) Specific Gravity and water absorption of fine aggregate.

Table 1.Fineness Modulus of Natural Sand

Is sieve	Weight of fine aggregate (gm)	Percentage of weight retained (%)	Cumulative percentage of passing (%)	Percentage passed (100-cpr)	Remark
10 mm	0	0	0	100	100
4.75mm	5	0.5	0.5	99.5	90-100
2.36mm	16	1.6	2.1	97.9	75-100
1.18mm	103	10.3	12.4	87.6	55-90
600micron	399	39.9	52.3	47.7	35-54
300micron	393	39.3	91.6	8.4	8-30
150micron	80	8	99.6	0.4	0-10
75micron	2	0.2	99.8	0.2	-
Pan	2	0.2	100	0	-

Table 2.Fineness Modulus of Extracted Sand

Is sieve	Weight of fine aggregate (gm)	Percentage of weight retained (%)	Cumulative percentage of passing (%)	Percentage passed (100-cpr)	Remark
10 mm	0	0	0	100	100
4.75mm	40	4	4	96	90-100
2.36mm	40	4	8	92	75-100
1.18mm	170	17	25	75	55-100
600micron	280	28	53	47	35-54
300micron	410	41	94	6	08-30
150micron	50	5	99	1	0-10
75micron	0	0	0	0	-
Pan	0	0	0	0	-

Table 3.Bulking phenomena of given sample of natural sand

Sr. No	Water content (%)	Initial volume of sample (v1)	Final volume of sample (v2)	V2-v1	Bulking (%) = ((v2-v1)/v1)*100	Bulking factor = v2/v1
1	2	150	200	50	33.33	1.33
2	4	150	240	90	60	1.6
3	6	150	250	100	66.67	1.67
4	8	150	240	90	60	1.6
5	10	150	230	80	53.33	1.53
6	12	150	210	60	40	1.4

Table 4. Bulking Phenomena of Extracted Sand.

Sr. No	Water content (%)	Initial volume of sample (v1)	Final volume of sample (v2)	V3 =	Bulking (%)= (v3/v1)*100	Bulking factor = v2/v1
1	2	150	200	50	33.33	1.33
2	4	150	210	60	40	1.4
3	6	150	240	90	60	1.6
4	8	150	250	100	66.67	1.67
5	10	150	230	80	53.33	1.533
6	12	150	210	60	40	1.4

Fig.7Bulking of natural sand versus Extracted sand
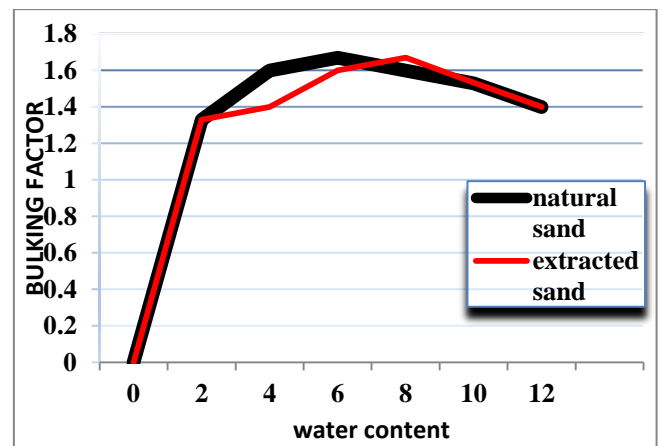
Table 5. Silt Content of Natural sand and extracted sand

Sr. no	Description	natural sand sample 1	natural sand sample 2	Extracted sand sample 1	extracted sand sample 2
1	Volume of sample	76	82	76	82

Sr					
	sand V2				
2	Volume of silt layer V1	3	3	2	2
3	Percentage of silt	3.95	3.6	2.63	2.4
	Average	3.77 %		2.515 %	

Table 6.Physical properties of natural sand & Extracted Sand from overburden

Sr no	Properties	Natural	Extracted	As per Indian standard code
1	Sieve analysis	zone 1	zone 2	Zone 1 to zone 4
2	Silt content	3.77%	2.52%	< 8%
3	specific gravity	2.63	2.59	2.5 to3.0
4	water absorption	0.8	1.41	0.3 to 2.5%
5	Bulk density	1500kg/m3	1603 kg/m3	1520 to1680

CAPACITY OF THE PLANT: 250 cum/DAY.

ANNUAL SAND RECOVERY		76250	cum	
DESCRIPTION	UNIT	AMOUNT	RS/cum	
CAPITAL EXPENDITURE				
COST OF PLANT	RS	15359376		
COST OF SEDIMENTATION POND	RS	2416707		
STOCKYARD PLAT FORM	RS	200000		
TOTAL		17976083		
COST ON CAPITAL				
PAYBACK PERIOD 5 YEAR)	MONTH	60		
CAPEX	RS	17976143	47.15	
OPERATIONAL EXPENDITURE				
COST OF MANPOWER	RS	2544798	33.37	
COST OF STORES/SPARES	RS	3071875	40.29	
COST OF POWER (170 KWH/HR)	RS	2990708	39.22	
REJECT HANDLING	RS	1026442	13.46	
COST OF ONE PAY LOADER	RS	2066680	27.10	
COST OF TRANSPORTATION OF OB FROM DUMP TO SAND PLANT	RS	4105769	53.85	
OPEX	RS	11700503.5	207.30	
	COST OF SAND/cum		254.45	

Fig.8. Approximate cost of Sand segregation at Bhanegaon open cast mines

VI. CONCLUSION

1) The results show that both natural and extracted sand comes under the zone II.

2) The silt content is in permissible limits, as the extracted sand contains less silt content as compared to the natural sand i.e .2.52%

3) Specific gravity of extracted sand is 2.59 which is within permissible limits and proves to be a good replacement of natural sand.

4) The bulk density and the water absorption is also in the permissible limits of properties of sand and hence can be concluded that the extracted sand from the overburden of open cast mines of Coal fields seems to be a sustainable substitute of natural sand.

5) The cost analysis of extraction at segregation plant goes to about 250/- per cumec which is much more less than the current rate of natural sand supplied for various construction activities. Thus making extracted sand most economical, sustainable substitute of natural sand.

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A Novel Strategy of Reusing Oil-Mill Soil to Obtain Fungal Lipolytic Enzymes: An Approach to Get Best from Waste

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Abstract— Present scenario demands a more sustainable, ecofriendly and economic measures globally to deal with the growing problems of environmental issues. The main goal of this work is to opt for such ideas and technologies which involve cleaner and greener procedures for utilizing waste materials for deriving value added products. The soil pertaining to the areas of oil mills contains densely population of various microbes', especially fungal origin. These microbes are rich in lipase content (due to oil source). Thus in this work, we isolated fungal colonies from this oil rich soil, cultured in laboratory, fermented them under various conditions to extract fungal enzyme i.e. lipase and then used it for further applications. Lipases are highly versatile and industrially important enzymes. Deriving the lipases from waste soil is the main attraction of this work and is a venture strategizing the "best from waste" approach.

Index Terms— Oil-Mill Soil, Fungal Lipolytic Enzymes, Best from Waste

I. INTRODUCTION

Since past few decades, there is a global drive to promote more selective and efficient green technology. Major advances in understanding of protein structure and function have better availability of biocatalytic applications. Scientific breakthrough in enzyme directed biocatalytic renovation has become an important tool for rational designing of sustainable ecofriendly industrial process progress [1]. Engineering of enzyme properties such as stability, activity, selectivity and substrate specificity tailor the rate of biocatalytic process. The use of hydrolases together with lipase offers a remarkable device for greatly selective biocatalysis.

Lipase enzymes are triacylglycerol acyl hydrolases (E.C.3.1.1.3) that catalyze the hydrolysis of glycerides and other fatty acid esters to glycerol and fatty acid under aqueous condition. In addition to it, lipases can catalyze a variety of diverse chemical reactions which include esterification, trans-esterification, acidolysis and aminolysis. Lipases of microbial origin, mainly bacterial and fungal, have already established their vast potential regarding their usage in numerous biotechnological applications (Fig. 1.2) [2]. Enantioselectivity, stability under extreme physiological and environmental conditions, broad substrate specificity and lack of requirement of cofactors are the basis of widespread industrial use of microbial lipases. Industrial demands for new source of microbial lipases have grown spectacularly for their catalytic versatility, high possible yields, ease of genetic manipulation, regular supply due to absence of seasonal fluctuations and rapid growth of microorganisms on inexpensive media [3]. Fungal lipases are preferable over bacterial lipases because of their easier extraction and purification processes. Lipase-producing fungi have been found in various habitats such as industrial wastes, vegetable oil processing factories, dairies, soil contaminated with oil, oilseeds, and decaying food [4], compost heaps, coal tips, and hot springs [5]. Lipolytic fungal species compete efficiently with other forms of life for survival by some important control mechanisms. These control mechanism modulating functions include substrate induction, feedback regulation, and nutritional regulation [6]. Lipid sources seem to be generally essential for obtaining a high lipase producing fungi. Use of agro- and food industrial waste products such as soil near the oil processing industry might be a rich source for production of lipase with industrial interest [7]. The global market demands for industrial lipases application scope for development of new industrial process including leather.

The establishment of oil mill industry depends on regional demand, use and economics. Mustard oil is utilized for oil production for human consumption and industrial application. Mustard oil has about 60% monounsaturated fatty acids (42% erucic acid and 12% oleic acid); it has about 21% polyunsaturated fats (6% the omega-3 alpha-linolenic acid and 15% the omega-6 linoleic acid), and it has about 12% saturated fats [8]. Small scale oil industries are important in the rural areas because they generate employment; reduce rural urban migration, and associated social problems. They are vital to reducing post-harvest food losses and increasing food availability. Food processing generates solid wastes. This waste contain huge quantity of oily sludge i.e. oil contaminated soil, bottom sludge, abandoned sludge pit, burial oil sludge. Sustainable management of this solid waste is crucial for the oil chain development mustard oil producing countries [9]. Indigenous microbial populations clean up biologically these organic components associated with the oily sludge by utilizing them as their nutritional requirements. A

significant growth of oil degrading microbe occurred in the oil contaminated environment due to significant bio-augmentation process. A great deal of scientific research has been carried out to explore the consequences of these biological cleaning machineries, including lipase.

1.1 LIPASES IN LEATHER INDUSTRY

Lipases have many applications and benefits in the pre tanning operations of leather processing. Lipases have the ability to bring about hydrolytic and synthetic reactions in both aqueous and non-aqueous media, hence have multifold applications in other post tanning operation as well. The most traditional application of lipases has been found in the degreasing operation [11] which might be extended to a variety of other operation such as fat liquoring. Conventional fat liquoring entails a series of drawbacks. Uneven diffusion of fat molecules inside the hide and skin is responsible for uneven dyeing and finishing, waxy patches which demerits the product quality. Thus one strategy to overcome this difficulty is by utilizing fungal lipase for hydrolysis of fat liquor.

II. OBJECTIVE

The objective of this study was to identify extracellular fungal lipase sources, which can be used as a basis for further basic and applied researches in leather processing. In addition, this work aimed to examine enzyme production by lipase producer isolates on various environmental conditions. The goals included the isolation of lipase producer and characterization of lipase catalyzed degradation of fat liquor.

For this purpose, the following specific objectives have been formulated:

- Isolation of fungal colonies from leather samples

- Screening of extracellular lipase producing fungi using tributyrin contained agar plates.

- Investigation of lipase production of selected strains under various culture conditions.

- Characterization of the hydrolytic activity of the crude enzyme on fat liquor

- Enzyme activity optimization

- Specific growth rate calculation of all the three isolates under various parameters of optimization

III. MATERIALS AND METHODS

3.1. MATERIALS

3.1.1. Media

3.1.1.1. Composition of potato dextrose agar (PDA) medium

PDA medium was used for storage of fungal cultures or fresh seeding for preparation of liquid cultures. Composition of potato dextrose agar (PDA) medium is tabulated in table 3.1. The potatoes (200 g) were first washed and cut into small pieces, then boiled in 1000 ml distilled water for 1 hour and filtered to get the potato infusion (table 3.1.). Potato dextrose broth was prepared without the addition of agar keeping all other compositions same.

3.1.1.2. Composition of tributyrin agar (TBA) medium

TBA medium was used for selective isolation of lipophilic fungi. Tributyrin was replaced by mustard oil in general composition of TBA medium whereas Tributyrin broth was prepared without the addition of agar. All other compositions were same.

3.1.2. Other chemicals

Lactophenol cotton blue was used for fungal staining. Tween 80, CaCl2, KH_2PO_4, K_2HPO_4, HCl, NaOH, Ninhydrin, BSA were also required.

3.2. COLLECTION OF SOIL SAMPLE

For the present study samples were collected from soil and oil contaminated soil from Diamond Harbour, District-South 24 PGS, West Bengal, India. The soil samples were taken in appropriately labeled pre-sterilized plastics with the help of sterile spatula from the depth of 0.5 to 1.0 cm surface and sub surface.

3.3. ISOLATION AND SCREENING OF LIPASE PRODUCING FUNGAL STRAINS

3.3.1. Screening of isolates

1 g of soil sample were dissolved in 100 ml of sterile PDB in a 250 ml of conical flask and agitated in an orbital shaker at 120 rpm for 30 minutes at 37°C. PDB acts as selective media for fungi. The sample (aqueous slurry) was serially diluted up to 10-15 dilution using sterile distilled water. 0.1 ml of each dilution was spread on PDA plates by spread plate technique to obtain isolated colonies after 72 h at 37°C of incubation. After the incubation, sixteen colonies with distinct morphology were easily isolated as they formed well dispersed surface colonies, particularly at higher dilutions. The pure cultures of the isolated strains were preserved in PDA medium under refrigerated conditions (4°C) and coded as C1 to C16.

3.3.2. Screening of isolates for lipase activity

Pure isolate of C1-C16 were further inoculated in 100 ml of TBB separately and were kept in shaker for 6 h at 37˚C. 100μl of pure cultures of the sixteen isolated strains were spread uniformly on TBA medium (Table 2.2) individually using inoculating bar .These were incubated at 37˚C and checked at different time interval between 24-72 h for zone formation around the colonies. Out of sixteen isolates three accessions viz. C1, C2 and C3 colonies were found prominent with regard to lipolytic activity. Pure fungal isolates were screened for lipase production by fungal colonies C1 of 10 -15 and C2 and C3 of 10-12 dilution were streaked on Tributyrin agar plate and incubated at 37° C for 48 hours. The pure cultures of the isolated strains

were preserved in PDA medium under refrigerated conditions (4°C).

3.4. MEASUREMENT OF GROWTH CURVE

The growth pattern of three isolates were characterised in liquid media. 150 µl of PDB and TBB were inoculated with 25µl PDB seed culture. The microorganisms were then placed in an incubated orbital shaker (MODEL ZHWY-100B) at the speed of 120 rpm and temperature of 37°C. Growth of the cells was monitored by checking its optical density at 600 nm at an interval of every 10mins with UV-visible spectrophotometer (Model HOLMARC SPECTRA HO-SP-1911). Each of them is analyzed in triplicate. The values recorded were then used to prepare growth curves for each of the microorganisms.

3.4.1. Optimization of media parameters for profound enzyme activity

Fungal growth and lipase enzyme accumulation were studied in the present investigation in flask batch cultures under different growth conditions. These conditions include incubation time, incubation temperature, pH, different carbon and lipid sources, and surfactant. The aim of these experiments is the optimization of lipase enzyme production by the strain under investigation. Lipase production is influenced by these physiologically important growth parameters i.e. temperature, pH, lipid, carbon source, presence of surfactants and time [12]. Each experiment was repeated three times. 25 µL of mother culture were added into the 200 ml tributyrin broth from 1 to 3 hours at 20, 37, and 45°C. The lipase production was then evaluated over a wide range of pH 4, pH 7 and pH 10. Further the changes of lipase production in response to the following carbon source (1% w/v) were evaluated: glucose, sucrose and starch, mustard oil, castor oil, sunflower oil and anionic detergent.

3.4.1.1. Influence of specific media

The growth pattern of three isolates was characterised in PDB and TBB media. Tributyrin was replaced by mustard oil because it is easily available and its hydrolysis can be followed by measuring the increase in biomass.

3.4.1.2. Effect of temperature on fungal growth

Temperature is one of the most important parameters regulating the activity of microorganisms in natural environments. Generally, there is an optimal temperature for the enzymatic activity produced by different microorganisms which is responsible for the biosynthesis or degradation of compounds. This optimal temperature may be similar or different from the optimal temperature of the microbial growth. Colony C1, C2 and C3 were cultured at temperature ranging from 20, 37 and 45°C to select the optimum temperature for maximum enzyme production by keeping the remaining parameters constant. To determine the effect of incubation temperature on mycelia growth which in turn influences enzyme production, Colony C1, C2 and C3 were cultured at under various temperatures

ranging from 20, 37 and 45°C to select the optimum temperature for maximum enzyme production by keeping the remaining parameters constant at 120 rpm.

3.4.1.3. Effect of pH on fungal growth

Hydrogen ion concentration (pH) of the medium is considered one of the most important factors. It has a great influence on the growth of microorganisms as well as their physiological activity. The effect of initial culture pH on biomass yield was studied at different pH values in order to reach the maximum lipase enzyme. The present experiment aimed to investigate the influence of pH on lipase enzyme production by fungal isolates. Colony C1, C2 and C3 were cultured at varying pH from pH 4, pH 7 and pH 10 to select the optimum pH for maximum enzyme production by keeping the remaining parameters constant.

3.4.1.4. Effect of carbon source as lipase inducers

To investigate the effect of carbon sources on biomass yields by the local isolate of C1, C2 and C3, the fungi were cultured in tributyrin broth supplemented with different carbon source (1% w/v) like glucose, sucrose and starch at 30°C under shaking (120 rpm). Carbon source influences the biomass yield which in turn affects enzyme production. Remaining physiological parameters and media composition were unaltered.

3.4.1.5. Effect of substrate on biomass yield

Substrate specificity affects the mycelial growth and enzyme production. To evaluate the effect of various substrates on lipase activity, 1% mustard oil, sunflower oil and castor oil was added to the culture media, separately. Remaining culture conditions were maintained constant.

3.4.1.6. Effect of Tween 80 on biomass yield

The effect of the addition of surfactant on mycelial growth was evaluated by the addition of surfactant to the production medium. Colony C1, C2 and C3 were cultured in presence and absence of Tween 80 to select the optimum culture media for maximum enzyme production by keeping the remaining parameters constant.

3.5. EXTRACELLULAR LIPASE ASSAY (QUANTITATIVE TITRIMETRIC METHOD)

The culture media of the flasks will centrifuged at the speed of 15000 rpm for 30 minutes and supernatant will be assayed for extracellular lipase activity. Lipase activity was determined titrimetrically on the basis of mustard oil hydrolysis by the following method [13].

1ml of cultured supernatant was added to assay substrate containing 10 ml of 10% (v/v) mustard oil in 10% (v/v) Tween 80, 2.0 ml of 0.6% $CaCl_2$ solution and 5 ml of phosphate buffer (pH 7). The enzyme substrate mixture was incubated on rotary shaker with 150 rpm at 30°C for one hour 20 ml of alcohol: acetone mixture. Liberated fatty acid was titrated with 0.1 N NaOH using 2-3 drops of phenolphthalein as an indicator. The end point will be light pink in color.

Lipolytic Activity of crude extract of C1, C2 and C3 for fat liquor was estimated by titrating the assay mixture containing fat liquor in lieu of mustard oil.

IV. RESULT AND DISCUSSION

The only organisms isolated were fungi as bacteria did not grow on the isolation medium. This may be due to differential growth conditions, especially composition. Due to the oil rich environments of the substrates, special attention was given to screening of lipolytic enzymes. The enzyme activity was associated with growth of the cell and favorable environmental conditions.

4.1. MEASUREMENT OF GROWTH CURVE

The recorded optical density with an interval of 10 min is representative of increased cell biomass with different time interval. Graphs were plotted with time versus optical density. Growth and multiplication of microorganisms on any substrates is often considered as the first step toward its bioconversion. Activity of lipase is directed by the biomass yield. This biomass yield is controlled by a variety of factors such as type of substrate, pH, temperature, and position of esters fatty acids, stereo specificity and a combination of all. These include factors that alter the binding of the enzyme to the substrate, the molecular properties of the enzyme, and structure of the substrate [16]. Therefore, in the work reported here, it was vital to institute an experimental design to test the effects of all the factors on the growth pattern of sample could be distinguished based on OD changes. The first phase was lag phase where no change in OD was observed. Rapid increase in OD indicates log phase. The next phase was the stationary phase, where there was no changes in OD. Last phase was death phase where negative slopes of the growth curve were observed.

4.1.1. Optimization of culture condition

4.1.1.1. Influence of specific media

Nutrient medium is a major factor that influences on fungal growth. All the media supported the growth of filamentous fungi to various degrees. An optimal nutrient medium should provide adequate growth and best possible growth, allowing molds to grow without restrictions. The growth of filamentous fungi is characterized by smoother curve and long transition periods although it is dependant of medium and species. The stages of fungal growth differ depending on the growth of microbes in the different media. Prolonged log phase is observed in case of colonies growing in TBB media as compared to PDB media. This could be due to the fact that the media nutrients are depleted more readily in PDB, so the isolates tend to enter in the death phase sooner. Tributyrin agar is a differential medium for lipophilic fungal growth. Lipases are inducible enzymes due to the fact that they are specifically expressed due to hydrolysis of acyl glycerol, oils and greases in TBB.

4.1.1.2. Optimization of culture condition for temperature

A detailed characterization of temperature-dependent growth of three isolates demonstrates inter-isolate variation in growth performance . It demonstrates that environmental conditions, specifically temperature, exert a strong influence on growth performance of three fungal isolates. C1, C2 and C3 were cultured at temperatures 20, 37 and 45°C to optimize maximum growth for maximum enzyme production. Differences in estimated growth curves among isolates were observed. It was observed that at 37 and 45°C, C3 showed maximum growth rate. But at 20°C, C1 showed growth rate to be maximum.C2 exhibited average growth rates under all the three temperature conditions. It could be inferred, for C3 and C2, enzyme was not properly activated at 20°C and so the growth rate was not so pronounced. Favorable temperature for enzymatic activity was at 37 and 45°C (most favorable being 45). Unlike that, in C1, at 20°C lipolytic activity was maximum and beyond that temperature, the enzymatic activity gets degraded and denatured.

4.1.1.3. Optimization of culture condition for pH

pH is one of the most important factors affecting the fungal growth and development and their relationships have been investigated. At acidic pH C2 showed maximum growth whereas for C1 it was neutral and for C3, it was basic pH. (Fig.12).

4.1.1.4. Optimization of culture condition for carbon source

Generally, microorganisms provide high yields of biomass when the medium is provided with carbon source. The expression of lipase activity can be significantly influenced by carbon source, since lipases are inducible enzymes [17]. However, lipase production is frequently limited due to a negative effect exerted by the carbon source. This regulatory mechanism, termed carbon catabolite regulation (CCR), is widely distributed among microbial systems and functions primarily to assure an organized and sequential utilization of carbon sources, when more than one is present in the environment [13]. Under this condition, the cell catabolizes the best carbon source which most rapidly supplies carbon and energy for growth present in the medium. Simultaneously, the synthesis of lipase utilizing other substrates is repressed until the primary substrate is exhausted. Fig. 8 shows variation in growth profile of three fungal isolates using different carbon source. Maximum biomass yield for colony C1 resulted in starch containing media whereas for colony C2, sucrose containing media was optimum for its maximum growth. On the other hand, C3 utilises glucose as the carbon source in media for its maximum growth .

4.1.1.5. Optimization of culture condition for inducer

The compound, the inducer (oil), is one of the major factors for biomass yields. It is able to "turn on" production in cells in such a way that the enzymes are produced only when

needed. It has shown that presence of lipid (especially natural oils) stimulate lipase production [19]. Colony C1, C2 and C3 showed maximum growth when the medium was supplemented with castor oil than mustard and sunflower oil (Fig.10). Among the different lipid source used, castor oil was found to be the most suitable source for growth of colony C1, C2 and C3.Higher growth of fungus indicates increase in degradation of oil. The increase in rates of fungal growth in the media containing castor oil might be due to the fact that fungi can utilize this oil as their substrate for their survival and growth using extra cellular enzymes.

4.1.1.6. Optimization of culture condition for surfactant

Tweens are nonionic surfactant which is widely employed as dispersing agent in the preparation of conidial suspensions of hydrophobic fungi. Emulsification leads to higher enzymatic activities in both cultures, though there are variations in enzyme levels depending on the presence or absence of Tween 80 and of different oils in growth media [20]. It has been the most widely used substrates for the detection of lipase/esterase producing microorganisms in agar media. Screening using Tween agar plates shows precipitation around the lipase/esterase producing micro-organisms. The method is based on the precipitation as the calcium salt of the fatty acids released by hydrolysis of Tweens [21].Maximum fungal growth of colony C1, C2 and C3 was observed with Tween 80 containing media than the media without surfactant. Tween 80 is mostly hydrolyzed by the lipase as it contains esters of oleic acid [22,23]. Prolonged log phase of fungal growth in presence of Tween 80 indicates rapid utilization of nutrients in presence of surfactant as there is rapid hydrolysis of oil in presence of Tween 80. In absence of Tween 80, hydrolysis and utilization of mustard oil by fungi occurs at a slower rate. This indicates that Tween 80 enhances the growth by acting as a lipase inducer.

4.1.1.7. Optimization of culture condition for nitrogen source

As nitrogen sources, yeast extract, beef extract and meat extract were used and varied to find out the optimum source of nitrogen for all the three isolates. It was observed that for meat extract when used, maximum growth rate was observed compared to other two sources.C2 showed highest growth rate meat extract, little lesser in beef and lowest in yeast extract. In Beef and yeast extracts, C2 and C3 showed maximum growth respectively. C1 showed moderate growth in all the three sources. As per calculation and graph, growth rate was most prominent in case of meat extract as exhibited by C2, so it can be concluded that optimum source of nitrogen for fungal growth is meat extract.

Lipases are used to assist in the reduction of size of fat molecules in order to provide the uniform distribution of fat molecules for enhanced levelness in finishing of leather processing. Most commercial applications do not require homogeneous lipase preparations; a certain degree of purity, however, enables efficient and successful usage. Lipase mediated hydrolysis indicates the method of hydrolysis of fat in the fat liquoring process. Lipases are used to assist in the reduction of size of fat molecules in order to provide the uniform distribution of fat molecules for enhanced level of finished leather.

Enzyme activity optimization

It was done by changing the physical parameters i.e. pH and temperature, of the fat liquor and then titrating it against 0.1N NaOH with the crude extract of lipase, at a regular interval of 30 minutes. We witnessed that with increase in time, activity of enzyme reduced. The reason could possibly be that an enzyme faces degradation in its activity with the increase in time, temperature, pH etc (table 5).

V. CONCLUSION

In present investigation, an effort has been made to study the lipase activity of three test fungi and their application in fat liquoring during leather processing. These observations provided interesting perspectives, demonstrating that fungi isolated from oil-rich environments represent a source of several enzymes potentially exploitable for biotechnological purposes. The use of fungal lipases for catalyzing esterification reaction became considerable interest because lipase mediated hydrolysis is an energy saving process. The great advantages of fungal lipases are that they are easily amenable to extraction due to their extracellular nature, which will significantly reduce the cost. Microbial lipases have gained special industrial attention due to their ability to remain active under extremes of temperature, pH and organic solvents, and chemo-, regio and enantioselectivity [24]. Lipase is frequently used to catalyze the hydrolysis of wide non-natural substrates in order to obtain enantio- and region selective substrates. Among those enzymes, lipase is predominantly used in several applications. These fat-splitting enzymes are attractive because of their wide industrial applications. The reasons for the enormous biotechnological potential of microbial lipases are: their stability in organic solvents, they do not require cofactors, possess broad substrate specificity and exhibit a high enantio-selectivity. The use of fungal lipase in leather industry is becoming increasingly important. Lipases have found application in the soaking, dehairing, bating, and degreasing operation in leather making. The great advantage of fungal lipases is that they are easily amenable to extraction due to their extracellular nature, which will significantly reduce the cost and makes these lipases more attractive than those bacteria. The major factor for the expression of lipase activity has always been carbon, since lipases are inducible enzymes and are thus generally produced in the presence of a lipid source such as oil or any other inducer, such as triacylglycerols, fatty acids, hydrolysable esters, Tweens, bile salts and glycerol. However, their production is significantly influenced by other carbon sources [25]. . In nature, microorganisms can adapt to a changing ecological situation within a certain

limits. In nature, microorganisms can adapt to a changing ecological situation within a certain limits. Experimental results suggest that various media compositions influenced fungal growth as well as lipase activity of isolated strains C1, C2 and C3.Optimization of growth parameters viz. temperature, pH, carbon source, nitrogen source, substrate and surfactant had significant effects on lipase activity. After optimization under various parameters, maximum growth rate was observed in each of the colonies respectively and the specific growth rate was deduced for each of them as enlisted in table 6 .The specific growth rate was calculated by fitting the graphs in Boltzmann's equation (curves being sigmoidal in nature) and the μ value was deduced from the value of slope.

Within a piece of particular hide or skin, the density of the fiber structure of hides and skins is non-uniform in different areas (e.g. butt, shoulder, belly, neck and flanks). In general, inherent fiber structure in the neck portion is compact and tight in nature. On contrary, the fibre density in the belly portion is low and hence belly portion is less organized, loose and less compact. Moreover, fiber structure at the flesh side is less dense and hence more open. On contrary, denser fiber structure with lesser void spaces is the basic characteristics of the grain side. Indeed, open fiber structure at the flesh side allows easier movement and penetration of degraded small fat molecules through flesh side. This penetration of fat molecules should be easier through the belly portion whereas fat molecules penetration would be little difficult in the neck region. However degraded fat small molecules can penetrate more easily than larger fat molecules so application of lipase enzyme should be required for uniform distribution of fat molecules in leather matrix.

5.1. FUTURE SCOPE

The tremendous potential of lipases in various industries including leather has stimulated interest in isolation of new lipases from novel sources. It shows the need to develop novel cost-effective technologies for increased production, scaling up and purification of this versatile enzyme. The process of fat splitting, along with interesterification, is an essential tool in the manufacture of new tailor made fats and oils. This makes lipases to be biocatalysts of choice for the present and future in leather. However, lipase-catalyzed hydrolysis also entails a series of hurdles in industrial applications including poor reaction efficiency, longer reaction times, higher catalyst concentrations and high price. One possible strategy to overcome these difficulties is the purification and immobilization of lipases on a carrier, so that the enzymes can be removed from the reaction mixture and can theoretically be reused for subsequent processing. Strong efforts might be attempted on the engineering of enzymes with specific properties or better performance for industrial applications.

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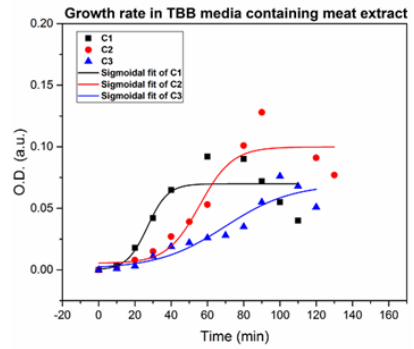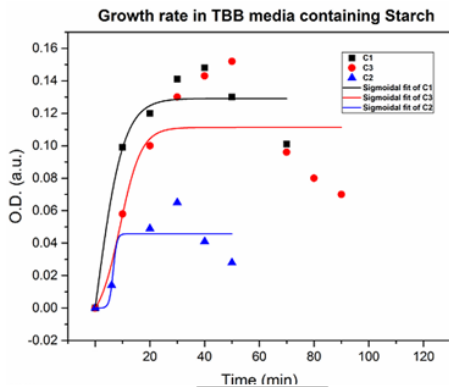
Fig. 1.

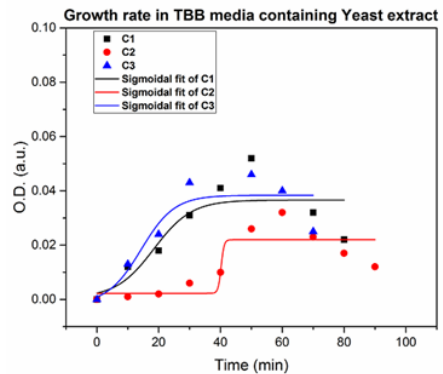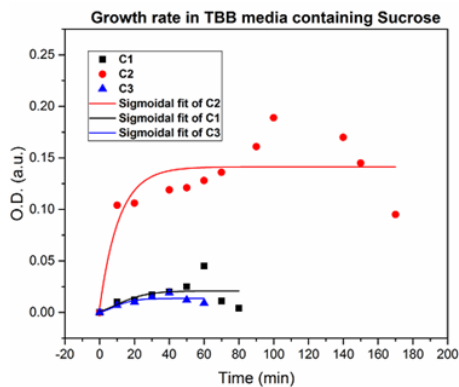**Fig. 2. (a)**

Fig. 2. (b)

Fig. 3 (a)

Fig. 4. (b)

Fig. 3(b)

Fig. 4(c)

Fig. 3(c)

Fig. 5(a)

Fig. 4(a)

Fig.5 (b)

Fig. 5.(c)

Fig. 6.(a)

Fig.6.(b)

Fig. 6.(c)

LIST OF TABLES

Table 1. Potato Dextrose Agar (1000 ml)

Potato infusion	4 g
Agar	20 g
Dextrose	15 g
pH	3.5
Temperature	37°C

Table 2. Tributyrin agar (TBA) medium (1000 ml)

Glucose	20 g
Yeast extract	4 g
Ammonium Nitrate	12 g
KH_2PO_4	40 g
K_2HPO_4	2 g
Mustard oil	2 g
Agar	40 ml
pH	8
Temperature	37°C

Detection and Prevention of Diabetes Miletus (Type-I & Type-II) using Data Mining and Warehousing Techniques in Andaman & Nicobar Islands

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Abstract— One of the most significant health issue faced by all the human being these days is diabetes. Diabetes is one of the leading causes of mortality and morbidity worldwide. The common sites of Diabetes have varied distribution in different geographical locations. The present study is conducted to detect and prevent Diabetes of two major types i.e., Type – I and Type - II using data mining and warehousing techniques in Andaman and Nicobar Islands.
The study uses data mining techniques such as classification, clustering and prediction to identify potential diabetes patients. For that a multidimensional architectural diabetes data warehouse will be built specifically to store and process diabetes-related database which include patient's general and medical records and also a data mining model is proposed to be build and will be implemented within the diabetes data warehouse which can predict a person's predisposition towards diabetes and generate the risk level for a particular type of diabetes and the exact method of clinical diagnosis.
The k-means clustering algorithm is used for partitioning the data into diabetes and non-diabetes clusters, where the initial cluster center is represented by the mean value of the weightage of significant patterns.

Index Terms— Andaman & Nicobar Islands, Diabetic patients, Data Mining and Warehousing Techniques, Multidimensional Star Schema, k- means Algorithm, OLAP Operations, Types of Diabetes- Type-I & Type-II, WAM

I. INTRODUCTION

According to the World Health Organization (WHO), India had 69.2 million people living with diabetes in 2015. Nearly 98 million people in India may have type 2 diabetes by 2030, according to a study published in the 'Lancet Diabetes & Endocrinology' journal, found that the amount of insulin needed to effectively treat type 2 diabetes will rise by more than 20% worldwide over the next 12 years.

"The number of adults with Type-II diabetes is expected to rise over the next 12 years due to aging, urbanization, and associated changes in diet and physical activity," said Sanjay Basu from Stanford University, who led the research.

As an alternative to the tedious physical storage of resources it is important to develop a data warehouse specific to diabetes disease and a data mining model to predict diabetes earlier. If a machine learning technique is developed to store a person's medical and general record and predict his predisposition towards diabetes, its type and exact diagnostic method, physicians can directly start treatment immediately without wasting the precious time in different methods of diagnosis. There have been multiple data mining techniques in health care and allied industries and specifically with respect to type-I & type-II of diabetes.

The present study is carried out for 1000 diabetic patients of Andaman & Nicobar Islands in which the data will be collected from Andaman Nicobar Islands Institute of Medical Science (ANIIMS), Port Blair, the only government tertiary care hospital in Andaman and Nicobar Islands.

All the patients diagnosed or suspected with diabetes, registered in G.B. Pant Hospital. This research focuses on the building of multidimensional diabetes data warehouse and development of data mining model for the early detection of two major types of diabetes namely, Type I and Type II, hence prevention is also possible.

II. AIMS AND OBJECTIVES OF THE RESEARCH

The aim of the study is to develop a multidimensional architectural diabetes data warehouse built specifically to store and process diabetes-related database which include patient's general and medical records.

The diabetes data warehouse is proposed to be built on OLTP and OLAP technologies simultaneously, thereby retrieving necessary information using query engines. A data mining model is also proposed to be built and will be implemented within the diabetes data warehouse which can predict a person's predisposition towards diabetes and

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generate the risk level for a particular type of diabetes and the exact method of clinical diagnosis.

## III. REVIEW OF RELATED LITERATURE

From the literature review it is learned that use of evolving IT systems in medical sciences to eradicate, diagnose, prevent diseases like diabetes and ameliorate the standard of living of patients with such life-threatening diseases has garnered the attention of IT researchers worldwide. Review of the literature on diabetes related databases helped to realize the fact that suitable data warehouse architecture should be implemented for the efficient functioning of the objective data analysis.

Review of the literature on diabetes related databases helped to realize the fact that suitable data warehouse architecture should be implemented for the efficient functioning of the objective data analysis.

IV. METHODOLOGY OF RESEARCH

Data warehousing is a collection of decision support technologies, aimed at enabling the knowledge worker (executive, manager, and analyst) to make better and faster decisions. A data warehouse (or scale data mart) is a specially prepared repository of data will be designed to support decision making.

Fig 1: DIABETES Data Warehousing Architecture using ECTL, OLTP, and OLAP Servers
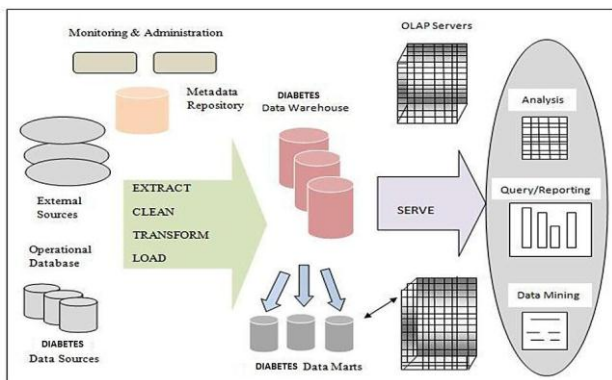

The data required for the research will be collected from Andaman Nicobar Islands Institute of Medical Science (ANIIMS), Port Blair, Andaman & Nicobar Islands. The study uses data mining techniques such as classification, clustering and prediction to identify potential diabetes patients. A multidimensional data warehouse specific to diabetes disease will be built and implemented and further it is to be used for a data mining work to detect a person's predisposition towards diabetes. Finally, a detection and prevention system will be developed to analyze the risk levels which help in prognosis.

The data will be comes from operational systems and external sources. To create the data warehouse, diabetes data will be extracted from source systems like questionnaire, diabetes institute database, etc. which will be cleaned (e.g., to detect and correct errors), transformed (e.g., put into subject groups or summarized), and loaded into a data store (i.e., placed into a data warehouse).

Fig2 Diabetes Data Warehouse Architecture
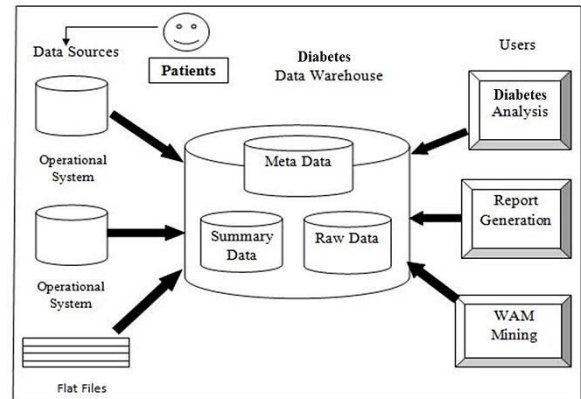
A. Multidimensional Star Schema

The basic building block going to be used in dimensional modeling is the star schema. A star schema will consists of one large central table called the fact table, and a number of smaller tables called dimension tables. The fact table forms the "center" of the star, while the dimension tables form the "points" of the star. A star schema may have any number of dimensions. The fact table will contain measurements (e.g. Patient History, Risk Factor, Diabetes, Symptoms, Treatment, and Diagnosis) which may be aggregated in various ways.

The dimension table will provide the basis for aggregating the measurements in the fact table.

The fact table will be linked to all the dimension tables by one-to-many relationships

The primary key of the fact table is the concatenation of the primary keys of all the dimension tables.

The advantage of using star schemas to represent data is that it reduces the number of tables in the database, the number of relationships between them and therefore the number of joins required in user queries.

Fig 3: Star Schema representing Diabetes Data Warehouse
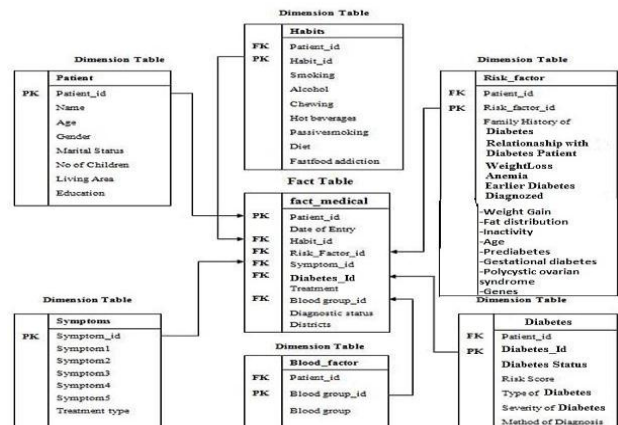
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B. OLAP Operations of Medical Diabetes Data Warehouse

OLAP is performed on diabetes data warehouse or diabetes disease data marts. The primary goal of OLAP is to support ad hoc query needed to support decision support system. The multidimensional view of diabetes data is fundamental to OLAP function. OLAP is a practical view, not a data structure or schema. The complex nature of OLAP process requires a multidimensional review of the diabetes data. OLAP Operations in Multidimensional Diabetes Data Warehouse (MDDW),

1. Roll-Up
2. Drill Down
3. Slice and Dice
4. Pivot

Roll Up (Drill-Up)

- It is performed by climbing up hierarchy of a dimension or by dimension reduction (reduces the cube by one or more dimensions).

- The roll up operation is based on location (roll up on location) and is equivalent to grouping the data by districts.

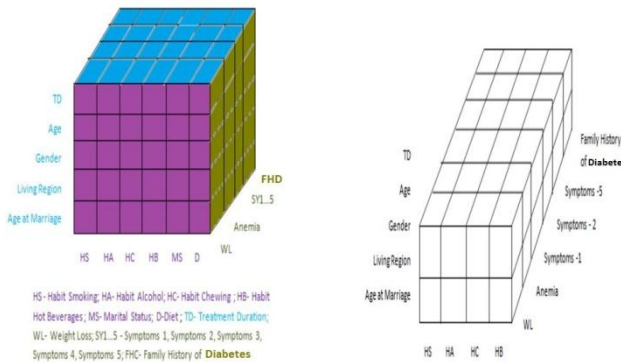- Roll-up operations do not remove any events but change the level of granularity of a particular dimension.

HS - Habit Smoking; HA- Habit Alcohol; HC- Habit Chewing ; HB- Habit Hot Beverages; MS- Marital Status; D-Diet ; TD- Treatment Duration; WL- Weight Loss; SY1...5 - Symptoms 1, Symptoms 2, Symptoms 3, Symptoms 4, Symptoms 5; FHC- Family History of **Diabetes**

Fig4(a): Original view of Diabetes Data Warehouse   Fig4(b): Roll-Up View

Drill down (Roll Down)

- It is the reverse of roll-up.

- Navigates from less detailed data to more detailed data by -

- Stepping down a concept hierarchy for a dimension to Introducing additional dimensions

- Drill down operations does not remove any events but change the level of granularity of a particular dimension.
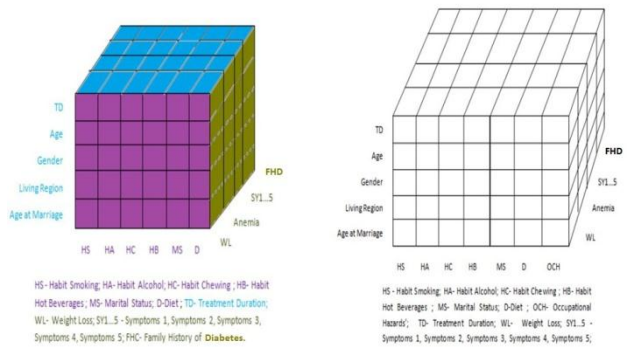

HS - Habit Smoking; HA- Habit Alcohol; HC- Habit Chewing ; HB- Habit Hot Beverages ; MS- Marital Status; D-Diet ; OCH- Occupational Hazards', TD- Treatment Duration; WL- Weight Loss; SY1...5 - Symptoms 1, Symptoms 2, Symptoms 3, Symptoms 4, Symptoms 5;

Fig5(a): Original view   Fig5 (b): Drill-Down View of Diabetes Data Warehouse

Slice and Dice

- The slice operation performs a selection on one dimension of the given cube, resulting in a sub-cube.

- The slice operation produces a sliced OLAP cube by allowing the analyst to pick specific value for one of the dimensions.
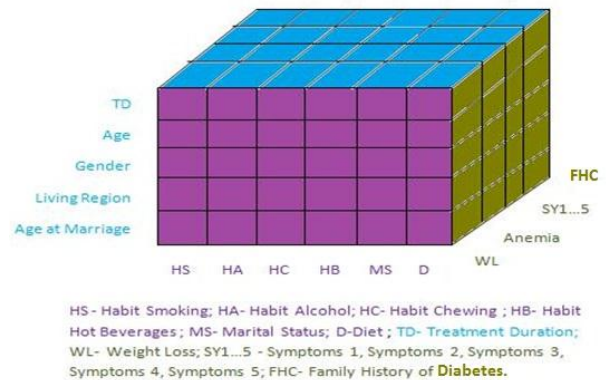

HS - Habit Smoking; HA- Habit Alcohol; HC- Habit Chewing ; HB- Habit Hot Beverages ; MS- Marital Status; D-Diet ; TD- Treatment Duration; WL- Weight Loss; SY1...5 - Symptoms 1, Symptoms 2, Symptoms 3, Symptoms 4, Symptoms 5; FHC- Family History of **Diabetes.**

Fig 6(a): Original view of Diabetes Data Warehouse
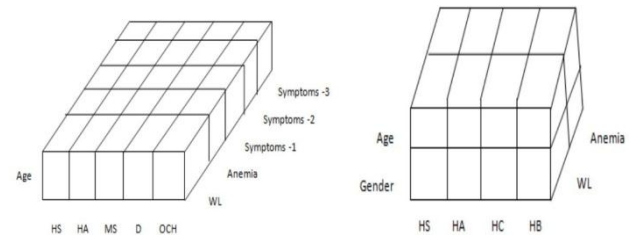

Fig: 6(b) Slice View   Fig 6(c): Dice View

Pivot

Visualization operation that rotates the data axes in view in order to provide an alternative presentation of the data. It removes a measure.

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HS- Habit Smoking; HA- Habit Alcohol; HC- Habit Chewing ; HB- Habit Hot Beverages ; MS- Marital Status; D-Diet ; TD- Treatment Duration; WL- Weight Loss; SY1...5 - Symptoms 1, Symptoms 2, Symptoms 3, Symptoms 4, Symptoms 5; FHC- Family History of Diabetes.

Fig: 7(a) Original view of Diabetes Data Warehouse
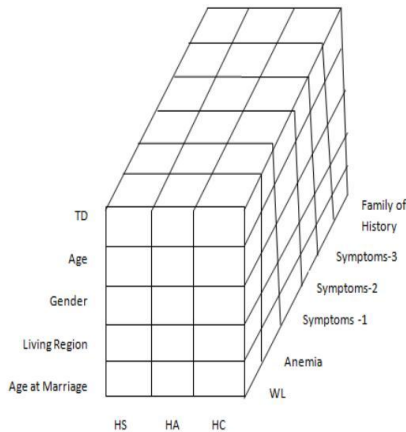
Fig: 7(b) Pivot view

Table 1: Site wise distribution of Diabetes

S. No.	Type of Diabetes	Male	Female	Total
1.	Type - I	250	250	500
2.	Type - II	250	250	500

Table 2 Correlation of Age and Sex of Diabetes patient

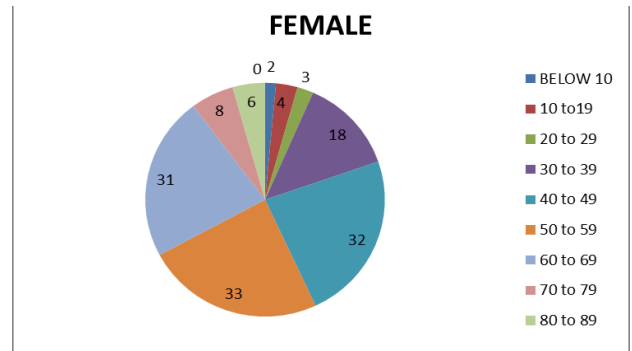| Age Group	Male	Female	Total
<10	500	500	1000
10-19			
20-29			
30-39			
40-49			
50-59			
60-69			
70-79			
80-89			
>90			

Data Cube dimension of 'Male' Factor of Diabetes data

Eg:-
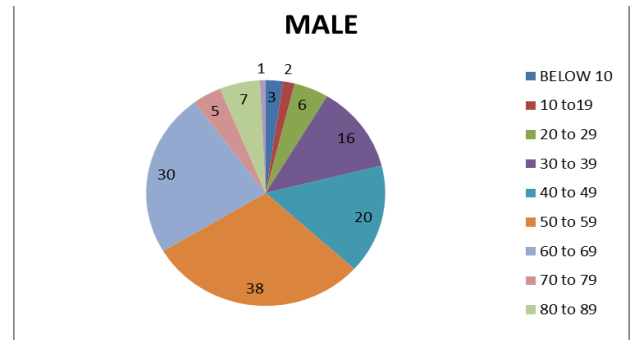
Data Cube dimension of 'female' factor of Diabetes data

Eg:-

Correlation of Age and Sex of Diabetic patients

Through this study we can easily correlate the various age groups of diabetic patients with respect to their sex.
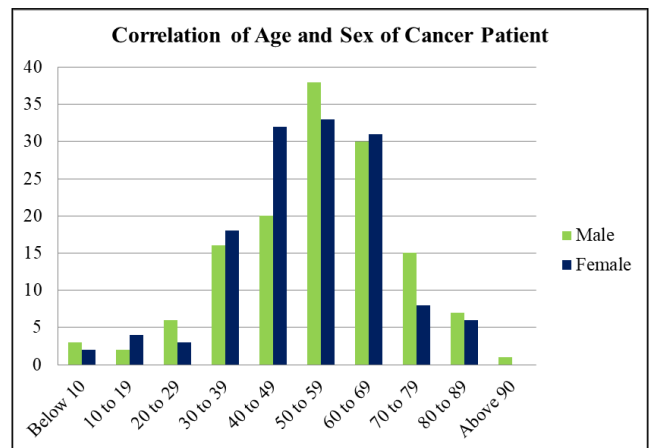
Eg:-

**Table 3: District-wise data of Diabetes Patients**

District	Male	Female	Total
North and Middle Andaman District	167	167	334
South Andaman District	167	167	334
Nicobar District	166	166	332

3ʳᵈ International conference on Latest Trends in Engineering and Management (ICLTEM)

Detection and Prevention of Diabetes Miletus (Type-I & Type-II) using Data Mining and Warehousing Techniques in Andaman & Nicobar Islands
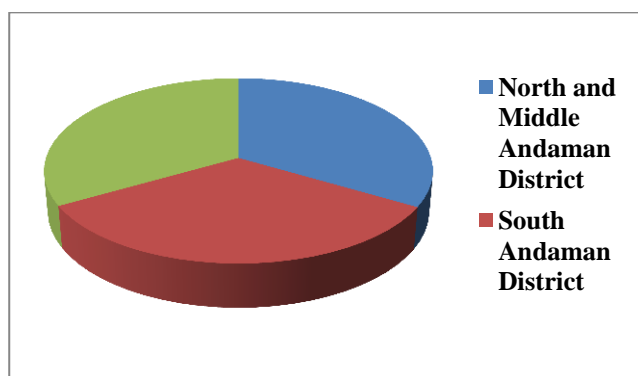
District - Wise Diabetic Patients distribution– Male
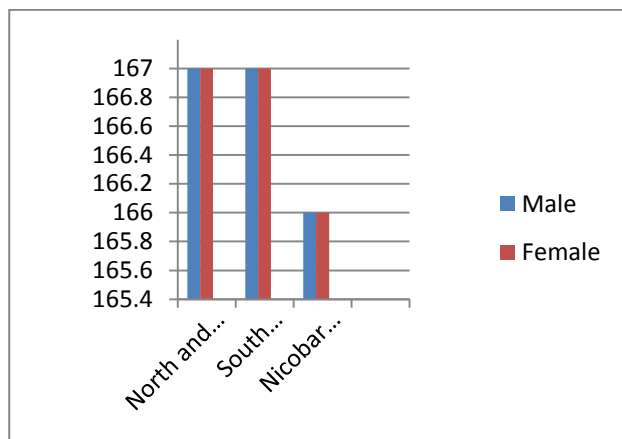
Eg:-
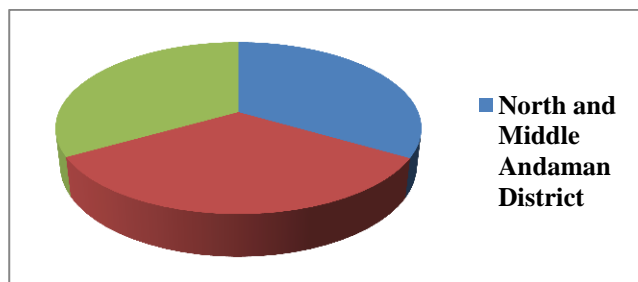
District - Wise Diabetic Patients distribution - Female

Eg:-

District – Wise Patients distribution –Male Vs Female

Eg:-

Like correlation between age and sex of diabetic patients, we can easily segregate the patients according to three major districts namely North and Middle Andaman District, South Andaman District and Nicobar District.

V. DEVELOPING A DATA MINING MODEL TO DIAGNOSE DIABETES DISEASE

The disease diagnosis is a major process to treat the patients who are affected by diabetes disease. The diagnosis process is more difficult comparatively known about the diabetes disease detection. Developing a proposed data mining model is useful to diagnose the diabetes disease once the diabetes detection is accomplished.

In the present study, a proposed data mining model will use two different techniques which perform consecutively. The techniques are classification and clustering method of conceptual modeling. So that the diabetes data would be converted into a knowledge base which is called as training data.

k-means Clustering for Classified Significant Pattern

The instances will be clustered into a number of classes where each class is identified by a unique feature based on the significant patterns mined by the decision tree algorithm.

The aim of clustering is that the data object is assigned to unknown classes that has a unique feature and hence maximize the intra-class similarity and minimize the interclass similarity. The weightage scores of the significant patterns mined will be fed into k-means clustering algorithm to cluster and divide it into diabetes and non - diabetes groups. The diabetes group is further subdivided into two groups with each cluster representing a type of diabetes.

The data in the cluster is again fed into *k-means* clustering algorithm to further subdivide it. The resulting two clusters are separated based on particular symptoms associated with any one type of diabetes i.e. Type-I and Type-II. Finally all the data is partitioned into two types of clusters and sub-clusters of the diabetes cluster. The k-means clustering algorithm is used for partitioning the data into diabetes and non-diabetes clusters, where the initial cluster center is represented by the mean value of the weightage of significant patterns.

Weighted Average Method k-means Clustering Based Diabetes Detection

Weighted Average Method (WAM) is used to improve the accuracy of analytic predictive performance models for diabetes prevention systems with more number of new patients. WAM considers the patient population distribution at a system to reflect the impact of behavior/genetic factors (family history).

The WAM *k*-means algorithm follows an iterative optimization similar to *k*-means, and by consequence it is affected by some of its strengths, such as its convergence in a finite number of iterations to improve the centroid of clusters.

Weighted Average cluster k-means could cluster the patient data of medical records to different groups, and divided into two groups mapped as diabetes types based on Db1 and Db2.The subset of diabetes types of instances with clusters will be processed towards weighted of *k*-means in specific features, parameter range. The sum of all the predicted values can be averaged by set of instances.

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VI. SUMMARY OF FINDINGS

Through this research, a novel multilayered method combines Data warehouse and Data Mining techniques to build the diabetes risk detection and prevention system will be developed. The most effective way to reduce the diabetes deaths is to detect and prevent diabetes disease. The developing of detection and prevention system may provide an easy and a cost-effective way for screening diabetes and may play a pivotal role in disease diagnosis process for different types of diabetes and provide useful, preventive strategy.

The multidimensional data has processed from diabetes data warehouse and multivariate data has derived from the data mining model. The diabetes disease prediction based on *k*-means clustering has been better improved by Weighted Average-based prediction value which maps the diabetes types and disease factors as symptoms along with the blood group factor.

VII. CONCLUSIONS

There's no cure for type 1 diabetes. It requires lifelong disease management. But with consistent monitoring and adherence to treatment, you may be able to avoid more serious complications of the disease.

If you work closely with your doctor and make good lifestyle choices, type 2 diabetes can often be successfully managed.

Diabetes control aims to reduce the incidence or instance, morbidity and mortality of diabetic and to improve the quality of life of diabetic patients in a defined population, through the systematic implementation of evidence.

An implementation of our new system to expose the diabetic risk factors and to ensure that people are provided with the information and support they need to adopt in a healthy lifestyles.

Four basic components of diabetes control–prevention, early detection, diagnosis, treatment and painkilling care–thus avoid and cure many diabetes, as well as palliative the suffered patients. Diabetes control aims to reduce the incidence or instance, morbidity and mortality of diabetes and to improve the quality of life of diabetes patients in a defined population, through the systematic implementation of evidence. An implementation of our new system to expose the diabetes risk factors and to ensure that people are provided with the information and support they need to adopt in a healthy lifestyles.

Diabetes detection and prevention is still a challenging for the upgraded and modern medical technology. After researching a lot of statistical analyses which is based on those people who are affected in various diabetes types are based on some general risk factors and symptoms have been discovered.

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Factors Affecting the Decision of Home Buying Of Millenial during the Covid-19 Pandemic

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Abstract— The purchase decision of buying a house or property is still considered important for young people. This paper aims to examine the factors related to purchase decision in buying a house during the pandemic Covid-19 that now has been lasted for almost one year. We considered feng shui factors as one of the important reasoning because the Chinese belief for the position and direction of the house will impact the occupants. Another variable are brand reputation and financial aspects. We run the data with regression to identify the relation and magnitude of independent to dependent which is property purchase decision. We focus on millennials cohort because they are the driver in the workforce and hit by the pandemic condition. Our sample consists of 112 of millennials that lived in Jakarta greater area.

Index Terms— Home, Covid-19, Pandemic, Millenial

I. INTRODUCTION

Background

In early 2020, the Covid - 19 epidemic occurred, which according to the World Health Organization (WHO), Covid - 19 was an infectious disease caused by the corona virus which was recently discovered and began to plague in Wuhan, China in December 2019. And now Covid - 19 has caused a pandemic that has hit many countries around the world (who.int/indonesia, 2020). Indonesia is no exception; it has also experienced the Covid-19 pandemic where this pandemic has created a domino effect into a social and economic problem that has hit all levels of society. This is evident from Indonesia's economic growth in the first quarter of 2020 minus 5.32 percent (idxchannel.com, 2020). According to the Ministry of Industry, around 60% of industries were affected due to the Covid-19 pandemic. Various strategies were prepared in various ways to restore industries affected by the pandemic (cnbcindonesia.com, 2020). However, in 2020 the Indonesian property market is expected to be vibrant. Property means real estate, house, land, shop, building or warehouse (propertyindonesia.co.id, 2020). In order to survive during a pandemic, many property market players have reduced property prices in order to attract consumers. Based on data from Rumah.com (2020) that in the second quarter of 2020 there was a correction in property prices, with a downward trend in prices since April 2020.

Then in the third quarter of 2020, the national property market is expected to improve, where the property market has adjusted to the new normal situation (business.tempo.co, 2020). This is the right opportunity for people from the baby boomer's generation to the millennial generation who want to buy property, either to live in or use themselves or as a means of investment. According to the definition of the Big Indonesian Dictionary, the millennial generation is the generation born in the 1980s and 1990s

(kbbi.kemdikbud.go.id, 2020). The number of millennial generation in 2019 reached 24 percent or 64.3 million of the population in the productive age category (14 - 64 years), which amounted to 179.1 million (67.6 percent of Indonesia's population) (IDN Research Institute, 2019)). This significant number of millennial generations can become a very large potential segment that is worked on by property developers (Ekonomi Bisnis.com, 2020). During the current pandemic, it is actually the right moment for millennial generation to invest in property, because the selling price can generally reach its current lowest position. Even after the pandemic ends, property prices can be corrected by up to 10% (Properti.kompas.com, 2020). However, it is necessary to know and understand how the millennial generation determines the occupancy criteria they will choose, especially during the current Covid-19 pandemic, so that the right property marketing strategy will be obtained for the millennial generation market.

According to Mulyano et al., (2020), for the millennial generation in deciding to buy a residence there are factors which are the main considerations, namely the factors of location, ease of access, price, design and aesthetic aspects, developer brand, land ownership, facilities. and physical attributes. Whereas in Redjo's research, Wijayaningtyas, Iskandar (2019) stated that the factors that influence home purchase decisions by the millennial generation are perceptions of behavioral control with indicators including perceptions of: the house building process, the cost of maintaining the house, the house looks comfortable, the house price, and home installment prices. In the author's previous research, it was found that feng shui beliefs and superstitious beliefs also influenced home purchase decisions by both ethnic Chinese and non-Chinese descendants (Heriyati, Saiman, Kusumaningrum, Suria, 2020). According to Chang & Lin (2015), for people in Asia, in determining home purchase decisions, it is strongly influenced by feng shui beliefs. This was reaffirmed by Sia

& Lu (2006) who stated that in the ethnic Chinese community, belief in feng shui can guide humans to live in harmony with the world and others, and improve aspects of life including luck. In addition, research conducted by Handayani (2009) found that feng shui beliefs were one of the factors that influence home purchase decisions. The millennial generation also considers location, ease of access, price, design and aesthetic aspects, developer reputation, land ownership and facilities, physical attributes in making house purchase decisions (Mulyano et al., 2020). The large number of Indonesian millennial generations and the pandemic phenomenon that has a significant impact on life aspect, encourages the study to examine the extent to which factors such as financial aspects, brand developers, access, and feng shui beliefs influence the decision to buy a house by the millennial generation.

Research Problem

The research that has been done before is a lot about things that influence home buying decisions by consumers with various demographic criteria, including factors that influence home buying decisions by the millennial generation. However, there is still very limited research on the factors that influence the decision to buy houses by millennial generation in the current Covid-19 pandemic situation (Mulyano et al., 2020; Redjo, Wijayaningtyas, Iskandar, 2019; Sulistyawati & Santosa, 2019; Kurniawan et al. ., 2020). This research will focus on the millennial generation in the Jabodetabek area during the pandemic era with a conceptual framework built on the factors that influence home purchase decisions in previous studies including financial aspects, brand developer, access and feng shui trust.

Property buying behavior is part of the development of consumer financial behavior. So that the financial aspect factors have a significant influence in purchasing decisions (Anastasia, 2015). The financial aspect is considered an important factor in influencing the decision to buy a house by the millennial generation. Previous research has also shown that affordability and inadequate income can be classified as important barriers to owning a house (Abidoye, Puspitasari, Sunindijo, 2020). Purchasing property from a reputable developer will give consumers a feeling of security in investing or buying property for their own use so that brand developers play an important role in encouraging consumers to decide to buy property (Rahadi, Wiryono, Koesrindartoto, 2014). In the residential market, a residence is said to be attractive, by providing easy access to important public facilities (Kauko, 2006). In addition to financial aspects, brand developer and access factors, feng shui trust factors are known to have an influence on home purchase decisions (Heriyati, Saiman, Kusumaningrum, Suria, 2020).

WHO (World Health Organization) stated that the Covid-19 pandemic is expected not to last soon and therefore the world must prepare for the next pandemic after the pandemic due to the Covid-19 virus (Harianhalmahera.com, 2020). The pandemic that has occurred has affected aspects of people's lives and caused changes in the way of doing business and consumer behavior (Donthu & Gustafsson, 2020) including consumers from the property business, which is one of the businesses that is severely affected by Covid-19 (McKinsey.com, 2020). Therefore, knowledge of the factors that influence home purchase decisions by millennial generations in the pandemic era is important to fill the gaps in previous research and as a basis for dealing with this pandemic.

II. LITERATURE REVIEW

Milenial Generation

The IDN Research Institute classifies the millennial generation into 2 (two) large groups, namely millennial juniors where those born between 1991 - 1998, while millennial seniors are millennial groups born between 1983 - 1990. Then it was also found that the millennial generation population was in the range 20 - 35 years old reaches 24 percent, namely 63.4 million people from the productive age category (14 - 64 years), which amounts to 179.1 million people (67.6 percent) of the total population of Indonesia, which number is which is very significant (IDN Research Institute, 2019).

Millennials tend to adapt more quickly to change, tend to want to get fast and up-to-date results, in the sense that more real-time is preferred. Ease of access, speed, convenience, and exploration of experiences are also the tendencies of the millennial generation (Gatra, 31 January 2018). Ali & Purwandi (2017) convey that one of the characteristics of the millennial generation is being connected through the role of the internet and social media. The life of the millennial generation, which is inseparable from technological advances, has formed the millennial generation into a generation with the characteristics of open, creative, informative and productive communication. In addition, the economic, political and social dynamics faced in the process of growth and development of the millennial generation allow each individual to have a character that upholds freedom, is critical, courageous and open minded (kemenpppa.go.id, 2018).

In a business context, it is very important to understand the characteristics of the millennial generation so that it can be used to determine marketing strategies targeting the millennial segment. Research on the millennial generation is something that needs to be done considering its large population and unique forms of consumption, so a strategy is needed to offer products and services that can influence the intention to buy which can continue with the positive experience that lead to the purchase and using of products and services (Küster et al., 2016 as quoted by Moreno et al. 2017).

Property Purchase Decision

Previous research to understand consumer behavior in purchasing decision making has been carried out. According to Stankevich (2017), consumer purchasing behavior is a series of processes in which individuals seek,

then choose, decide to buy, and use them, and or choose to no longer use these goods or services according to the satisfaction they want or need and other influencing factors. Purchasing decision making by consumers has a correlation with consumer behavior towards product offerings, so a better and deeper understanding of consumer behavior and purchasing strategies can provide greater opportunities to strengthen marketing campaigns and increase success in competitive markets. Ramya & Ali (2016) stated that by identifying and understanding the factors that influence consumers in making purchasing decisions, products can develop strategies, unique product offerings, advertising campaigns that are more efficient and in accordance with the needs and ways of thinking of targeted consumers.

Mariadas et al., (2019) said buyers will consider the factors that are most important to them, before making a property purchase. Mulyano et al., (2020) found that the preference for home purchases by millennial generation can be divided into several indicators, namely location, accessibility, price, physical attributes, facilities, design and aesthetic aspects, developer reputation and land ownership. These indicators are taken into consideration in making home purchase decisions by millennial generation.

Financial Aspect

Property buying behavior is part of the development of consumer financial behavior and financial aspects have a significant influence on decisions. According to Agarwal et al., (2014) there are various decisions that consumers need to make to buy and own a house, namely the price of a house or how much it costs to buy a house; mortgage requirements when funding home purchases on a mortgage basis; refinancing during the mortgage cycle; possibility of default during the mortgage period.

Previous research to determine the effect of financial aspects on home purchase decisions has been carried out. When property prices decrease, investment in property increases. Eze & Lim (2013) state that financial factors that can influence property purchase decisions are protection from inflation, low prices, low investment, the amount of income and high interest rates. Property prices have a big impact on investment because investors will consider their ability to make purchases. Access to a mortgage loan will also provide financial support and have a positive influence on purchasing decisions. Research by Kurniawan et.al (2020) found that millennial home purchase decisions are influenced by structural, location, and financial attribute factors. In line with the research above, the financial aspect, namely price, turns out to be the main determining factor for buyers in deciding to choose a property, followed by products (Maoludyo & Aprianingsih, 2015).

Brand Reputation

The definition of brand developer according to Fah and Cheok (2008) quoted from Viitanen (2004) is formed from the image generated by real estate development, the concept offered, its physical and operational functions, the

performance provided and the service difference with other competitors. The success of a brand developer is resulted from the good reputation of the developer itself. So that brand developers have an important role in being one of the considerations for consumers to make property purchase decisions. In Rahadi's (2013), it is found that it is normal for housing developers in Indonesia to mention their brand / brand in property advertisements to increase housing sales. Real estate developers will have a better reputation and brand if they successfully interpret what consumers need, take action in a professional manner, provide products on time according to agreements, maintain product quality, and support consumers with good after-sales service, all of which will make real estate developers have a better reputation and brand. Real estate developers with good brands will be in a better position to bid on prices, compared to real estate developers who are just starting up and launching their initial product (Rahadi et al., 2013).

According to the a study by Jung et al. (2018) that the millennial generation has a tendency for high mobility and in terms of housing prefers a place to live in urban areas due to easy access to facilities that support their daily activities. Accessibility of a location is the ease of entering and exiting using a transportation system and land use patterns are indicated as important aspects of residential locations (Mulyano et al., 2020). Ease of access includes:

1) Close to stations or modern public transportation, such as MRT, LRT, Busway, KRL.

2) Easy direct access to and from main roads and toll roads.

3) Close to regional facilities (schools, hospitals, markets, etc.)

This criterion arises because the needs of today's millennials are more specific. The distance to the work place is getting farther, and traffic jams are the main considerations where the house must be close to modern public transportation. Regular public transportation such as minibus, bus is felt to be ineffective due to higher levels of congestion. Based on information from Hei & Dastane (2017) which explains that there is a positive and significant influence between the purchase of a dream home with location factors, environmental completeness factors, financial factors, environmental management factors, and demographic factors. The location factor explains that the distance factor makes it easier for access to public transportation, hospitals / schools, workplaces, relatives, and shopping centers.

Feng Shui Belief

In the Chinese community, belief in feng shui can guide people to live in harmony with the world and everyone, and improve every aspect of life, including luck (Sia & Lu, 2006). According to Chang & Lin (2015), in Asia, feng shui belief has become a significant factor in purchasing a home. Feng shui beliefs refer to the direction towards the house; ground level; big tree in the front yard; located at a T-shaped junction; earth-pocket form; fan-ground form; the

main front door parallel to the rear door; the position of the kitchen right next to the bedroom; the total number of stairs. Chang and Lien (2015) found feng shui affects home prices and home buyers.

Likewise, according to Handayani (2009) found that feng shui beliefs are one of the factors that influence home purchase decisions. In the previous author's research, feng shui beliefs and superstitious beliefs influence home purchase decisions for both ethnic Chinese and non-Chinese descendants in the Jabodetabek area (Heriyati, Saiman, Kusumaningrum, Suria, 2020). Based on literature and research background, we build a conceptual model as follows :
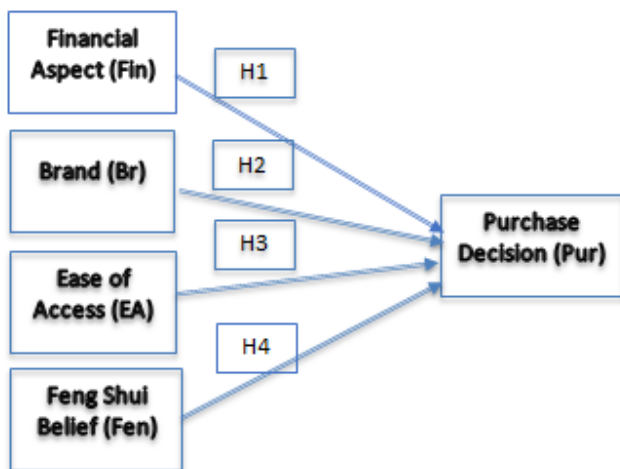
Figure 1. Research Model

The hypotheses developed are as follow:

H1: Financial aspect has significant effect on purchase decision

H2: Brand Reputation has significant effect on purchase decision

H3: Ease of access has significant effect on purchase decision

H4: Feng shui confidence has significant effect on purchase decision

III. DESIGN AND METHOD

This research is a descriptive study with a quantitative approach. According to Sekaran and Bougie (2020) in descriptive research, connectivity between the independent variables and the dependent variable will be studied. This research was conducted to determine the influence of financial aspects, brand reputation, ease of access, and feng shui beliefs on the decision to buy house by millennials in the Greater Jakarta area during the current Covid-19 pandemic.

The population in this study is the millennial generation in the greater Jakarta area area who have their owned income and familiar or aware of Feng Shui concept (Heriyati, Saiman, Kusumaningrum, Suria, 2020).

Sample and Sampling Method

Sample are taken from population, the millennial generation who live greater Jakarta area, have their income and have knowledge on feng shui belief. Sample are collected based on convenience sampling method. The determination of the number of samples in this study refers to the statement by Hair et al., 2011 that in determining the number of samples, it must be adjusted to the number of indicators used in the questions on the questionnaire. By using the formula n x 5 to n x 10 where n is the total indicator question on the questionnaire. This formula suggests that the minimum sample is 5 - 10 observations for each indicator. In this study there are 19 indicators, therefore the total minimum sample size is 95 people as respondents. Data was collected by distributing offline and online questionnaires to the respondents.

Questionnaire Development

In this study, the questionnaire was developed through the operationalization of four independent variables, namely Financial Aspect, Brand Reputation, Access, and Feng Shui belief which affect the dependent variable, namely Purchase Decision on housing or property.

Independent variables namely Financial aspect was measured by pricing, amount installment, rate of installment, bank financing easiness, and property cost maintenance (Eze & Lim (2013); Agarwal et al., (2014); Kurniawan, et.al (2020)). Provider Brand was measured by dimensions namely brand reputation, brand awareness (Mulyano et al., (2020)). Access was measured by dimensions integration to transportation system, access to main road, access to public facilities, located in the city centre (Mulyano et al., (2020); (Jung et al., 2018). The Feng Shui Belief was measured by land position, room layout position, stairs position (Heriyati, Saiman, Kusumaningrum, Suria, 2020), and lastly, the dependent variable Purchase decision was measured by dimensions, preference property, liked the selected property, will buy the selected property (Stankevich, 2017).

Data Analysis

This study conducted data analysis of reliability and validity test and for hypotheses testing we will employ multiple regression analysis. We utilize SPSS Software and analysis tool to analyze the data.

IV. RESULT AND DISCUSSION

This paper is intended to answer the research question of : 1) what is the factor of purchase decision of millennials in buying a house and 2) is the fengshui a significant factors instead of other factors. First, we will show the description result in Table 1, Table 2, Table 3, Table 4, and Table 5, Table 6, Table 7 and Table 8.

Table 1. Age Frequency

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	22 to 25 yo	11	9,8	9,8	9,8
	26 to 30 yo	38	33,9	33,9	43,8
	31 to 35 yo	45	40,2	40,2	83,9
	36 to 40 yo	18	16,1	16,1	100,0
	Total	112	100,0	100,0	

Table 2. Marital Status Frequency

Marital_Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	74	66,1	66,1	66,1
	No	38	33,9	33,9	100,0
	Total	112	100,0	100,0	

Table 3. Domicile Frequency

Domicile

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Centre Jkt	6	5,4	5,4	5,4
	South Jkt	11	9,8	9,8	15,2
	East Jkt	5	4,5	4,5	19,6
	North Jkt	10	8,9	8,9	28,6
	Bogor	6	5,4	5,4	33,9
	Tangerang	14	12,5	12,5	46,4
	Bekasi	24	21,4	21,4	67,9
	Depok	36	32,1	32,1	100,0
	Total	112	100,0	100,0	

Table 4. Education Frequency

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	17	15,2	15,2	15,2
	Bachelor	73	65,2	65,2	80,4
	Graduate	22	19,6	19,6	100,0
	Total	112	100,0	100,0	

Table 5. Occupation Frequency

Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Government Employee	17	15,2	15,2	15,2
	Private Employee	33	29,5	29,5	44,6
	Entrepreneur	39	34,8	34,8	79,5
	Professional	23	20,5	20,5	100,0
	Total	112	100,0	100,0	

Table 6. Monthly Expenses Frequency

Monthly_Expense

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 7 mio	16	14,3	14,3	14,3
	11 to 20 mio	85	75,9	75,9	90,2
	21 to 30 mio	11	9,8	9,8	100,0
	Total	112	100,0	100,0	

Table 7. Housing Type Frequency

Housing_Type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Residential	55	49,1	49,1	49,1
	Non Residential	21	18,8	18,8	67,9
	Apartement	36	32,1	32,1	100,0
	Total	112	100,0	100,0	

Table 8. Long of Stay Frequency

Long_of_Stay

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 5 yrs	69	61,6	61,6	61,6
	6 to 10 yrs	43	38,4	38,4	100,0
	Total	112	100,0	100,0	

From Table 1 we have all millennials respondents (total of 112). Table 2 shows that 66% of them is married, and 33% not married. Table 3 shows that 32% respondents live in Depok, a city of 40 km to south from Jakarta, 21% lives in Bekasi, a city of 20 km north of Jakarta, 12% in Tangerang, 20 km to west from Jakarta, and about 32% live in Jakarta. Small percentage live in Bogor, 60 km in the south of Jakarta.

Table 4 shows 73% of respondents hold bachelor's degree, and 22% hold master's degree, and 17% hold diploma's degree. All of respondents is educated because they continue their study after high school. Table 5 shows that 44% are employees either in government or private sectors. We have 54% are entrepreneur and professional. All the respondents are job holders. The normal assumption is job holders want to seek their own house and consider buying a house for their family. Table 6 shows monthly expenses of 75% have 11 to 20 million rupiah per month, 9% has expenses between 21 to 30 million rupiah and 14% has monthly expenses of 1 to 7 million rupiah. Table 7 shows the need of housing type is 49% residential, 19% nonresidential, and 32% apartments. Table 8 shows the long of stay is 61% less than 5 years, and 38% is more than 5 years. With the installment of 5 to 7 million rupiah per month, our respondents are keen to buy their own house due to opening new area in the western Jakarta, with house price range between 200 million to 1 billion.

Table 9 shows the result of the buying decision with factors consist of financial aspect, company brand, location and feng shui belief. The fengshui belief is the only one that significant to buying decision. Other variables such as financial aspects, company brand and location show positive relation but insignificant to buying decision.

Table 9. Regression Result of Buying Decision

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,828	,905		,915	,362
	Financial_Aspect	,006	,099	,004	,059	,953
	Company_Brand	,358	,139	,211	2,577	,011
	Location	,112	,166	,048	,674	,502
	FengShui_Belief	,297	,031	,843	9,488	,000

a. Dependent Variable: Buying_Decision

Table 10 shows that the R-square of buying decision model is 57,5%. In other words, the factors in the model can explain 57,5% of buying decision, while 42,5% of the model is explained by other factors than financial aspect, company brand, location and fengshui belief.

Table 10. R-Square of Buying Decision Model

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,768[a]	,590	,575	,18896

a. Predictors: (Constant), FengShui_Belief, Location, Financial_Aspect, Company_Brand
b. Dependent Variable: Buying_Decision

V. CONCLUSION

This paper aims to examine the factors related to purchase decision in buying a house during the pandemic Covid-19 that now has been lasted for almost one year. The survey was taken during the pandemic and the respondents are informed that the answer in the survey is related to the pandemic time. From the result and discussion, we can conclude that the model of buying decision can be explained by the financial aspect, company brand, location and fengshui belief. The fengshui belief is the only variables that significantly affected the buying decision from millennials during the pandemic. The interesting phenomena is the millennials with all attributes of technology savvy, open, creative, informative, hence they still considered the traditional belief like fengshui to choose their home to live in. They still believe that good position of the house (and not the location) can affect their long-lasting stay and belief of welfare that will be given by the house. The basic needs of home sweet home.

We believe that this paper contributes to at least two things. First, the millennials in Indonesia especially, still hold on to traditional values to make the safety and the prosperity of their living. Second, the location of the house seemed irrelevant these days, due to easiness of transportation and the higher possibility of work from home policy, not only during the pandemic, but also for the future work policy. This study also gives insight that millennials prefer house and apartment to be their home.

We propose the further study in other belief from other culture to be one of the factors in buying a house, where this study can be done in country level. This opens a new opportunity to map how different beliefs can affect the buying decision. This will benefit the developer and business property owner in selling their property using the right marketing strategy with the local belief components.

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CNC Based Drawing Machine

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Abstract— In day-to-day life, diagrammatic representations often make things easy, given drawings play a huge role from a toddlers to adults, and every human being's life. CNC Machines play an integral part in the manufacturing industry. These machines are fast, accurate, and flexible. The project motivated us to design and implement low-cost Computer Numerical Control (CNC) machine for drawing purposes. The main function of this CNC machine is to draw the composition once, thus connecting both the PC and a digital numerical format control machine. As there is a great need in the market for accurate and low-cost CNC printing machines. The simulation of the project's components is done in such a way that the main element and sole part of the equipment can be moved to the x and y direction using a stepper motor with direction up and down using a servo motor. Arduino Uno and CNC shields are used to drive engines. The GRBL firmware uses G-code as input and outputs motion control via the Arduino. Benbox software is used to generate G-code and provide a graphic input of image via rotation in art builder. To achieve cost-effectiveness, our program is based on an Arduino microcontroller that also maintains accuracy, and reliability is required for complex shapes. The movement of the CNC machine can be controlled by commands. This project offers us to make effective equipment that makes copying of articles from one digital format to a piece of paper, sheet, or manageable print-worthy substances. The backbone of the program is an intelligent mechanical system with an integrated system that provides direct results.

Index Terms— CNC, Arduino Uno, Benbox, Microcontroller and G-code

I. INTRODUCTION

In modern times we have seen the powerful influence of robots on many Science and Technology fields, in the field of education and entertainment. That very much gives us a scenario of the quality and reliability of these equipment's and machines as it is based on the various machinery parts and sub-systems of machines to get preferred results. CNC is basically whose machine performance is computer controlled. While many important parts and features of CNC equipment should be considered design, such as machine design, steering methods, feeders, spinning controls, software and interface design, monitoring tool. Computer with Numbers Control can be applied to milling machines, lathe machines, mills equipment, plasma cutters, laser, cutters, over grinders and much more such electrical tools. In this paper we introduce an automated robotic machine with the skill of drawing art. The robotic machine is capable of drawing, drawings such as quality art or images, how one performs with great precision and as well as accuracy. It is a challenging effort to assign a robotic machine with graphic design and writing work required for the newest and most innovative as per our requirements. The drawing robot is designed to work with the help of Inkscape open source software for further research Studying as mentioned is key to this research and G-code, in which the sender by using the most effective Benbox Software here as an alternative for Inkspace. Inkscape offers a new drawing platform once and for all and convert them into G-code, as required the machine parts are designed to use CAD tools as its functions will support it. The main purpose of this research to develop a drawing robot that can draw complex drawings paper. A robot can have a powerful influence on training and other things educational *objectives*. This machine will not only encourage people to that they engage in artistic activities but also inspire people to play an active role in robotics and programs.

II. LITERATURE SURVEY

For the *background*, Literature survey and the review that we conducted these are the main lead papers that we referred. Titles and authors have been mentioned cordially.

[1] In a study proposed by Pratik Kamble, Dr. Suchitra Khoje and Prof. Jyoti Lele in 2018 named "Implementation of Paper PCB using Conductive Ink 2D Plotter" at 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA). A new technique of PCB Drawing method is used based on the following objectives that we came across and felt an important to be listed so as to refer later on while studying papers to prepare our project. They discussed it using two methods :

1. Using Autodesk Software

2. Using Inkscape.

In this paper the objectives were to study different types of CNC machines using the above 2 methods and look for the applications. First of which, the machines conducted was converting the PCB design file into hex file so that it would make the work of microcontroller easy. In both designs out of which the first used L293D Shield to work the motors, in Inkscape further graphically helped in achieving this project. Likewise the second method used the Arduino board and Autodesk Software, where Benbox Software was used. From the above conclusions, we decided on sticking to using the Benbox software as it would be more versatile and as currently most operating system used are Windows.

[2] In a study proposed by Amit Kumar Singh, Prateekshit Tamta and Gaurav Singh in "HOMEWORK WRITING MACHINE" paper in 2018 at IJARIIE, which is a similar use in CNC but as a machine which would help in Homework completion. Wherein it has usage of L293 IC and have used the GRB Shield unlike the CNC shield that is in Drawing Machine which makes it easy if progressed as a wireless device in future.

In this paper it is discussed that gcode doesn't help much, another product known as Processing is taken into consideration. This device also uses Inkscape. Arduino is used to make things work as per the process.

[3] In the Study proposed by Rohit Choudhary, Sambhav, Sunny David Titus, Akshaya P, Dr. Jose Alex Mathew and Balaji N in Wood engraving machine from "CNC PCB Milling and Wood Engraving Machine 2017, where a CNC Wood engraving machine was made. In consideration it used CAD software, whereas software like EAGLE and EASLE were used which showed that the tip would engrave substances in those wood supplied articles.

Its setup combination with the g-code is seen to make its working much easier though it's mechanical part that have put together take a load of effort. Here main thing we learnt is the use of pulley which we easily replaced by the servo motor which has its handle that moves in 180/90 degrees which helped us give any writing entity, in our case a pen or a pencil that we use a free movement.

III. SYSTEM ARCHITECTURE AND DESIGN IMPLEMENTATION

3.1 Hardware and Software Requirements

This plotter unit consists of various sections. 1. Hardware section (Benbox). 2. Software and Electronic control system (G-code and Arduino). 3. Fabrication set up for three axis movement that is the stepper motor which allows the working.

CNC Machines are Computerized Numerical Control Machines which are used to make particular design of the sincerely fed images or designs through software part and worked through mechanical part according to the design program fed into their controller units. Controller unit can be either of them a computer or microcontroller. After, doing a thorough research on CNC machines, we came to decide on building a CNC machine using locally available materials. This DIY Arduino CNC Machine can draw most of the basic shapes, texts, impromptu designs and even cartoons and figurine. Its operation is similar to the way a human hand writes or draws. It's faster and more accurate compared to the way a human being can write or draw in real life. Moving to the descriptive method on how to perform this project:

To simplify the mechanism, we use these Hardware components-

- 2 Old DVD drives.
- MG 90 Micro SERVO
- 2 * A4988 Driver Module
- Arduino CNC Shield V3
- UNO R3 Arduino
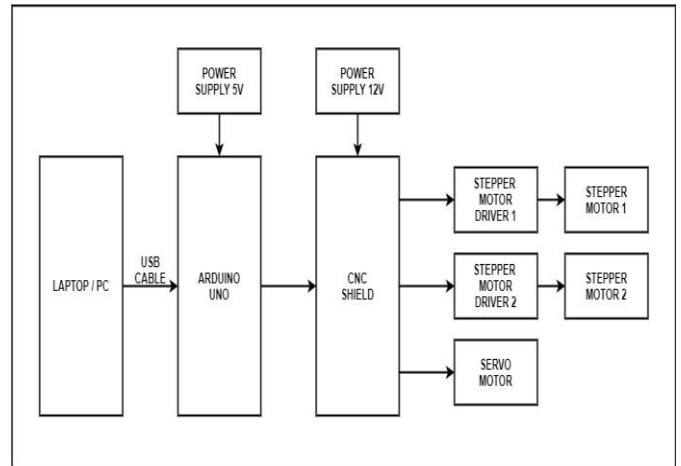- 5V 2 Amp Adapter
- Aluminum Composite
- Jumping Wire

Fig 1
Fig 1: Block diagram of hardware connections of the project.

Descriptions of the main parts and components-

1. ARDUINO UNO: The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.

2. CNC SHIELD: The CNC Shield V3 for Arduino, is an Arduino compatible board that turns your Arduino into a CNC controller.

3. STEPPER MOTOR DRIVER: A stepper motor driver usually consists of a controller, a driver and the connections to the motor. Two A4988 Stepper Motor Drivers are used to control stepper motors.

4. STEPPER MOTOR: A stepper motor, also known as step motor or stepping motor, is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps.

5. SERVO MOTOR: A servo motor is an electrical device which can push, rotate or move an object with great precision. A SG90 Servo Motor is used to move the pen up and down.

6. POWER SUPPLY: A power supply is an electrical device that supplies electric power to an electrical load. A 5V and 12V supply is used for supplying power to Arduino UNO and CNC Shield respectively.
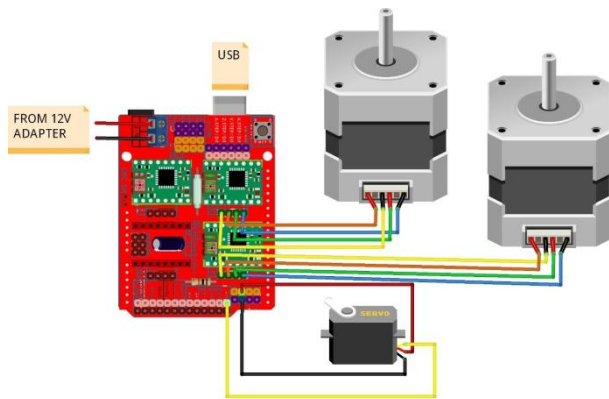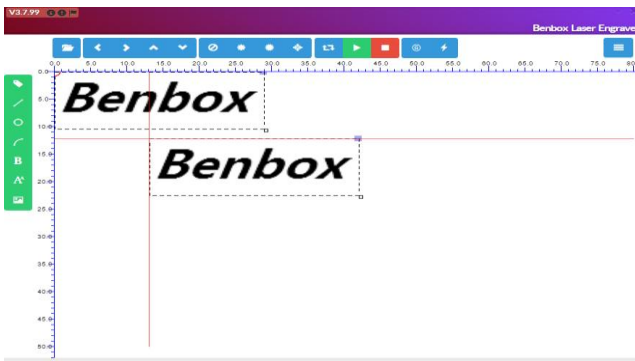
Fig 2
Fig 2: Circuit Diagram of the connections between motors and the CNC shield (which is fitted on the Arduino).

To simplify the mechanism, we use these Software specifications-

This is the Benbox Software makes things easy and is also the most important thing of the set up. G-code of an image is generated using Benbox software. It is only supported by Windows operating system. It can configure the microcontroller. Speed, steps and other parameters can be controlled using this software. Whereas over here the feature of the image is extracted. This Firmware IDE provides for the plotter so it works on the same principle of CNC machine thereby utilizing free open source software with low cost hardware components to draw 2D drawings.

Working observed in Hardware Part of the project-

Fig 3
Fig 3 – Initial step in joiing all the hardware parts before connecting it with software setup.
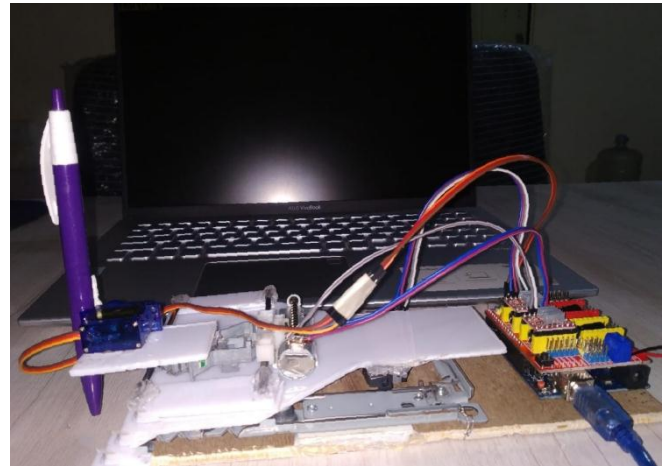
Fig 4
Fig 4: Connections of CNC shield placed over Arduino in the whole setup.
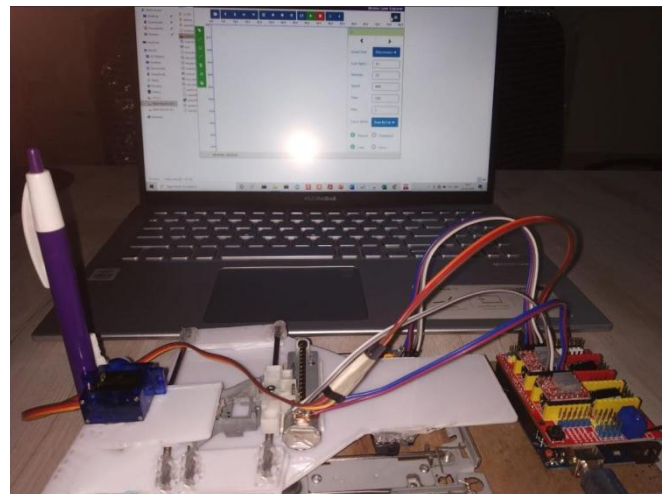
Fig 5
Fig 5: Final result and proper completed setup of Drawing Machine.

IV. WORKING

Steps on how the function will work from software to hardware-

Flow of system based on Arduino UNO and CNC shield using Benbox software.

1) Click on the lightning bolt icon in Benbox software, where a drop box will occur, in that there are three options.

2) From it we select the COM port for serial communication. Then select the board you are using for example Arduino UNO or Mega and then click on chose firmware to select the firmware file.

3) Next step is to select the hex file of the code which is created in the Arduino IDE and then click on right tick button, the firmware will be uploaded into the Arduino board.

4) Click on the topmost right side icon, the options of serial port, speed, time, curve mode will occur. Select the serial port.

5) Select the curve mode continuous and few parameters according to your requirement.

6) Select the values of STEP, DIR, feed rate, MIN, MAX. Speed of stepper motor and then Click on right button.

7) Now upload the image file which you have to draw and click on the run button in green color, Machine will go to the home position and then it will start to draw according to the input drawing given to it.

Further steps-

1. Arduino UNO is used as a microcontroller in the system.

2. An Arduino UNO compatible shield is used in the system for making the system CNC enabled.

3. The system comprises of two stepper motors; one for enabling movement in X direction and another for enabling movement in Y direction.

4. A4988 Stepper motor driver are used to drive steppers motors in X and Y direction.

5. A servo motor is used for movement of refill in Z direction. A string is attached in order to make the refill move in Z (Upward & Downward) direction.

6. A 12V Adapter is used to power CNC Shield while USB (5V) is used to power Arduino Uno.

7. The system when assembled as shown in the circuit diagram and is connected to power will require use of a software for CNC drawing.

8. Benbox software is used for CNC drawing. A compatible firmware is first loaded into the Benbox Software.

9. COM Port at which Arduino is connected is then selected in the software.

10. User can then perform basic configuration and load image that needs to be drawn.

V. FEATURES

Features

Specifications	UNO
Operating Voltage	5 V
DC Current per I/O Pin	20 mA
Flash Memory	32 KB
SRAM	2 KB
EEPROM	1 KB
Input Voltage	12 V

VI. OBSERVATIONS

Observations found:

Entity	Observation
Position of pen upward	35 degrees
Position of pen downward	22 degrees
Speed of pen's movement with help of servo motor	0.1s/60 degrees
Torque for motor	2.5 kg/cm
Rotation of motor	0-180 degrees

VII. RESULT

Throughout this making of project the main aim was achieved of creating a cost efficient drawing machine. The above diagrams give a brief view of how the project was conducted. We created G-CODE and fitted it with a CNC shield. Drawing, drawings using software and emulating it using BENBOX software. Default CNC the machine is designed and designed to draw using Arduino at low cost and better accuracy.

VIII. FUTURE SCOPE

The CNC Machine can be upgraded to work wirelessly using Bluetooth or Wi-Fi protocol. Customized Android application can be designed to control the CNC Machine. The size of the machine can be scaled for bigger sketches. The same setting can be converted into a laser recording machine by simply positioning the laser unit with board driver or CNC automatic drill board PCB board with simply place the drill unit on the driver board by replacing the servo motor pen.

IX. SUMMARY AND CONCLUSIONS

After installing all the required software, the machine works fine, it draws drawings more accurately on paper. After looking at the work related to doing an integrated study for documentation and project implementation planning to the definition and work on the flow of data and block diagrams behind all of our choices other flow that can give us better accuracy in our project. We studied the various types of CNC machinery, its purpose and application. We read various research papers, we obtained patents limitations. This paper discusses construction, the introduction and analysis of low-cost robotic drawing machines for drawing purposes.

In this research work we introduced an efficient CNC with different drawing skills. Robot testing points to a promising end result. The result of a calculation drawn by the machine is exactly the same as the image / drawing provided as input and Response time is very similar to all trials. The total cost of the program without a microcontroller unit for only about Rs 4,500. Data processing is a bit complicated. First, the image will be having a lot of noise and that had to be removed and the roads were made over you. The line of large size is our main thing and that's it rearranged and converted into a binary form. After that it becomes easy to file for processor processing. In-depth and familiar reading of the pattern helps to predict the object accurately. After

this a simple text is just spoken. This device is very useful and useful at technical terms. We have divided our project into smaller modules. As a project the use is made in relation to those modules. We also aim to do the exam next semester. Real-time testing with all possible inputs to make our device more accurate and easy to work with real-time users. Also, change the device to make it more wearable.

X. ACKNOWLEDGEMENT

We would like to earnestly acknowledge the sincere efforts and valuable time given by our respected Project Guide Prof. Archana Ekbote. Her valuable guidance and feedback has helped us in completing this project efficiently and well before time.

Also, we would like to mention the support system and consideration of our beloved parents who have always been there in our life. Without them, we could never have completed this task.

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Stock Price Prediction by Simulink Model with Fuzzy Logic Toolbox

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Abstract— A prototype model is created in Simulink with four inputs viz.Moving Average Convergence Divergence (MACD), Relative Strength Index (RSI), Stochastic Oscillator (SO), On Balance Volume (OBV) and they are processed with the use of Fuzzy Logic designer which was created in Matlab environment and is used in Simulink. The results are displayed instantly in "Display" block. The inputs viz. MACD, RSI, SO, OBV are set in the range of 0 - 10, 0 - 100, 0 -100, 0-10 respectively. The "Display" blocks display the values which are processed in Fuzzy Logic Toolbox. The "Display" shows the recommendation whether to buy, hold or sell the stocks.

Index Terms— Neural network; Forecasting and prediction methods-simulation methods; Input-output model
JEL: C45, C53, C67

I. INTRODUCTION

A stock market is a dynamic, non-linear and chaos system. Predicting stock price is a great challenge in this scenario. Stock markets are one of the important part of the economy of a country. As stock market influences individual and national economy heavily, so it is necessary to predict the future values of stock market. In the world of finance, stock market is a challenging area of research. Stock holders tend to increase their profit by any means at any cost.

Fuzzy Logic is an application of Artificial Intelligence (AI) which makes it simple as well as benefits to the investors. A set of fuzzy rules based on real stock data and expert knowledge is ascertained and recommendations are made as to whether to buy, hold or sell the stocks.

Fuzzy logic falls under the category of Artificial Intelligence process, as a fair concept in predicting the stock price. It is applied in the model and the results are obtained (in seconds).

"Linguistic variable, that is variables whose values are not numerals but are words or sentences in a natural or artificial language" - L.A. Zadah"

Simulink is a matlab based Graphical Programming Environment for modelling, simulating and analysing multi domain dynamical systems. Simulink Library Browser – where different types of blocks can be accessed.
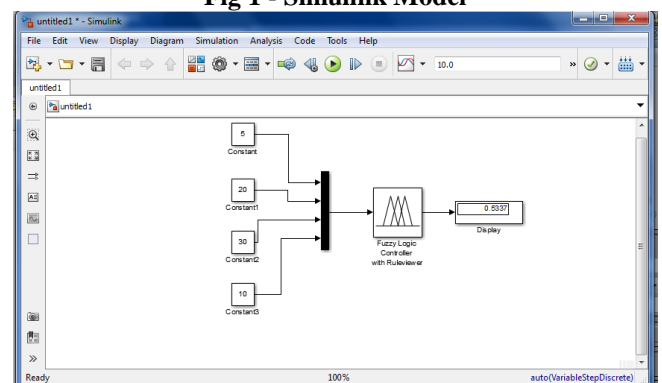
Blocks - are used to generate, modify, combine, output and display signals.

Lines - are used to transfer signals from one block to another.

II. OBJECTIVE OF THE STUDY

2.1 To create fuzzy logic model and simulink model in MATLAB & SIMULINK for obtaining instant results as whether to buy, hold or sell stocks.

Fig 1 - Simulink Model

To start with Simulink, type f(x)>>Simulink,a Simulink platform for modelling pops up. To search for the blocks to be added in Simulink type f(x)>>slLibraryBrowser, a list of Toolbox with various blocks appears on the screen.

To take up inputs, go for "sinks" or "Commonly used Blocks". For this model, "constant" block is dragged from the library browser and dropped in the model. For more inputs, repeat the same or make duplicate copies of the "constant". For convergence of all the four inputs into one, "Mux" is used which combines all the inputs as one.

From Fuzzy logic toolbox, "fuzzy logic with rule viewer" is used for modelling, which is already created in matlab with the function f(x)>>FuzzyLogicDesigner and saved as a (.fis)file in the workspace for modelling.

The blocks, which display the output is listed in the "Sources". "Display" is used for displaying the results of the model.

For each and every block, the configuration parameters must be set up. Each and every blocks must be connected by lines for process. Enter the input values to the constant and Run the simulation. Output is obtained in the "display" blocks. As the input value changes, the value of the "display" also changes. The input is processed in Fuzzy Logic and the results are displayed in "Display".

Fig 2: Command Window
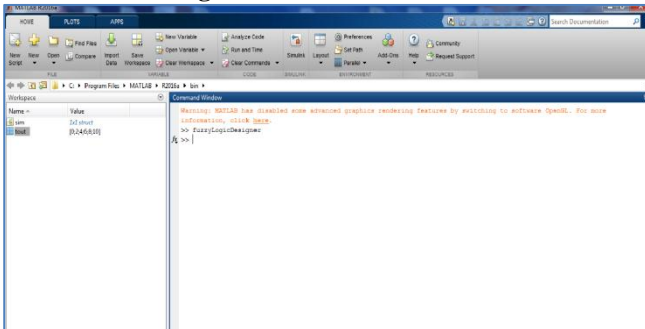
Before creating the model in Simulink, a .fis file must be created in matlab environment and the same is applied in Simulink for processing the model or simulation. To create a (.fis) file type f(x)>>fuzzyLogicDesigner. In Edit, four inputs viz. Moving Average Convergence Divergence (MACD), Relative Strength Index (RSI), Stochastic Oscillator (SO), On Balance Volume (OBV) are created and one output "Recommendation" is obtained.

Fig 3: Fuzzy Logic Designer
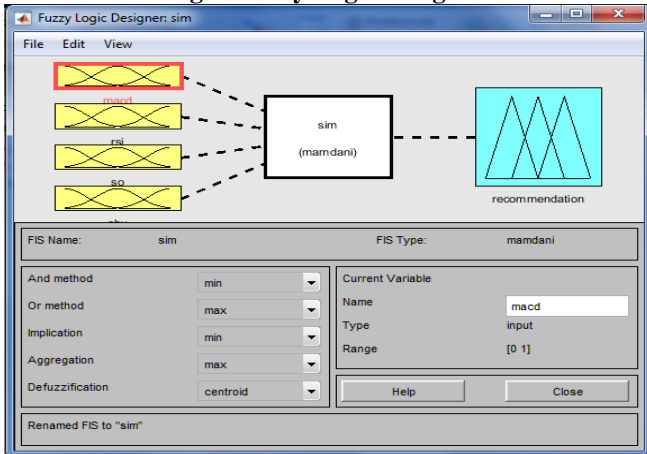
A (.fis) file named "sim" is created and saved in the matlab workspace for further processing in Simulink models. The decision rule is specified in table 1.

Table 1: Decision Base

Technical Indicator with Range	Buy	Hold	Sell
MACD(0-10)	Above signal line		Below signal line
RSI(0-100)	Below 30	30-70	Above 70

SO(0-100)	Below 20	20-80	Above 80
OBV(0-10)	Line is upward		Line is downward

Fig 4: Membership function Editor
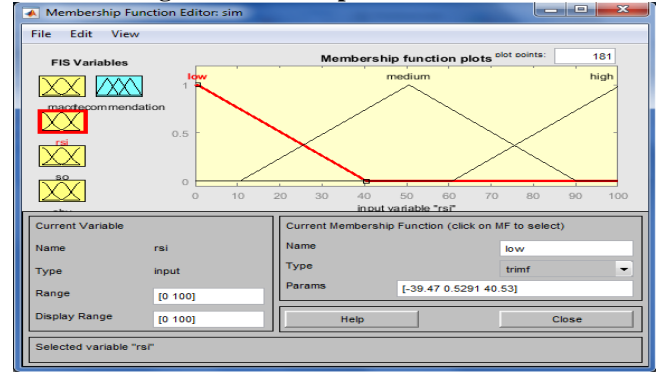
For each and every input, separate Membership function is created and different range is fixed for different inputs.

Fig 5: Rule Editor
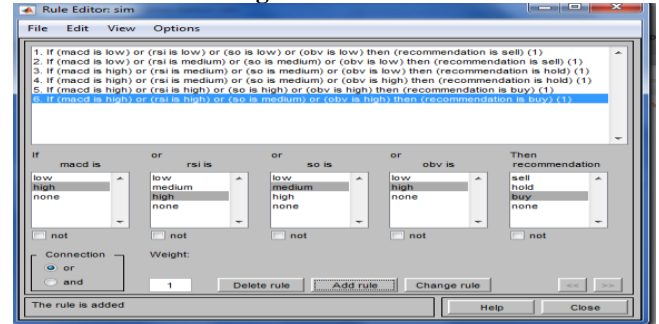
In Edit, "add Rule" by selecting one option from each input and output. Any number of rules can be created for securing accuracy in results.
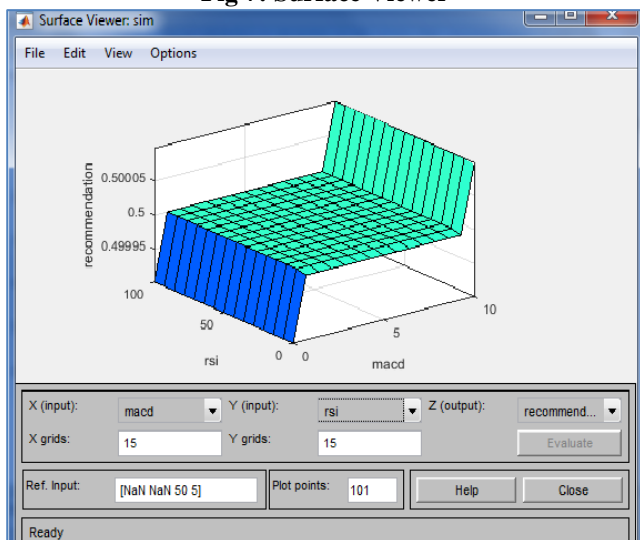
Fig 6: Rule viewer
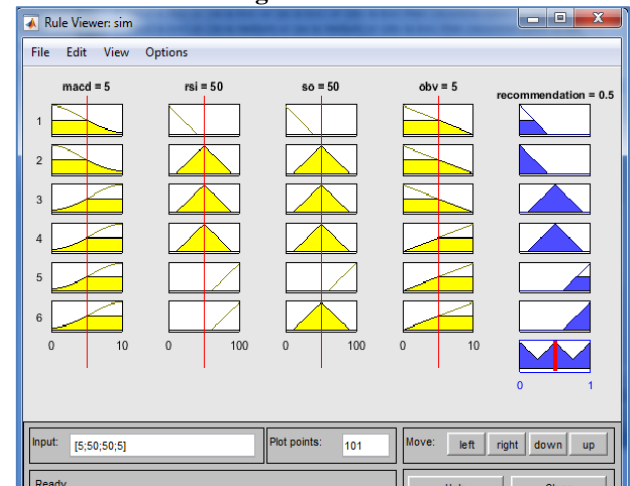
In view, by changing the input values, the output i.e. recommendation also changes. By simply moving the vertical line on the inputs, the output changes automatically.

Fig 7: Surface Viewer

In view, surface viewer is viewed for only 2 inputs and 1 output. To view the surface viewer of the other two inputs, the other two inputs must be selected.

Fig 8: Variable
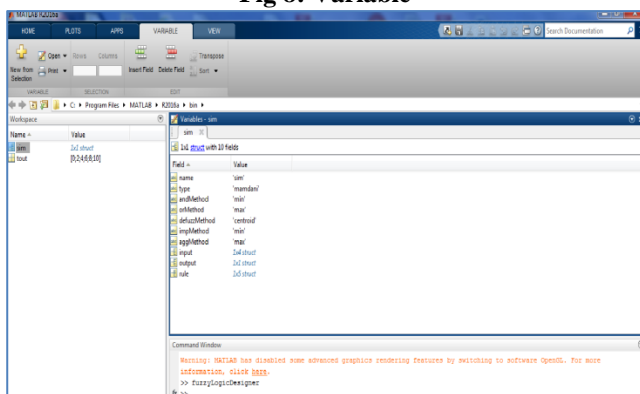
The model is saved as "sim" in the matlab work space. The "sim" model is saved in Simulink as a "template".

The structure of the Fuzzy Logic Designer is created in matlab environment and is used in Simulink environment with the name "sim". "Mamdami" style of Fuzzy Logic with "centroid" defuzzication with

$$Input\ matrix = 1X4\ structure$$

$$Output\ matrix = 1X1\ structure$$

$$Rule\ matrix = 1X5\ sturcture$$

III. RESULT AND IMPLICATIONS

Simulink is a prototype model,which is created to view instantly the results. The inputs used are MACD, RSI, SO, OBV within the range of 0-10, 0-100, 0-100, 0-10 respectively and the output is the recommendation for the stock holders to take decisions whether to buy, hold or sell the stocks. The completed process of the inputs is done in the Fuzzy Logic with Rule Viewer". The study reveals that when the model is simulated, the results are shown in the "display" block. As the value in the input changes, the value in the output also changes accordingly.

IV. LIMITATION OF THE STUDY

The fuzzy logic model is created with only four inputs and a simple prototype model is created.

V. SCOPE FOR FURTHER STUDIES

The same model can also be applied in commodity market or forex market or any sort of prediction.

VI. CONCLUSION

❖ When compared to viewing the results as a dataset or as a process it is preferable to view the results as a prototype model i.e. Simulink Model for instant results.

❖ Stock market is a chaos system and predicting stock price is a difficult task, which can be achieved with the help of Artificial Neural Network which falls under the category of Artificial Intelligence.

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Enhancement of Mobile Ad-Hoc Network Lifetime by Energy Efficient Dynamic State Routing Algorithm

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Abstract— Wireless ad-hoc network is a fast-developing research area with vast variety of applications. Wireless ad-hoc network also called Mobile ad-hoc network (MANET). Energy efficiency continues to be a key factor in limiting the deploy ability of ad-hoc networks. Deploying an energy-efficient system exploiting the maximum lifetime of the network has remained great challenge for years. The major concern in the wireless network in recent days is energy consumption. There are numerous algorithms proposed to overcome this issue. The Energy Efficiency Dynamic State (EEDS) algorithm is proposed. In EEDS the intermediate nodes are participating in routing and node energy is monitored all the time. Whenever there is an energy drop of 10% occur in intermediate node, new neighboring node will assign its work. Like this we save energy in the individual node, This will use to increase the network consistency also improves the lifetime of network. Our result is better than existing methods.

Index Terms— Mobile Ad-Hoc Networks, energy-efficient routing protocols, simulation analysis, network lifetime, energy efficiency dynamic state, grid formation

I. INTRODUCTION

MANET Stands for "Mobile Ad Hoc Network." MANET is a type of ad- hoc network that can change locations and configure itself on the fly. Because MANETS are mobile, they use wireless connections to connect to various networks. This can be a standard Wi-Fi connection, or another medium, such as a cellular or satellite transmission. Wireless ad-hoc network or MANET nodes are mobile, the link between the nodes breaks and re-establishes. Some nodes may enter the network and some may leave. In MANET communication is established by forwarding the packets from source to destination through the intermediate nodes. MANETs can operate in standalone fashion or they can be part of larger internet. They form highly dynamic autonomous topology with the presence of one or multiple transceivers between the nodes. According to a survey, [9] for energy consumption and save energy in individual nodes, by providing load balancing. To cope up with the dynamic nature of MANETs and memory and energy constraints of mobile nodes, use hierarchical concept, [2]. LEACH- Low Energy Adaptive cluster Hierarchy, in LEACH it will randomly distributes the energy among the nodes in the network. In MANET each nodes have wireless receiver and a transmitter. Ad-hoc Network is built for Special Purposes It Does not rely on the Base Stations. Every individual node participating in routing to forward the data to other nodes.To improve the quality of service & lifetime of network, we need to improve mainly 2 parameters that are "Throughput" is defined as the amount of data can be sent by source node per unit time, measured by bit per second & "Network Lifetime" is the most essential parameter, It is the time taken by the node at which it starts participating in routing until the node

running out of energy, we can achieve this using proposed method.[5] MANETs can be used in many applications ranging from sensors for environment, vehicular ad hoc communication, road safety, health, home,peer-to-peer messaging, disaster rescue operations etc.

II. PROPOSED METHODOLOGY

This work proposes Energy Efficiency Dynamic State (EEDS) algorithm. The network is divided into virtual grids based on the location, each virtual grid assigned with some nodes based on their current location. The nodes which are in same virtual grid can assign their works to the neighboring node within the same virtual grid. The proposed work describes three states Active state, Night mode state, Discovery state, and using these 3 states we can improve lifetime of network and its simulation is regulated by using Network simulator NS 2.35.

A. *Network formation:*

The network is divided into virtual grids based on the location. In 500x 500 square area is used to increase average hop length of a route with mobile nodes exist. Each virtual grid assigned with some nodes based on their current location. Every mobile node is moving based on the mobility data files In figure 2 shows the representation of virtual grid of the network, shows total 6 grids with 50 nodes. When the node energy drop of 10 percent occur, node assign it's work to the neighboring node within the same virtual grid.
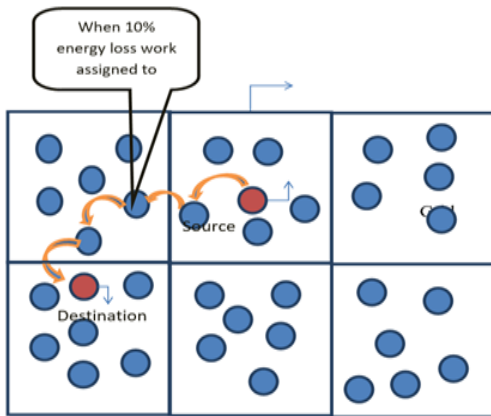
Fig.1 Grid formation

B. EEDS algorithm:

Following figure 2 shows that after grid formation based on location. The nodes which are actively participating in routing will be in Active state, when the energy of the node consumed up to 10 percent energy then the node will assigned it's work to neighbor node present in same grid and is moved to night mode state. In night state the node will be idle or inactive for a certain timestamp, the node will be idle and consume its energy so that it can be active in the network more than a stipulated time also here nodes energy will remain constant as it does not involve in any kind of process. The buffer size of each state is set to 5, this implies that any state can accommodate 4 nodes simultaneously since a free space should be for a new node entering the state, when the fifth node enters the buffer, the first node that entered the buffer will move towards the discovery state indicating that it is ready to participate routing process.
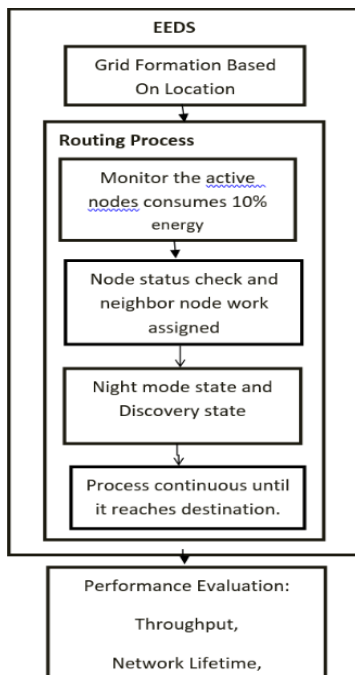
Fig.2 Flow Diagram of EEDS algorithm

In discovery state, the node consumes half of the energy when compared to the energy consumed by the active state since it triggers an alarm periodically indicating that it is ready to enter the active state. Similarly, when a node in active state loses 10 percent of it's energy and want to move to the night mode state, it sends request message to discovery state for a node to enter the active state. This process continues although the simulation for efficient energy management of each node in the network which in turn increases the overall network lifetime. EEDS algorithm is designed to enhance the network lifetime by continuously monitoring the individual nodes in the network.

C. Simulation Model Parameters:

In table no.1 shows, simulation is regulated by using ns 2.35. As we know that the network is divided into virtual grids based on the location, In 500 x 500 meter square area is used for grid formation to increase average hop length. Communication range is 100 m, packet size 512 bytes, number of nodes 50 etc.

Table No.1 Simulation Parameters

SIMULATOR	Network Simulator 2.35
NUMBER OF NODES	50
AREA	500m x 500m
COMMUNICATION RANGE	100m
PACKET SIZE	512 bytes
INTERFACE TYPE	Phy/WirelessPhy
MAC TYPE	IEEE 802.11
QUEUE TYPE	Drop Tail/Priority Queue
QUEUE LENGTH	50 Packets
ANTENNA TYPE	Omni Antenna
PROPAGATION TYPE	Two-Ray Ground
TRANSPORT AGENT	UDP
APPLICATION AGENT	CBR
SIMULATION TIME	100s, 200s, 300s, 400s, 500s

III. EXPRIMENTAL ANALYSIS

In figure 3, shows the Network animator is animation tool for viewing network simulation for 50 nodes, node 0 is Source node & node 1 is destination node also shows 6 grid with 6 different colors, grid 1 nodes shows in 'Steelblue color' with total 8 nodes, grid 2 nodes shows in 'blue color' with 8 nodes, grid 3 nodes shows in 'Dark green color' with 5 nodes, grid4 nodes in 'Magenta color' with 9 nodes, grid 5 nodes in 'dark red color' with8 nodes, grid 6 nodes in 'orange color' with 12 nodes, like this we did grid formation for total 50 nodes in ns2.35. As we know Simulation is regulated using Network simulator NS2.35.

Following figure 4 & 5 shows that, in EEDS sourcs node is 0 which forwards the data to destination 1.when an energy loss occur in any of the routing nodes the node will assign it's work to neighbor node within the grid. In figure 5 the

energy of the routing node is reduced new neighbor node with maximum energy is selected. Node 0 forward data to node 9, node 9 energy reduced and new node 36 is selected. The data packets forward through the new path.
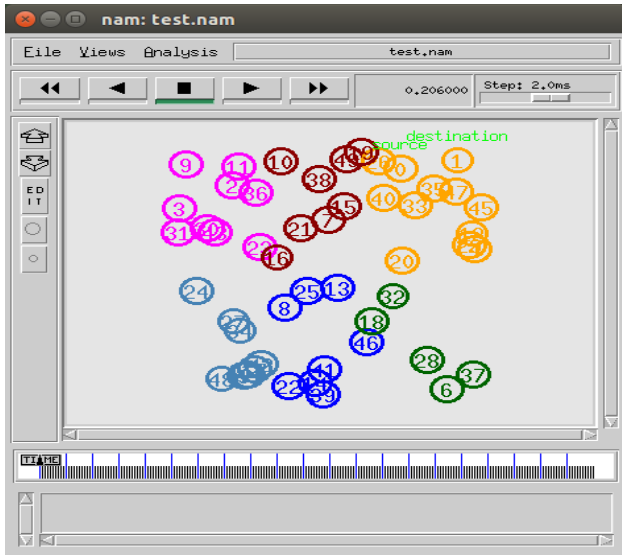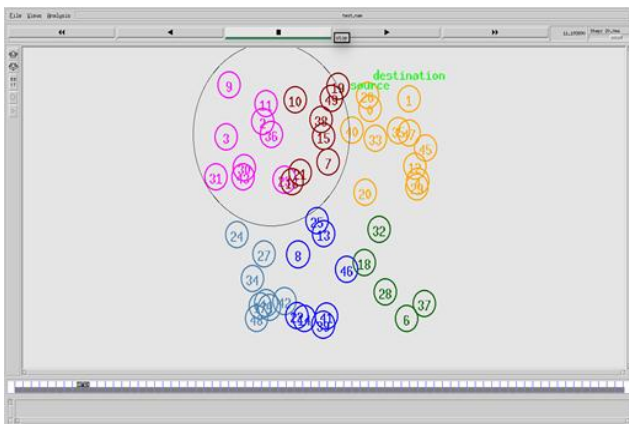

Fig.3 Network Animation tool in NS2
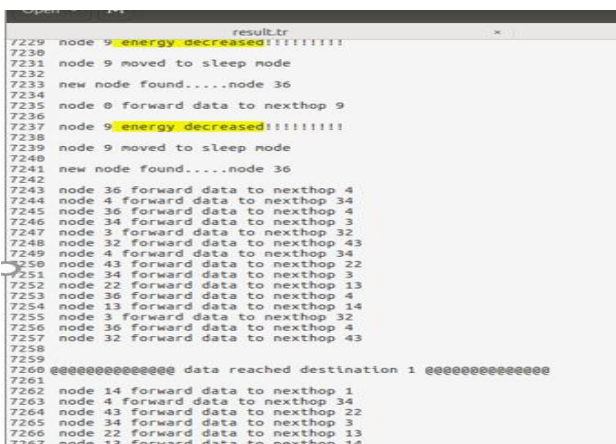

Fig.4 New Next hop Selection

Fig.5 Result.tr file

D. Performance Parameters:

The performances of proposed work based on Throughput and Network lifetime. Simulation time varies by 100, 200, 300, 400, 500 seconds, for simulation time Vs Throughput & simulation time Vs Network lifetime.

Throughput:- is the rate of successful data delivered to the destination per unit time,(typically it measured by bit per second(bps)).

Network lifetime:-is the time taken by the node at which it starts participating in routing until the node running out of energy. Network life increases as we save energy in the individual nodes.

E. Performances Evaluation:

Performance of proposed algorithm "Energy Efficient Dynamic State Routing Algorithm" (EEDS) compared with existing AODV and DSR protocols also compared with 'Energy-Efficient On-Demand Routing Algorithm (EEODR) and 'Hierarchical Routing Algorithm' (HR).

In figure 6, shows simulation time vs Throughput, simulation time in second & throughput in kbps. For increasing simulation time, the EEDS provides high throughput which is 1.53324 kbps as compared to AODV and DSR routing protocols, throughput is 1.34044 kbps & 1.30574 kbps respectively, for 100 seconds period of simulation time.

In figure 7, the network lifetime of EEDS is 772.39 KJ (kilojoules) much better than that of AODV and DSR routing protocols, having 220.94 & 264.67 respectively, for 100 seconds period of simulation time. In EEDS ,energy reduced node assign its work to high energy neighbor node and the neighbor node involves in routing. So the energy of the nodes are preserved, hence network lifetime improved.

In figure 8 the EEDS provides high throughput compared to EEAODR and HR algorithms, at 100 seconds EEDS shows 1.53324 kbps which is higher throughput as compared to HR and EEAODR. And In figure 9, the EEDS algorithm shows network lifetime better than that of EEAODR and HR routing algorithms. EEDS shows 772.39 at 100 seconds, better network life time as compared to HR and EEAODR.
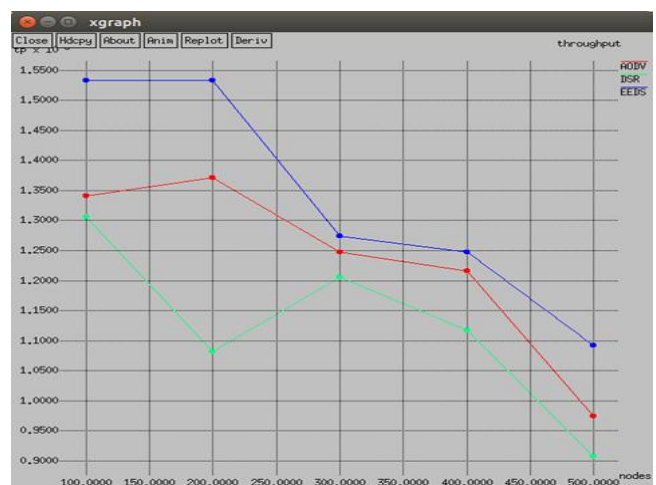

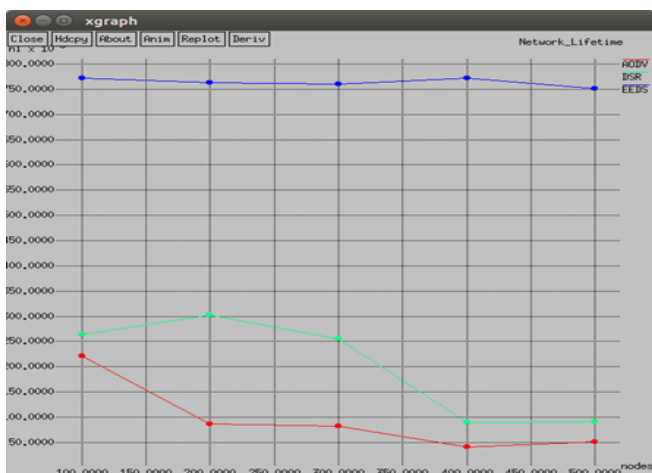**Fig.6 Simulation time Vs Throughput**

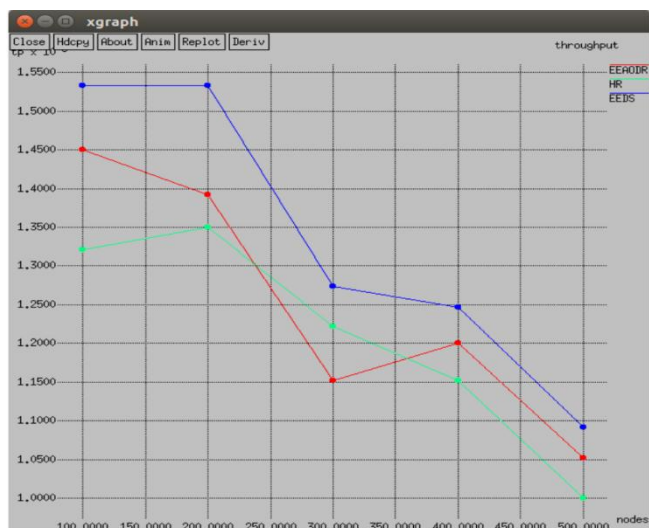**Fig.7 Simulation time Vs Network lifetime**
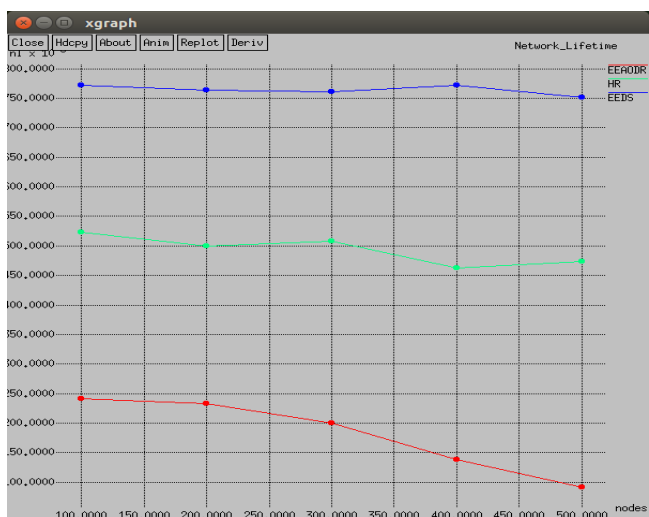

Fig.8 Simulation time Vs Throughput

Fig.9 Simulation time Vs Network lifetime

IV. CONCLUSION

The proposed algorithm "Energy Efficiency Dynamic State"(EEDS) routing algorithm enhances the node's performance throughout the simulation by maintaining the energy of the node. When intermediate nodes in the routing process consume 10% energy, the node will go to night mode state and new neighbor node assigns the work. Like this we can save energy in the individual nodes. In simulation results, EEDS provide higher 'throughput' which is 1.53324 kbps as compared to AODV, DSR Protocols and EEAODR, HR Algorithms. Also improved 'lifetime of network' which is 772.39 for EEDS, its shows much better results than AODV, DSR, HR and EEAODR network lifetime.

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Research Intuitions of Asymmetric Crypto System

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Abstract— The fast moving world full of data exchange and communication technology, with all sensitive information of an individual virtually available anywhere and anytime, make the Internet world more critical in security aspects. The areas of risks are attended and assured to be safe by means of some sought of crypto mechanisms. The strength and vulnerability of the crypto mechanism defines the durability of the system. The encryption on the communication channel can implement either public or private key algorithms based on the area of applications. The public key cryptography is specifically designed to keep the key itself safe between the sender and receiver themselves. There are plenty of public key cryptographic algorithms but only a few are renowned. This paper is aimed to collect all possible public key cryptographic methods and analyze its pros and cons so as to find a better algorithm to suite almost all conditions in Internet communication world and e-commerce. Research in quantum computers is booming now and it is anticipated that the supremacy of quantum computers will crack the present public key crypto algorithms. This paper highlights issues and challenges to be faced from quantum computing and draws the attention of network researchers to march towards researching on quantum-safe algorithms.

Index Terms— Asymmetric Cryptography, RSA, DHA, Elliptic Curve, Public Key Cryptography, Post Quantum Crypto System, Issues and Challenges in Crypto World

I. INTRODUCTION

This era of information technology creates a major concern on the security of the information and the methods of addressing the challenges of data security.

Cryptography is used in places of data storage and also in communication of data. Modern cryptography is classified into three, (i) Symmetric Key Cryptography (with a single key), (ii) Asymmetric Key Cryptography (with two different keys), and (iii) Hashing (without any key) which are shown in figure, Figure-1 below [1, 2].

Symmetric Key Cryptography deals with a single secret key shared by both users namely Sender and receiver whereas Asymmetric Key Cryptography deals with pair of related keys called private key (to be maintained secretly by the owner) and public key (shared by both users namely Sender and receiver). Hashing is a one-way cryptographic transformation using an algorithm (and no key).

A cryptographic algorithm must be secure against different attacks and must have a high processing speed. The efficiency of a security algorithm is based on the difficulty in obtaining the encryption key through the cyber-attacks. It is presumed that the larger the key size, the safer the system is. At the same time the increase in the key size simultaneously increases the computational complexity and the processing time of the algorithm.

Figure-1(a): Symmetric Key Cryptography Primitives

Figure-1(b): Asymmetric Key Cryptography Primitives

Figure-1(c): Hashing Cryptography Primitives

The field of quantum computing with its very large scale computing power which has been proposed in the 1980s, has recently garnered significant attention due to progress in building small-scale devices.

However, significant technical advances will be required before a large-scale, practical quantum computer can be achieved. Quantum computers, quantum encryption, post-quantum cryptography, quantum security, quantum proof, quantum resistant cryptography, quantum key space, quantum cryptographic infrastructure etc. all are similar sounding yet different. The swift changing era leads to swift changes in the world of security. The changes are taking so fast that it is difficult to understand the drift without ambiguity. Quantum security, quantum encryption and quantum cryptography all means the same wherein the cryptography is achieved by executing complex mathematical algorithms to hide the data and information from the eavesdropper.

Many researchers from academia and Industries foresee that a quantum computer will be able to implement Shor's Algorithm at a relevant scale in the next 10 to 15 years. Most recently, researchers have shown that quantum computing is capable of breaking the strong cryptographic primitives, such as Diffie- Hellman key exchange.

This paper is aimed to present a literature review on the research aspects of asymmetric cryptography. Since the design and development of asymmetric cryptography date back from the middle of 1970s, the research papers for the literature study are covered from the mid of 1970's to 2020. It is observed from the literature study that there are several

ongoing research works on new methods for encryption and decryption which will be more challenging to attacks by booming of large scale Quantum computers in the digital era.

All the research works in the literature papers have been thoroughly studied, analysed and a Concise Report of the Literature Study on the asymmetric algorithms is presented in section-II. Section III outlines the Current Scenario of the Crypto System and summarizes a few of the literature study carried out for the same. Section IV sketches out the Post- Quantum Crypto System and summarizes some of the major Issues and Challenges faced in developing Post-Quantum Crypto System. Section V summarizes the Inferences Observed from the Literature Study. Section VI concludes the paper with a further research focus.

II. LITERATURE SURVEY OF ASYMMETRIC CRYPTO SYSTEM

Asymmetric Cryptography otherwise called as a Public Key Cryptography provides two keys. These two different keys are private key and public key. A public key can be given to anyone and a private key must be kept secret as the key in symmetric cryptography. This asymmetric cryptography has two primary use cases: authentication and confidentiality. Using asymmetric cryptography, messages can be signed with a private key, and then anyone with the public key is able to verify that the message was created by someone possessing the corresponding private key. This can be combined with a proof of identity system to know the user, actually owns that private key, providing authentication.

Encryption with asymmetric cryptography works in a slightly different way from symmetric encryption. Someone with the public key is able to encrypt a message, providing confidentiality, and then only the person in possession of the private key is able to decrypt it and these processes are depicted in figure, Figure-2.

Based on these asymmetric concepts, various algorithms are introduced by several researchers. Some of the remarkable and noteworthy research works based the asymmetric crypto system are reviewed, analysed and summarized in this section as follows.
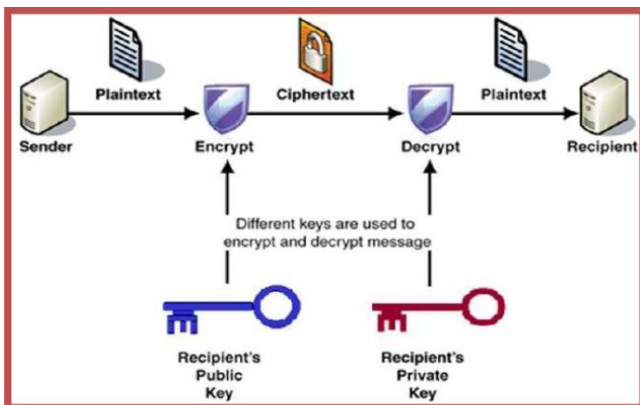

Figure-2: Asymmetric Cryptography Diagram

Diffie-Hellman designed the idea of public key cryptography in which the keys for encryption are shared between the sender and the receiver publicly but still the intruder could not get the actual secret key [Diffie et al., 1976]. Later their algorithm is referred to as 'Diffie Hellman Algorithm' (DHA) and till date, is considered a strongest method in public key cryptography. The well known RSA, Elliptic Curve Cryptography (ECC) all use this concept of Diffie Hellman by just generating the secret and public keys.

Rivest et al. presented a method for Obtaining Digital Signatures and Public-Key Cryptosystems which is the first secure Asymmetric cryptographic algorithm. Later, it is referred to as RSA Algorithm and then, followed the Diffie-Hellman logic of public key system. This concept gives an idea to a researcher in the field of cryptography of how to proceed when designing a new algorithm so that whoever reads the article can easily understand the value of the piece of research. The authors have concentrated on the privacy and security issues [Rivest et al., 1978] and developed encryption and decryption algorithms with mathematical prime values. However, the weakness of this algorithm is also discussed in the cryptanalytic approaches and proves how difficult it is to break the proposed RSA algorithm.

Tather ElGamal sketched out Diffie-Hellman key exchange and designed an 'asymmetric key encryption algorithm using algebraic properties of modular exponentiation along with discrete logarithm'. In this algorithm, a private key is used to produce the digital signature for a message and a public key is used to verify the signer's digital signature [Elgamal, 1985]. This algorithm is referred to as ElGamal algorithm, which is then published in GNU Privacy guard. ElGamal cryptosystem is usually used in hybrid cryptosystems because it is little slower than the symmetric cryptosystems and hence not widely used.

Victor Miller from IBM and Neil Koblitz from University of Washington designed and developed 'Elliptic Curve Cryptography' independently from two different places [Victor, 1986], [Koblitz, 1987]. The elliptic curve cryptography methods use the cubic curves that represent elliptic curves graphically. The equation of an elliptic curve is used to create the public key and the private key in a public key cryptographic system. A simple affine equation of an elliptic curve is ($y2=x3 +ax +b$). As the values of and varies, different curves are obtained. There are some curves on which successful attack can take place in sub-exponential time. If identified these curves can be tested and avoided. These curves are called super singular curves and anomalous curves and are declared by National Institute of Standards and Technology (NIST) of United States as not good for usage in cryptography.

Zheng et al. presented a distribution based Elliptic Curve Public Key Cryptosystem (ECPKC) by using the chord tangent group laws of Elliptic curve wherein the private keys are normal integers and the public keys are points on elliptic curve [Zheng et al., 1993]. This is a small variation inserted and implemented by the authors in algorithm.

Boneh et al. introduced 'Black Box Fields' (BBF) where in these BBF contains the secrecy of an algorithm that makes it strong. It was believed by the author that any cryptographic algorithm can be broken in sub-exponential time. The authors also insist that the hardness of solving the elliptic curve or the hyper elliptic curve is the security of the Diffie-Hellman protocol beneath it. Thus the authors generalized this scenario of manipulating the BBF on the rationales is as hard as factoring of integers [Boneh et al., 1996].

Dawn et al. designed an algorithm to search and store encrypted files and documents by querying the database where the encrypted information is stored. The authors have classified the queries as (i) queries from authorized and (ii) queries from unauthorized users [Dawn et al., 2000]. Their algorithm also supports hidden queries wherein the query is itself encrypted and then sends to the database server. The purpose of encrypting and storing the sensitive data is itself cracked with the notion of the authors; this paper is itself a cryptanalytic approach of the encryption done on the database. It should be kept in mind that the search engine designed may break the entire cryptosystem don day or other.

Wander et al. presented a proposal of 'Energy Analysis of Public-Key Cryptography for Wireless Sensor Networks' wherein the authors quantified the energy cost of key exchange and authentication of public key cryptographic systems using 8-bit microcontroller [Wander et al., 2005]. They concluded that ECC is advantageous than RSA as ECC takes lesser computational time, amount of data transmitted is lesser and stored data is also small.

However, it is now a known fact that the public key systems have overheads based on the key size used. Liu et al. delivered a different approach of Diffie-Hellman Public key cryptosystem (DHA) by implementing the neural synaptic matrix after permutation as a public key and a random permutation operation on the neural synaptic matrix as secret key using Java Program. The authors tested for the feasibility and inferred that their algorithm is feasible with better performance for secure communication.

This is based on the one-way function between the chaotic attractors and the initial states of Overstorage Hopfield Neural Networks (OHNN) [Liu et al., 2006]. The real time IPng secure communications could be done by using DHA. However, the authors themselves are not sure if this could be implemented in situations of other new type of attacks and so left it for future enhancement.

Silva et al. introduced a proposal of direct algorithm that was very simple and applied to the product of two different but equalized primes and was based on reversing the decimal digits of the modulus [Silva et al., 2010]. This algorithm required very less memory and was easily parallelized.

Wu et al. with a goal of studying time-efficient and space-efficient algorithms like RSA cryptography and El-Gamal Cryptography have mused on the modular exponentiations algorithms that are of practical significance in folded substrings which then improves the efficiency of the binary algorithm, and reduces the computational complexity of modular exponentiation.

The authors have made a detailed study on the mathematical concepts of modular arithmetic, Square-and-multiply binary method, signed-digit recoding method and Montgomery's reduction method and as it is time consuming because they involve repeated multiplications and scanning of bits in the plain text [Wu et al., 2012].

Alese et al. performed a comparative study using time lapse for encryption, decryption, key generation and the encrypted data size of different public key crypto systems like RSA, ElGamal Elliptical Curve Encryption and Menezes-Vanstone Elliptic curve algorithm [Alese et al., 2012]. The implementation of all these three algorithms are discussed in detail and the authors themselves say that these algorithms are used to eliminate the problems of primitive conventional methods but still they are not widely used as these algorithms are implemented with lots of overheads. ECC is widely used because it involves fewer overheads. So with no other go we are forced to accept ECC as there is no better algorithm to overcome these overheads with the same efficiency.

Mandal et al. designed an algorithm by combining the Diffie-Hellman algorithm and the RSA algorithm to provide a higher level of security for data. They designed the algorithms for both small as well as large sized data by choosing a random key pair from the set of RSA keys and one randomly chosen secret key from Diffie-Hellman algorithm and then applied the RSA algorithm to the public components of Diffie-Hellman algorithm to make it more difficult for the eavesdropper to access. Again the authors have used only the key generation methods of RSA and DHA; and used these keys in the Symmetric algorithms and evaluated [Mandal et al., 2013]. All the under bench flaws of these algorithms still persists and is just an eyewash as the attacks on symmetric encryption algorithms still exists.

Mohammed et al. have proposed Advanced Encryption and Decryption Standard (AEDS) by combining the properties of both AES and DES [Mohammed et al., 2019]. The authors studied the encryption and decryption time of AES and DES and found that the for a good cryptographic algorithm the encryption algorithm should take lesser time so that the hackers couldn't track the processing and the decryption algorithm should take longer time as it should be difficult to break the cipher text. These authors have made a comparative analysis of their proposed work, AEDS with AES and DES, on Windows, Linux-OS and Mac OS machines for encryption, decryption. They considered different strings and different file sizes. They calculated average encryption time, and average decryption time, as the parameters for their comparison and prepared a comparison chart for each and every result obtained.

Their comparative study concludes that brute force attack is nearly reduced than in AES and in DES. However, Encryption and Decryption time for AEDS more robust and secure than in AES and in DES. Pradeep et al. have introduced an Efficient Framework for Sharing a File in a Secure Manner using Asymmetric Key Distribution Management in Cloud Environment [Pradeep et al., 2019]. The data accessed or shared between various devices on the cloud environment which is likely to face many attacks like Identity Access Management (IAM), intruders hijacking a service or an account either internally or externally. Security is mainly resting on the key and every cloud provider takes more effort to protect the key. The authors proposed a new system wherein the exposure of keys and the framework is secured using a third party. The authors compared the new system using RSA, ELGamal and Paillier and suggested RSA as a better result. The authors have used a third party code for providing security which can also be a threat to the entire cloud system.

Khider et al. have introduced Hybrid Cryptography and Steganography Method to embed encrypted that message within image, as a hybrid security system wherein the message to be transmitted is first encrypted to cipher text by using RSA algorithm [Khider et al., 2019]. Then the produced cipher text is embedded into an 800x600 pixel image using the least significant bit insertion method. The authors took this invention as to give a new method of message hiding a small application where the security is increased by combining two different message hiding techniques.

The accuracy of the final embedded image is analyzed for accuracy using Mean Square Error (MSE) metric and Peak Signal to Noise Ratio (PSNR) metrics. A high PSNR value and a low MSE value proves that the message hiding is good and had not caused too much of drifts in the image. The Key of RSA is itself huge in some situation wherein a smaller system is required; here in this system, the key of RSA is hidden in the image at the cost of more storage space, this is itself a drawback to implement their work.

III. HOT SCENARIO OF CRYPTO SYSTEM

In 1994 Peter Shor an American Mathematician invented an algorithm for integer factorization to find the factors of a given integer number N. This has become a threat to the field of cryptography as quantum computers that could work with subexponential time can function faster than expected.

The Shor's algorithm is efficient in quantum Fourier transform and modular exponentiation by repeated squaring thus it is feasible to defeat RSA by constructing a large quantum computer. This has lead to research in new crypto systems such that it is secure from quantum computers.

Due the high speed in the processing of the quantum computers the asymmetric-cryptography methods will be cracked and at the same time symmetric cryptographic methods will be able to withstand the quantum attack. This change in the scenario has divided the entire cryptography world into two parts as post-quantum cryptographic era and pre-quantum cryptographic era. Some of the post-quantum cryptographic supporting papers are as follows.

Bernstein et al. published a paper to ponder into the many commonly used cryptosystems that breaks by the existence of large quantum computers. Postquantum cryptography is cryptography world where it is assumed that the attacker has a large quantum computer and the post-quantum cryptosystems fights hard to remain secure even in this situation [Bernstein, 2009]. The challenge for the young cryptographic researchers is that identifying a mathematical operation that could withstand the quantum algorithms. The major challenge is to meet the requirements for cryptographic usability and flexibility without compensating on confidence.

Jasmin et al. presented another approach of public key encryption algorithm which was meant to avoid long and complex computation of conventional popular algorithms. The authors made a detailed survey in the key generation mathematical foundation of each and every popular algorithms both symmetric and asymmetric algorithms, found that the public key cryptography schemes are all passive for three decades and finally concluded to leave the invention of a new algorithm to the hands of future researchers to generate a new algorithm that could solve the problems of all the available algorithms of cryptography [Jasmin et al., 2018].

William et al. is a NIST authorised draft published to inform the public about the migration of cryptographic technologies to post-quantum cryptography after the standardization process is completed [William et al., 2020]. Cryptographic technologies are used almost everywhere in industry and in government to protect the confidentiality, authenticate the source and integrity of information that are stored and communicated. This paper also introduces adoption challenges associated with postquantum cryptography after the standardization process is completed. The authors explained how the cryptographic technologies get affected by the introduction of quantum computing including the popular and secure RSA public key cryptography. The authors also discussed the planning requirements for migration to post-quantum cryptography. In the conclusion the steps to help to migrate to post quantum cryptography are given.

Fernández et al. concentrated on the current situation of post-quantum cryptosystems and their applications to block chains and Distributed Ledger Technologies (DLT) [Fernández et al., 2020]. The most apt postquantum block chain systems and their challenges are studied. A comparative analysis is done on the characteristics and performance of the most promising post-quantum public-key encryption and digital signatures for block chains. The article provides a broad view and good guidelines for post-quantum block chain security as an eye-opener for the future block chain developers and researchers.

Borges et al. the two major mathematical primitives that assure the security of cryptographic algorithm are Factorization problem and discrete logarithm problem [Borges et al., 2020]. Shor's quantum algorithm easily breaks these problems and hence a necessity for a new cryptographic algorithm that could run on classical computers and are resistant to quantum computing arises. This area of research is called post-quantum cryptography and is usually dealt with asymmetric cryptography.

IV. ISSUES AND CHALLENGES IN DEVELOPING POSTQUANTUM CRYPTOGRAPHY

Post-quantum cryptography is the era wherein the algorithms like Shor's algorithm came into the scene and made the attacking process also in the same way as the cryptography algorithm was used. Now for every Quantum-cryptography there can be a Quantum computer to break this algorithm. This lead to a threat to the entire cryptographic world, which involves uses complex mathematical calculations, mostly Asymmetric Public Key encryption. This issue is temporarily solved by using Quantum-key space wherein the keys of the asymmetric public key cryptography are transmitted in the form of photons rather than binary digits. In this case if an eavesdropper tries to trap the photons it changes state and key will fail resulting in the loss of information to both the sender and the receiver too. This is leading cryptographic science to a new era of post-quantum cryptography. Post-Quantum cryptography (PQC) is algorithms that could resist the attacks from quantum computers.

With anticipated Quantum Computing, there are several issues and challenges to be addressed [Helena, 2020], [QT_Timeline_Report, 2019], [Naoyuki , 2019], [Ding et al., 2017].

Some of the major challenges are the (i) Key Size, (ii) Public Key Infrastructure, (iii) Devices in IoTs, (iv) Security Services, (v) Composite Keys and Signatures for Use in Internet PKI, (vi) Multiple Public-Key Algorithm X.509 Certificates, and (vii) Multi- Algorithm PKI and these are briefed below.

i. Key Size:

The key size is one of the major problems in postquantum asymmetric cryptography wherein a few thousands of bits long key is required to be used thus causing storage overhead.

ii. Public Key Infrastructure:

Public key infrastructure (PKI) when used in public key cryptography it requires more bandwidth to communicate between the devices on the Internet.

iii. Devices in IoTs

Nowadays edge computing and IoTs have become more ubiquitous, and creates a major challenge where the edge devices with limited computing and power processing facilities are prone to quantum attacks. Rambus a standardising organization for electrical and electronic devices believe that security becomes hardware dependent rather than software driven.

iv. Security Services

The mathematical algorithms in the classical and quantum cryptosystems are not well studied yet so the possibilities to attacks on the unread methods are easily possible.

v. Composite Keys and Signatures for Use in Internet PKI

The entry of post-quantum cryptography has lead to the necessity to assign different structures for holding composite public keys in different algorithms. This is because the trustworthiness of the individual postquantum algorithm is not assured.

vi. Multiple Public-Key Algorithm X.509 Certificates:

This document describes a method of embedding alternative sets of cryptographic materials into X.509v3 digital certificates, X.509v2 Certificate Revocation Lists (CRLs), and PKCS #10 Certificate Signing Requests (CSRs). The embedded alternative cryptographic materials allow a Public Key Infrastructure (PKI) to use multiple cryptographic algorithms in a single object and allow it to transition to the new cryptographic algorithms while maintaining backwards compatibility with systems using the existing algorithms. Three X.509 extensions and three PKCS #10 attributes are defined, and the signing and verification procedures for the alternative cryptographic material contained in the extensions and attributes are detailed.

vii. Multi-Algorithm PKI:

Hybridized cryptography is compelled by Postquantum community (for example, surrounding the NIST PQC competition) that combines RSA/ECC with new primitives in order to hedge the challenge against both quantum adversaries.

V. OBSERVATIONS AND INFERENCES

Even though message hiding exists from the Palaeolithic age as Egyptian hieroglyphs, Mesopotamia's clay tablets, Cryptography a science of secret messaging came into existence when substitution and transposition of letters of message came into existence.

The Ceasar Cipher, Vigenere algorithm, lead to secret transmission of messages during the World War II as Germany's Enigma machine Japanese's M-1 machine, where machines were used to substitute and transposition the letters of the message.

Later the modern cryptography where in the keys were used to digitally gibberish the readable plain text there were plenty of symmetric cryptographic methods where same key was used to encrypt and decrypt a message.

Later a revolution in the field of crypto science evolved from Diffie-Hellman Algorithm (DHA), RSA and ECC. The DHA algorithm is a key exchange algorithm that

worked in a public network. Using the concepts of DHA, RSA was invented as a new era of public key cryptography systems such as Pretty Good Privacy (PGP). ECC is also a predecessor of DHA where the keys are generated by affine elliptic curves.

These algorithms worked with strength of difficulty in Factorization, discrete logarithmic problem and elliptic-curve discrete logarithm problem. Brute force is an effective attacking method of collapsing most forms of cryptography methods with a patience of waiting till the key space is exhausted. Man-in-the-middle attacks could break the cryptographic algorithm. Using simple passphrases and passwords as secret keys in cryptographic algorithms can result in adverse effects, and improperly stored private and public key can cripple the entire cryptosystem.

Conceptual computer that could work on algorithms used in quantum mechanics are called quantum computers. By the invention of Shor's algorithm the quantum computers were able to break the toughness of the asymmetric algorithms. This has become a threat to the world of cryptography.

NIST started the Open Quantum Safe (OQS) Project in the late 2016 to fight against attacks called postquantum cryptography with potentially quantum safe cryptographic algorithms.

Hence, there is a potential need to face post-quantum attacks and rethink of a new kind of secured crypto system other than Symmetric / Asymmetric / Hashing Crypto Systems that will work with quantum computing and classical computing as well. Designing a new set of encryption decryption algorithms, the following parameters are to be considered; o Current key sizes and hardware/software limits on future key sizes and signature sizes o The key size used in the existing system, hardware and software resource limits and future possibilities of the key sizes and signature sizes

o   Threshold of throughput and latency
o   Protocols and procedures used for crypto mechanisms negotiation
o   Existing handshake rules and key establishment procedures
o   The place of execution of cryptographic process in the stack
o   The method of calling and activating the cryptographic process (using a function included in the operating system or calling a new application, or using cryptography as a service)
o   Identify the owner(s), supplier(s) or standardizer(s) of the hardware or software process
o   Generation Source(s) of keys and its certificates
o   Legal conditions and contractual applied on and by the supplier(s)

o   Reason for migration from existing system to new system.

VI. CONCLUSION

The cryptography techniques discussed in this paper gives a clear idea that the current available cryptographic methods are becoming bizarre, is like a new wine in the old wineskin. Hence a new methodology to meet the current situation, to survive the attacks from a quantum computer must be generated.

During the post quantum standardization a new wineskin is required to hold the new wine. Adding plug-in to the existing crypto algorithms to generate quantum resistant cryptosystem will be an interesting journey for both cryptographers and practitioners.

VII. ACKNOWLEDGEMENT

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Sniffer Mail

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Abstract— One of the essential services on the internet is the Email Service. The Email server can be vulnerable to several types of cyber-attacks. This research aims to analyze and improve the Email service. This mail is the process of following the path and function performed by the receiver on the received mail. The development of this system serves as a secure way of mailing. The tracking and notification feature is aimed at providing proof of reading mail. The Notification Messages can be sent to either sender's mail Id or if given to the sender's mobile phone. The retractable emails are aimed at providing a means by which the sender can delete his mail even after sending it. This can be used when a person sends a mail to the wrong mail id. The block backup feature provides a means of preventing printing, saving, and copying the mail contents. This can be used for secured mails that are not intended for manipulation. Then self destructible mail is also a similar security add-on but in a different context. This feature aims at preventing achieving of the mails in the receiver's mailbox folders. The whole system's working style is abstract to the end-user and provides a feature-rich secured way of mailing.

Index Terms— Encryption, decryption, key, RSA algorithm

I. INTRODUCTION

The project is aimed at developing communication among colleagues about the project via email. The purpose of the project is to enhance the security among the communication of workers. It allows the sender to be aware of when and how this mail reaches the client and what the receiver does with it. There are two types of users, desired users (they are in the same team) and undesired users(they belong to different teams). The admin decides who are desired, users, and undesired users.

In our project, we have a notification feature that is aimed at providing proof of reading mail, which hardly any mail service offers. The notification messages are sent to the sender's mail id and vice versa. The block forwarding feature is a worthy alternative for mail encryption. Encryption is done to prevent access from undesired users. In the same way, this feature prevents unintended users from viewing the mail. In this system, once the receiver deletes the mail, it is automatically sent to the administrator. The administrator views the deleted mails in the form of a document.

II. LITERATURE SURVEY

In 1995, Daniel l. McDonald enlightens the merits of one type pad by launching a software name done time passwords in everything (OTP) that diverge from S/key (Password sequence of authentication)during designing. OPI defeats password sniffing attacks. He provided security from various attacks like shoulder surfing. Shoulder surfing is a technique to maintain view by direct observation to gain information. It is commonly used to obtain passwords, PINs, security codes, and similar data.

In 2006, Susan gave information that when the user inputs password publicly, the rate of risk of attackers of stealing password increases. The attacker easily captures the password by following the user's authentication process. This is known as shoulder surfing. Super valiance is the best solution for dealing with shoulder service. Susan developed and evaluated a game like graphical authentication method known as convex hull click(CHC). CHC inhibits users from knowing about a graphical password safely in dangerous locations as users can quickly go to a password image. Password sniffing creates lots of problems as the transfer of passwords goes in the same

format through a communication medium. HTTPS needs a secure cover to make encryption sessions during browsing.

In 2009, Adam Barth provided defense against content sniffing XSS. They construct a model content sniffing algorithm that offers security and also maintains compatibility having four major browsers. Web browser teaches the algorithm to work on the Content of HTTP responses and MIME type of the server. If the attacker detects this algorithm, he can easily lead to cross-site scripting (XSS) attack. In his study, he found models of this algorithm with the help of four major browsers.

In 2012, Syed Imran Ahmed Quadri [3] provided security against attacks for client and server sites. In his research paper, this security framework provides prevention methods for server sites and works from client sites. This works against Content sniffing attacks. This security is important to prevent phishing sites by file splitter technique. The demerit of this framework is that it doesn't work against the browser as it treats non HTML files as HTML files. He proposed a security system to detect Content sniffing in server-client relations as it secures the server and warns the client site.

In 2012, Usman Shaukat Qureshi provided modern web applications to internet users by launching AJAX, which reloads pages and updates only important sections of web pages. It consists of a large number of essential components that deal with HTTP requests, HTML codes, client &amp, and server-side scripts. It consists of different layers that provide various threats in web applications, leading to a large number of attacks. For example, Content sniffing

attack, Mal- advertising attack, CSR forgery attack, XSS attacks, Man in the middle attacks, and Clickjacking attack. They focus on improving the security of web applications (AJAX).

III. ELECTRONIC MAIL SECURITY BY USING MESSAGE ENCRYPTION AND DIGITAL SIGNATURE

Now a day's electronic mail is one of the most widely used applications on the internet. Using email, internet users can send and receive messages from other internet users. Simultaneously, the security of an email is an essential issue while sending sensitive information, like bank transactions, commercial secrets, even the country's intelligence information being delivered through emails. To achieve email security, we need to use such a mechanism that provides security to these emails. We can use the S/MIME (Secure Multipurpose Internet Mail Extension) for secure email communication. So, in this paper, I present the review of the security mechanism provided by S/MIME, which has been an industry standard for secure email exchange.

IV. IMPLEMENTATION

4.1 Problem description:

At present, many existing mail clients provide very fundamental features such as reading, forwarding, moving, deleting, etc. But they do not provide proof for reading the mail, security features such as block forwarding. The aforementioned is an email acknowledgment system that resolves the issuer above deletes the mail-in Trash, that mail cannot be retrieved later. Our project aims to enhance security and communication among co-workers. Here, the admin plays a vital role where he/she decides the status of his/her employees. There are two types of users.

1.Desired users

2.Undesired users.

Every user has their username and password. If the sender and receiver are desired users, the sender sends the mail to the receiver, and this notification message is sent to the receiver's mail id. The receiver views the mail only through the product. After the receiver views the mail and this notification is sent to the sender's mail id.

If the sender and receiver are undesired users, the process is the same as in the desired users, but the security key is generated automatically while the receiver receives the notification message. The receiver views the mail in the form of a ciphertext (encrypted mode). After the receiver uses the security key and views the mail in the way of plain text (decrypted mode), the administrator views all user details, sent mails, and deleted emails.

4.2 Methodology:

Our system consists of several modules.

4.2.1 Module 1:

Authentication:

The user goes through a registration process. His/Her profile details are stored for giving information such as Name, Address, Mobile number, Mail id, Date Of Birth, Father's Name, User name, and password. To the provided user name and password facility and credentials should be appropriately checked at the time of login.

4.2.1 Module 2:

Notification:

The Notification Module provides proof for reading the received mails. The Notification Messages are sent to the receiver's mail Id while composing messages and also sent to the sender's mail Id while reading received mails.

4.2.3 Module 3:

Admin:

In Our Project, the admin plays a vital role. He decides who should be the desired users and undesired users. He can view all the details of desired and undesired users. He also views the sent mails and deleted mails by the users. Once the receiver deletes the mail, it will be stored as a document and sent to the admin.

4.2.4 Module 4:

Desired user:

All the users have their username and password to use the product. The desired users communicate with each other easily. The users compose the mail to another desired user. Then that receiver will receive the notification from his/her personal mail. Once the receiver views the notification, then the sender gets a notification to his/her personal mail id that the receiver has viewed the message.

4.2.5 Module 5:

Undesired user:

If the employee is an undesired user, then he/she sends the mail from the product to another user. Then the receiver receives the notification from his/her personal mail. But here the receiver will receive a security code using that code he/she can view the message from the product

4.2.6 Flow diagram:

4.2.6.1 Admin panel:

4.2.6.2 User panel:

V. RESULT

The system consists of five modules. They are authentication, notification, admin, desired user, the undesired user. The user can securely send the mail.
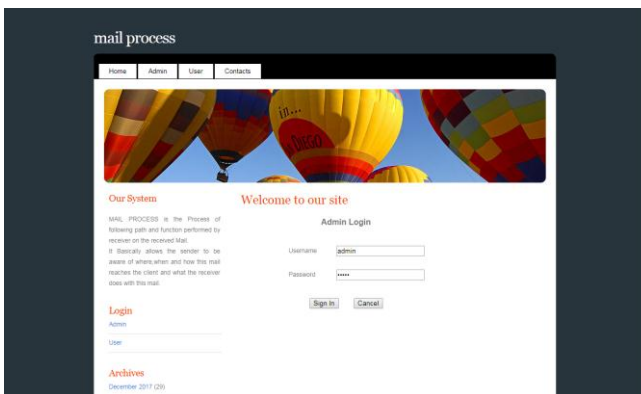
Sniffer Mail

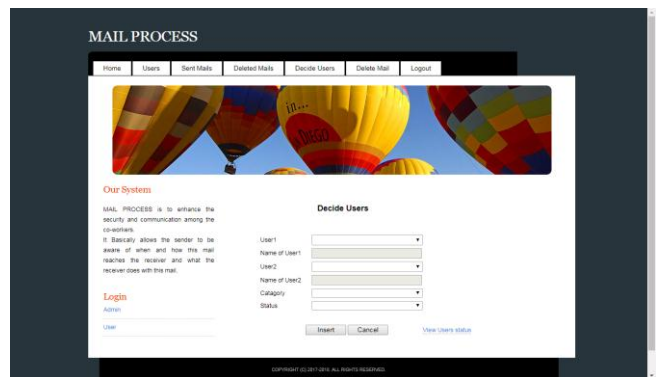**Fig 1: The admin can enter their user name and password on this page. They can monitor the user's activity.**
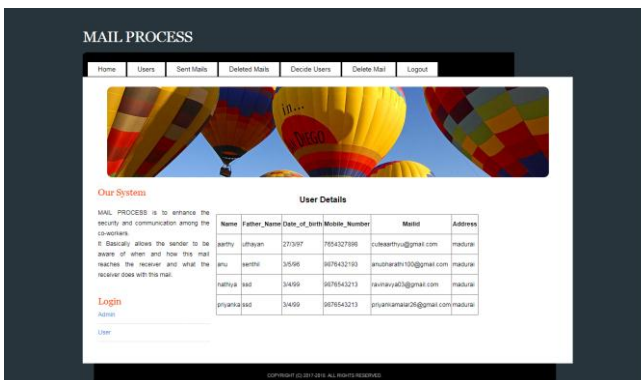

Fig 2: The admin includes the user details provided by the user at the time of user signup.

Fig 3: Sender's mail details in admin login.

Fig 4: Mail process deleted mail

Fig 5: Send the mail to the desired user.
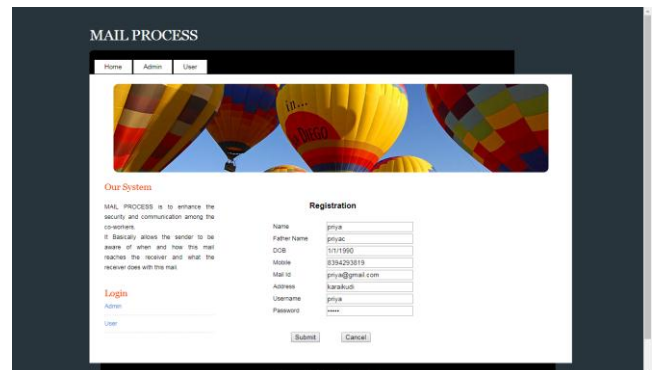
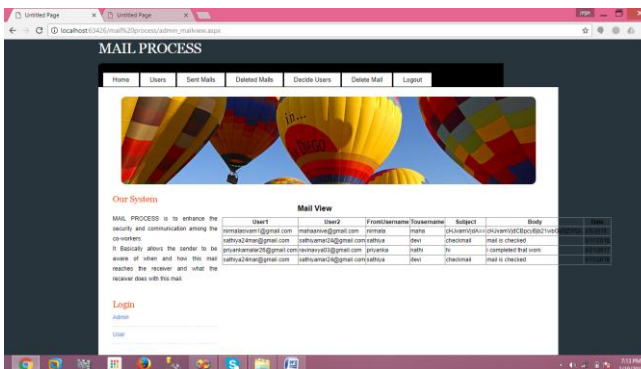**Fig 6: Registration page. If a user wants to send the mail first, they have registered the user form.**
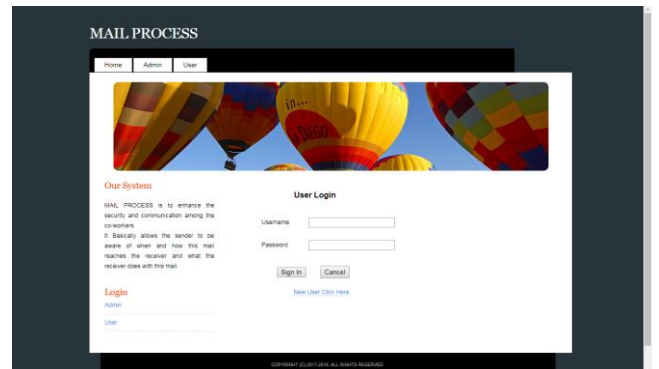

Fig 7:User login page. It includes the user name and password.

Fig 8: Compose mail

Fig 9: User inbox.

VI. CONCLUSION

It provides security to the member's personal information by giving a user id. This site has further enhancement facility, and subscribers can feel free to use this site. This package developed is tested with sample data, which were to provide satisfactory results. After the system has been implemented, the system's maintenances should be very easy so that the forthcoming changes can be made quickly. This has been developed is so flexible that the change can be made promptly.

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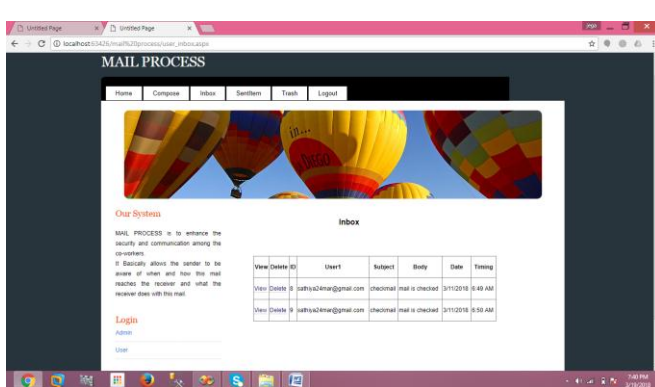
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A Study of Stress Creating Elements among the Women Professionals in IT Sector

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Abstract— The occupational stress is becoming a stumbling block for all types of organizations. Information Technology based organizations are not an exception in this regard. Pune, which is also known as IT hub and among the top ten workplaces in India, where stress levels due to work are very high. Extended exposure to such stressful situations prompt to a draining and exhaustion of resources in the mind and body, with deterioated effects on job performance and overall organizational effectiveness. This situation is grueling for IT employees and they are not able to cope with the new rapid changes in this sector which results in stress. This study explores the influence of stress creating elements among women information technology (IT)professionals in Pune, India. In the current lifestyle of utmost complexities, the stress level is raising at a remarkable rate. The factors that contribute to stress not only differ between cultures, but also within the culture itself, from a sophisticated to a conventional, the ultimate necessity is the job, may it be a business or a salaried job. The result of the study shows that there are innumerable causes of stress in spite of the efforts made to reduce occupational stress among the IT employees. This study indicates that, majority of employees faced physical as well as psychological stress due to heavy workload.

Index Terms— Stress, Depression, Women IT professionals, Occupational stress, IT companies

I. INTRODUCTION

Information technology (IT) industry in India has played a huge role in putting India on the global map. IT industry has been one of the most significant growth contributors for the Indian economy. The industry has played an outstanding role in launching India as a global player in providing world class technology solutions and business services and established India's image from a passive bureaucratic economy to a land of innovative entrepreneurs. Software job is stressful job and require different sets of knowledge and skills from understanding of clients" requirement to the maintenance phases.

Hence, multiple workforce are involved in a cycle, like business developers, project managers, system analysts, programmers, coders, and quality assurance people; apart from other consultants who provide the insight into the domain knowledge of the area in which software is developed. Work efficiency of employees is the most significant factor in the growth and development of any organization. The work performance is concerned with physical and psychological well-being of the employees. The IT sector organizations have been facing many challenges in this context. Occupational stress is an inevitable factor on the part of the IT employees as the systems, procedures and advanced technology is getting complicated each day. It is far off from the employees capacity to cope with such changes taking place in their jobs. This situation urges the stress among IT employees.

Stress

Stress at work is a relatively new phenomenon of modern lifestyles. The word, STRESS" has been derived from Latin word, "Stringere" which means to draw tight. The term is used to refer to hardship, strain, adversity or affliction. Various terms have been synonymously used with stress such as anxiety, frustration, and pressure. Hans Selye (1936), who defined it as "the non-specific response of the body to any demand for change"while Kellie Marksberry (2017) defined Stress is not a useful term for scientists because it is such a highly subjective phenomenon that it defies definition.

Occupational Stress

Occupational Stress is stress at work. Stress is defined in terms of its physical and physiological effects in a person. Stress is mental, physical or emotional strain or tension or it is a situation or factor that can cause distress. Occupational stress occurs when there is a discrepancy between the demands of the workplace and an individual's ability to carry out and complete these demands. Often a stressor can lead the body to have a physiological change which in turn will cause physical as well as mental strain.

II. REVIEW OF LITERATURE

The literature cites the various studies conducted in this area. The some of the studies are very important.

Praveen (2009) investigated occupational stress experienced by working and non-working women of Hyderabad city. A sample of 180 working women was taken out of which 90 were married and 90 were unmarried. These two groups were analyzed by organisational stress scale. Five-point Likert scale was used. It was found that unmarried working women experiences low stress as compared to married women. It was concluded that household responsibilities, marital adjustment, child caring issues and family relationship are the sources of stress for married working women.

Uma Devi T. (2011), has highlighted the wide spread silent problem by name 'stress' which caused for, acute dysfunctions, diseases and other harassments. Author has

observed that, the occupational stress is found in IT employees because they are highly target driven and highly pressured on results. Through this study author has focused on the stress level of IT employees, identified stress management programs, Physical functions included in job design and life style modification programs, Spiritual programs. Author has concluded that, occupational stress problem become contemporary, being an occupational hazard in fast pacing IT profession needs to be addressed promptly.

Gladies J. J. & Kennedy V.(2011)-study revealed a significant correlation between Organizational Climate and Job Stress among the women working in IT companies of India. According to him, learning how to manage stress is a very crucial issue that should be developed in IT companies so that they can reduce or eliminate the causes of stress and poor working environment.

Sharma S., Sharma J. & Devi A.(2012)- The level of stress within a role varies because of individual differences in mindset, age, gender, and their performance in job. However, various factors that influence stress are age where the younger employees are more stressed as compared to other employees, level of qualification, pay, authorities of control, awards, word of praise, improved designations and working couples. The study recommended a reinforcement approach that should be positive in nature so as to reduce the degree of stress at the workplace.

Srivastav A.K. (2010)– The articles focus on the nature of role that causes stress. It says role performance encountered the problems of stress so they should be tried to reduce or eliminated. The nature of role stress was found to be heterogeneous which cannot be dealt with one uniform solution or intervention as a whole. Hence, specific problem related solution or interventions should be adapted for better organizational performance and effectiveness.

Michailidis M. and Georgiou Y. (2005)- The author focus on the degree of occupational stress that is influenced by the factors like level of education, various patterns of their relaxation and any other habits like drinking or smoking. The implications say that consuming alcoholic drinks is the main factor that determines the degree of occupational stress in an individual.

Bhatti N. ,Shar H. A., Shaikh F. M. &Nazar M. S.(2010)- He has classified stressors broadly into two main types-a) Extra-Organizational and b) Intra-Organizational Stressors. According to his study he predicted that the major causes of stress are firstly workload that causes 25% of stress, secondly timings that results 16% of stress, thirdly climate that causes 11% of stress.11 occupational stress and job satisfaction. It is suggested that conduct of seminars and presentations, open door policy, feedback system and periodical review of occupational stress should be adopted to reduce stress.

The above studies have touched the various aspects relating to occupational stress among working women in the different countries of the world but only few studies seem to have touched the area relating to occupational stress among working women at the regional or State level. The present study proposes to fill the gap in existing literature.

Chatterjee and Amitava 2002), According to themit is difficult to note how demand characteristics alone qualify as stressors. In some circumstances time pressure and workload would initiate anxiety or frustration that might further distract or interfere with performance. However, it is not important that this would necessarily be so in most of the situations. They also punctuated that the direct and indirect stressor carry significant role in influencing an individual stress level.

Pestonjee D.M 1992) defined occupational stress as a condition arising from the interaction of people and their jobs and characterized by changes within people that force them to deviate from their normal functioning.

Aziz (2004)15 investigated the intensity of ORS among women IT professionals in the Indian private sector and found differences in the level of stress between married and unmarried employees on several role stressors. Another substantial factor is the fact that stress causes a high cost on individual health and wellbeing. In the same direction the study of **Cooper, Dewe& O'Driscoll, (2001)lg**. , **Wirtz et al. (2013)** and **Ramya, P. and Mallika, N. (2014)** also identified the various factors related to stress creation and also the relief of the stress.

III. METHODOLOGY

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Research methodology is the specific procedures or techniques used to identify, select, process, and analyze information about a topic. The methodology section allows the reader to critically evaluate a study's overall validity and reliability.

IV. RESEARCH DESIGN

The study explores the elements of stress and depression among women employees in the IT industry based on their age and experience. The study uses a descriptive research design. A survey was conducted among the women IT professionals with the help of a structured questionnaire.

V. SAMPLING FRAMEWORK

The study was conducted in Pune, India. Pune has the maximum number of software concerns in India. The software industries in Pune have extended their business in all areas, namely, software testing, development, programming, and maintenance of projects. Accordingly, Pune is the most suitable place to conduct this research in India. In this study, the researcher adopted a random sampling technique for selecting the sample.

VI. SAMPLING TECHNIQUE

In this study, the researcher adopted a random sampling technique for selecting the sample. Random sampling refers to a variety of selection techniques in which sample members are selected by chance, but with a known probability of selection. Most social science, business, and agricultural surveys rely on random sampling techniques for the selection of survey participants or sample units.

There was no bias in the responses in using the random sampling since the respondents voluntarily participate in the survey. As the respondents show interest in completing the questionnaires, the error rate will be minimal. Many Internet surveys are conducted with volunteer respondents.

VII. DATA COLLECTION

The primary data (the respondent's opinion about their role stress and depression) were collected by questionnaire. Face to face questionnaires are conducted by an interviewer asking questions of a respondent in person. Some companies has their strict protocols for their employees on providing information and entry of outsiders in their office premises where interviewer has handover the hard copies to the respondents and requested to respond back by mail.

The tools used were the structured questionnaire, in-depth case studies. For this qualitative methodology is deployed.

VIII. UNIVERSE OF STUDY

- Universe comprises all IT industries located in different part of Pune city and enlisted in NASCSOM. *(National Association of Software and Services Companies).*

- Total No of companies 1700

- No of companies deployed more than 350 women workers are 85.

- Out of 85 companies 4 companies were selected, where more than 350 women are employed. Co- operation of the company was the base for random selection.

- For selection of company Random_Sampling Method was used.

IX. CRITERIA FOR SELECTION OF THE RESPONDENTS

- Women employee working in IT industry.

- Minimum 3 year of work experience in IT Industries.

- Age ranging between 25- 40 years.

- Employee must be engaged in:

  a. Software development

  b. Computer application field.

  c. Generation of data or data management, data storing or data mining.

  d. Image processing or software testing.

  e. Any other aspect related to software development.

f. Working in shifts

X. TOOLS OF DATA COLLECTION:

- Structured questionnaire distributed among the women employees through management.

- Data is collected through self-administered inventory.

- Adopted inventory by making some modification

XI. DATA ANALYSIS AND INTERPRETATION

Table-1Age wise distribution of selected respondents

Company	N=%	<30	31-40	41-50
TCS	N	66	32	8
	%	62%	30%	8%
Infosys	N=	56	48	6
	%	51%	44%	5%
Persistent	N=	51	52	2
	%	49%	50%	2%
Cognizant	N=	35	40	4
	%	44%	51%	5%
Total	N=	208	172	20
	% Total	52%	43%	5%

In this research study age of the respondents are grouped into three categories: (l) less than30 years, (2) 31-40 years, (3) 41 – 50 years. About half of the respondents are below 30 years of age group followed by 43% between 31 to 40 years and hardly 5% above 41 years. In TCS (Tata consultancy services) the proportion of the respondent below 30 years of age group is 60 to which the years as compared to rest of the three followed by 31% in Infosys and almost 49% in Persistent The proportion is observed in Cognizant that is 44%.
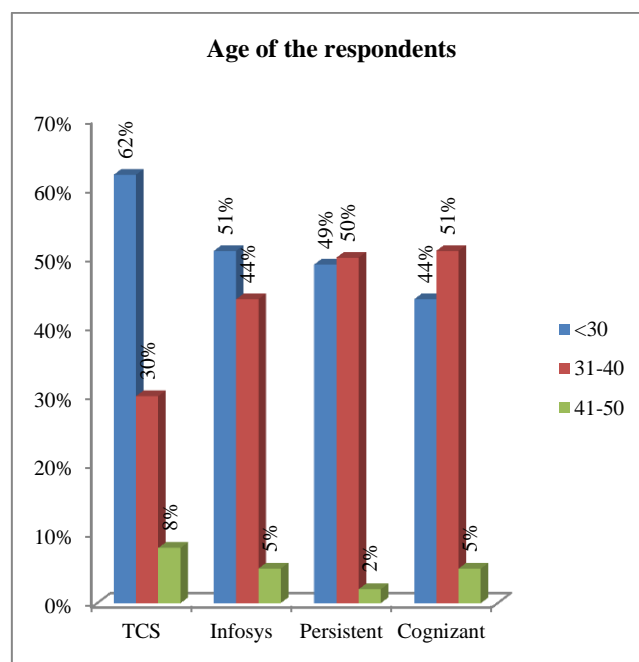
Age of the respondents

Table-2 Domestic responsibilities that affects the work performance

Company	N=%	Never	Hardly ever	Sometimes	Often
TCS	N=	15	31	52	8
	%	14%	29%	49%	8%
Infosys	N=	24	28	53	5
	%	22%	25%	48%	5%
Persistent	N=	27	24	54	0
	%	26%	23%	51%	0%
Cognizant	N=	22	20	34	3
	%	28%	25%	43%	4%
Total	N=	88	103	193	16
	%	22%	26%	48%	4%

It is seen from the table above that there are 22% of the respondents who have reported that this stress created due to family level doesn't affect their work performance in office however 26% of the respondents have reported that hardly it affects their work performance no large variations have been absurd between various companies under study however 48% of the respondents have reported that sometimes it creates the major problem and it creates the major problem in performance of the work at family level naturally they cannot perform the duties and complete that task as per schedule given by the company. In TCS 49% followed by Infosys 48% have reported sometimes it creates the problem. In Persistent and Cognizant about 51% and 43% respectively have reported that they find more difficulties in completing the task in the office. There are about 4% of the respondents were reported that quite frequently it creates the problem for their performance. The overall situation shows that about 75% of the respondents have reported that it creates the major problem in performing their day-to-day duties at office level. In brief it is to state that there is an association of level of stress and the performance at office level.

Table-3 Frequent feeling of fatigue

Company		Hardly ever	Sometimes	Often	Always
TCS	N=	6	44	45	11
	%	6%	42%	42%	10%
Infosys	N=	8	40	44	18
	%	7%	36%	40%	16%
Persistent	N=	5	38	46	16
	%	5%	36%	44%	15%
Cognizant	N=	5	30	33	11
	%	6%	38%	42%	14%
Total	N=	24	152	168	56
	%	6%	38%	42%	14%

It is seen from the table above that about 80% of the respondents have feeling that they feel that they have fatigue sometimes or quite often. Only 6% of the respondent have reported that they have feeling but there is a hardly any fatigue. There are 38% of the respondents were reported that sometimes they feel they are tired. In TCS 42% followed by Cognizant 38%, Infosys 36% and Persistent 36% have reported that there is a feeling of fatigue sometimes. Due to the workload various tensions that they are experiencing in day-to-day life, 42% of the respondent have reported that they feel they have the fatigue. No large variations have been absurd between various companies and respondents reported that they feel fatigue quite often. In brief it is to state that about 80% of them are of the opinion that they feel fatigue whereas only 6% are there who do not think that they experience any fatigue due to workload or working condition at the office level.

Table-4 Symptoms of pressure of workplace and family

Company		Pain	Excess fatigue	Gastrointestinal complaints	Delayed menstrual cycle	Nausea
TCS	N=	47	46	26	25	12
	%	44%	43%	25%	24%	11%
Infosys	N=	54	54	25	19	24
	%	49%	49%	23%	17%	22%
Persistent	N=	55	56	24	13	16
	%	52%	53%	23%	12%	15%
Cognizant	N=	37	35	12	14	13
	%	47%	44%	15%	18%	16%
Total	N=	193	191	87	71	65
	%	48%	48%	22%	18%	16%

Table-4 Symptoms of pressure of workplace and family

Company		Quickened heart rate/ Chest pain	Dry mouth	Fainting	Perspiration	Fast breathing	Delayed conception
TCS	N=	11	8	5	3	5	5
	%	10%	8%	5%	3%	5%	5%
Infosys	N=	15	13	13	8	8	4
	%	14%	12%	12%	7%	7%	4%
Persistent	N=	13	15	7	6	6	5

|							
	%	12%	14%	7%	6%	6%	5%
Cognizant	N=	9	5	7	7	5	2
	%	11%	6%	9%	9%	6%	3%
Total	N=	48	41	32	24	24	16
	%	12%	10%	8%	6%	6%	4%

It is seen from the table above that about 48% of the respondents from all the companies have reported that pain is the symptom that they observe when there is a very heavy workload or work pressure at office or at family level. Respondents have also reported that the excessive fatigue is also one the symptom. They have work overload either at family level or at office level. Pain and the excessive fatigue these are the two symptoms that one can realise that can create particularly the major health problems in every individual.

As all the respondents are the female, gastrointestinal tract complaints and delayed menstrual cycle or disturbance in menstrual cycle is one of the major symptom of work load and work pressure they experience. Due to work pressure they are not been able to take the adequate rest, they are not been able to take the food on time, they are not been able to perform the day to day exercises.

There are some individuals who has experienced other various symptoms such as chest pain, abdomen pain, dry mouth, increase in weight, fast breathing, such as there are several symptoms which is visible either on their face or on body. For this purpose, they have to take adequate care to prevent these symptoms by ultimately reducing their workload. Even though there is a workload one has to accept it as a part of their daily routine and daily life otherwise a small thing can create the major pressure on the minds of the working women. Particularly when there are the family responsibilities and at the office level responsibilities it becomes very difficult to manage all these activities at the same time.

Table-5 Action management should take to improve the workplace environment

Company		Social Security	Retirement /Joining Bonus	Counseling Services	Remuneration for Extra Work
TCS	N=	99	55	54	70
	%	93%	52%	51%	66%
Infosys	N=	100	62	53	86
	%	91%	56%	48%	78%
Persistent	N=	88	62	63	88
	%	84%	59%	60%	84%
Cognizant	N=	65	62	63	60
	%	82%	59%	60%	76%
Total	N=	352	216	214	304
	%	88%	47%	51%	76%
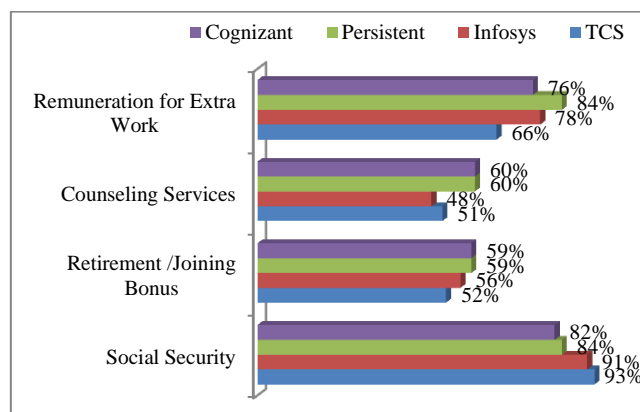
It is seen from the table above 88% of the respondent have reported that they need more social Security. There are several dimensional is of the Social Security. Social Security includes the insurance policies, health policies, accidental policies or any other social aspect of the life.

Retirement benefit of the planning benefit is one of the emerging Social Security major in IT sector. When the person is retiring apart from his dues such as Provident fund etc. there should be some incentive to be given at the time of retirement for the services he or she has rendered for longer time and served the company. About 45% of the respondent have reported that they need the retirement bonus facility in their company. In TCS 52% of the respondents followed by Infosys 56%, Persistent and cognizant same 59% respondent have reported that there should be the retirement and joining bonus.

Counselling services are needed is reported by about 51% of the respondent in all the companies. It is one of the most important aspect in the company as far as work culture and stress is concerned. The individuals those who has more stress and the strain they need counselling services. Counselling services would definitely help in understanding the problem in a proper prospective and finding the appropriate solution to relieve from the stress.

There are several individuals those were working more than working hours. Even after working hours in the company they have to work from the home also. Those who are working from the home in extra hours they are not getting any benefit. Hence most of the respondent that is 67% of the respondent have reported that there should be the remuneration for the extra work that is carried out after hours of the work. About 66% respondents from TCS,78% from Infosys, 84% from Persistent and 76% of Cognizant have reported that there should be remuneration policy for extra work hours. In brief it is to state that Social Security retirement benefits planning, bonus, counselling services, remuneration for extra work these are some of the facilities

they are expecting from the management that they should undertake which will help to develop the work culture.

XII. CONCLUSION

The daily impact of IT on our lives continues unabated. As innovations and computer capacities increase this influence will continue to grow in the coming years at an increasing rate. As technology advances, there is also increased stress that is associated with it called as "technology stress." IT is here to stay. This brings extra pressure on people to adapt to new advancements and update their knowledge in their field.

From the study as observed most of the employees feel stress because of the untimely extra working hours and due to this also they should to be able to avail a free time for relaxing and spending their quality time with their children and family. The employees are quite satisfied about their stress managing situation from the management during the study still they think yet many facilities are needed for the employees.

Stress management programs like yoga, meditation and other distressing activities like aerobics, dance etc., would prevent or reduce risk of disease due to stress in IT people which in turn will produce a healthy community. Healthy employees mean better performance by employee that in turn produce a healthy community.

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Machine Learning Approach for Attack Detection on Network Traffic Data Using NSL-KDD Dataset

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Abstract— **Distributed Denial of Service (DDoS) is a network cyber-attack designed to interrupt a targeted server's regular activity. Although advanced Machine Learning (ML) techniques were developed to classify DDoS, the assault remains a major Internet threat. Most new DDoS recognition methods are in two categories: Managed and Unsupervised. Availability of named network traffic datasets relies on managed DDoS recognition approaches. Although unattended ML approaches, assaults are identified by evaluating incoming network traffic. Both methods are difficult by vast volumes of network traffic data, poor identification precision, and strong false positive data. This study proposes a semi-controlled DDoS-detection method that tests entropy, co-clustering, knowledge benefit ratio and algorithm of the Random Forest network. The unregulated functionality of the device enables the usual meaningless traffic data for DDoS identification to be eliminated, helping to minimize wrong positives and improve precision. The monitored portion tends to reduce the unregulated part's fake optimistic rates and correctly distinguish DDoS traffic.**

Index Terms— **DDoS attacks, Machine learning, Semi-supervised**

I. INTRODUCTION

With the tremendous development of information security technologies in recent years, the DDoS attack remains a major Internet threat. A distributed Denial-of-Service (DDoS) attack is a deliberate effort to interrupt normal domain, service or network traffic by an enormous cascade of Internet traffic on the aim or surrounding networks. The key purpose of the attack is to deprive legal Internet users. The outcome of the attack depends on the speed and amount of traffic sent to the victim.

Machine Learning (ML) is the science of making machines learn and function like humans by feeding data and information. Using an algorithm to formulate responses, the computer accepts data as input. DDoS-based approaches for machine learning may be classified into 3 groups, i.e. controlled, unmonitored or semi-monitored. This study is focused on a combination of controlled and unmonitored techniques, which functions on both classified and unlisted data sets, to increase consistency and decrease the false positive rate. For header characteristics of network traffic knowledge, entropy is calculated in the Semi-supervised ML method. Incoming network traffic data is broken into 3 clusters by the Unsupervised co-clustering algorithm. For each cluster, the information-gain ratio is then calculated by using the average function header entropy between the traffic data and the cluster. The data cluster that provides the strong information-gain ratio is called anomalous and is chosen by ensemble ML classifiers, i.e. the Random Forest algorithm, for preprocessing and classification. NSL-KDD network traffic dataset is used to help assess the utility of this strategy.

II. PROBLEM STATEMENT

The inclusion of significant volumes of meaningless data in the incoming network traffic data for DDoS identification limits the efficiency of the supervised method. The curse of dimensionality issue arises due to high dimensional network traffic info, which prevents the unsupervised method from accurately detecting the attacks.

1.2.1 Existing System

The Supervised ML process uses named network traffic datasets to build the detection model in current DDoS-based approaches. Unlike the first group, no classified dataset is needed in the unsupervised approaches to construct the model of detection. Based on the study of their underlying delivery features, the DDoS and the regular traffic are separated.

Disadvantages:

- Supervised ML methods do not anticipate new legal actions and assault behaviors. The existence of noisy data decreases the classifiers' efficiency.

- High false positive rates are the biggest downside of the unsupervised ML strategy.

1.2.2 Proposed System

The semi-supervised method takes use of both supervised and unsupervised approaches, which can run on both labeled and unlabeled datasets. Entropy calculation, co-clustering and info-gain ratio are used in the unsupervised section. The Random forest ensemble classifier is the supervised part.

Advantages:

- Unregulated component of our plan to minimize meaningless and noisy daily traffic outcomes, decreasing false positive rates and improving the consistency of the monitored portion.

- The controlled part removes the unsupervised portion's false positive rate and correctly classifies DDoS traffic.

III. LITERATURE SURVEY

Bhuyan MH, Bhattacharyya DK, Kalita JK[1] is an empirical analysis of many of the major metrics of the results, including entropy of Hartley and Shannon, entropy, widespread entropy, Kullback-Leibler divergence and widespread assessment of the gap between the details.

Akilandeswari V. et al. utilize a Probabilistic Neural Network with the use of flash crowd events in response to DDoS attacks. The system achieves strong detection performance with lower false positives[2].

Alan S et al suggested ANN-based DDoS detection system (DDMA). DDMA (DDMA). The authors used three separate MLP topologies according to the context protocol used with any attack, namely TCP, UDP and ICMP, in order to detect 3 modes of DDOS attack. Unknown and recorded device zero-day accurately detects DDoS attacks[3].

Lui T, Wang Z, Wang H, Lu K[4] implemented entropy-based methodologies for the study and identification of real IDS alarms. Shannon entropy is used to measure IP address distribution, IP address destination, source attacks, invasion of destination and alert time of IDS data; use Reyni cross entropy in order to combine the vector Shannon entropy to detect the network attack.

Boro D. Et al.[5] suggested a DyProSD defense approach incorporating the merits of a predictive feature-based solution for coping with DDoS assaults through floods. The math module labels the traffic of the attacker and sends it to classifiers to label traffic as dangerous or normal.

A managed do-detection approach focused on the neural feed forward network with Mohamed I et al.[6] was proposed. This process comprises three key steps: (1) the compilation of incoming network traffic, (2) the selection of DoS identification features utilizing an unmonitored CFS, (3) the sortation of incoming network traffic in DoS or typical traffic.

A two-stage classification was introduced, based on RepTree algorithms and network intrusion detection sub-sets[7]. They are theoretically liable for splitting inbound traffic into three types: TCP, UDP or Other, and labeling it into regular or irregular traffic. A second level multi-class algorithm is used to identify the attack class to select the right behaviour. Two public sources are used for analysis, UNSW-NB15 and NSL-KDD.

Ali S.B. A groundbreaking Sugeno-style adaptive neuro-fuzzy classifier community is recommended[8] for utilizing Marliboost effective DDoS recognition boosting technologies. The proposed approach was tested for fair efficiency on the NSL-KDD dataset.

Mohiuddin A. AbdunNaser M. Presence [9] implemented a DDoS co-clustering recognition technique. The co-clustering algorithm was generalized by writers to adopt categorical characteristics. The technique was tested and the KDD cup 99 data set was successful.

The Van C. Van C. [10] introduced a modern one-class learning approach for combining measurements of the anomaly detection density and vehicle encoders. Authors have tested their NSL-KDD dataset framework and provided satisfactory results.

V. Jaiganesh, Dr.P. Sumathi, S. Mangayarkarasi[11], classed attacks as machine-learning and BPN technics in 4 groups: DoS, Demo, U2R, R2L. The detection rate for DoS risks is 78.15%.

The 8-style BPN attack data was qualified by Changjun Han[12], Yi Lv, and Dan Yang, Yu Hao. 1325 instructions and 1245 theoretical relations. Their findings are: 80.5% identification rate, 7.4% false alarm rate, 11.3% absence. Sufyan T. Faraj et al. are eligible for usual and abnormal BPN detection and distinction in[13] initial instances. Abnormal events are split down into five distinct groups. Identification rate and false positive rate in various cases are measured. The test collection recognition levels for the detection of usual and pathological cases is approximately 90% and for the classification into DoS, U2R and R2L is approximately 60-85%.

Eth. Eth. Eth. Eth. and Mukhopadhyay. For DoS, U2R, Inquire, U2L, and BPN neural network versions, al[14]. The method has an overall performance of 73.9% for the latest test range and 95.6% for stage 1. In neural SVM and MLP anomaly analysis Hua TANG and Zhuolin CAO are included. They compared precision for DoS, U2R, Study, U2L attack groups and found that the performance of the neural network is greater than SVM. Vladimir Bukhtoyarovf and Eugene Semenkin used the ensemble approach of a neural network. Their research centered on classifying sample attacks using combined use of specialized neural networks. They noticed a 99.87% ID rate for test attacks, but one of the IDS problems needed significant planning time.

The performance of the network for intrusion prevention typically focuses on the propagation properties of the data used to forecast network traffic. Two main classes of unsupervised approaches and controlled approaches represent DDoS literature recognition strategies. Unmonitored approaches frequently suffer from high false positives and managed approaches cannot handle vast amounts of network traffic data based on benchmark datasets used, and their performance is often restricted by noisy, irrelevant network data. It is also necessary to combine regulated and unregulated methods to address DDoS recognition concerns.

IV. SYSTEM ARCHITECTURE

System Architecture is a computational model that explains a system's configuration, actions, and more opinions. An architectural overview, organized in a way that encourages

thought about the processes and actions of the system, is the formal concept and representation of a system.
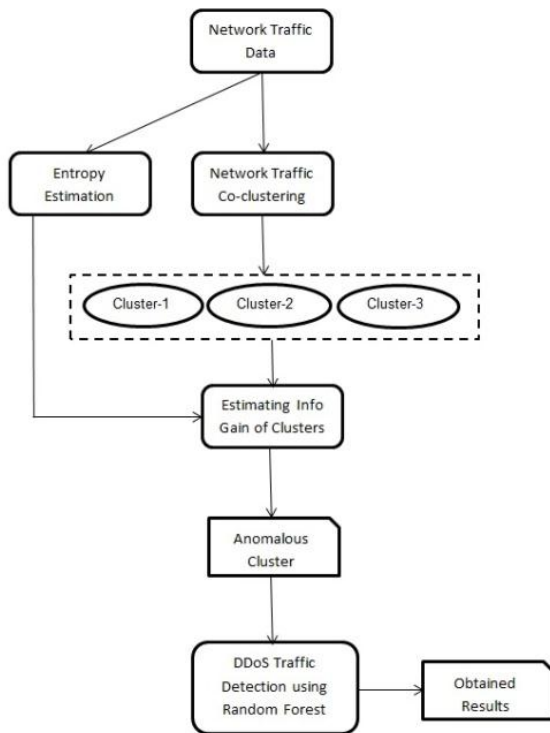

Fig. 4.1.1 System Architecture

Fig 4.1.1 Represents the device design for the solution suggested. It consists of several modules that are interrelated and function together to execute the framework.

Network Traffic Data

The proposed work contains traffic details from NSL-KDD[13]. NSL-KDD is a compilation of data proposed to resolve some of the essential issues of the KDD'99 dataset. Although the current iteration of KDD is not completely representative of real networks, it can also be used as a big dataset to help researchers validate numerous nuanced detection methods due to the scarcity of public data sets for network-based IDSs.

NSL-KDD dataset includes descriptions of attack. It has 42 functions: main features, content and traffic features, grouped into three groups. This data collection contains a total of 125973 training records and 22554 study records.

Compared with the original KDD data collection, the NSL-KDD data set presents the following benefits:

➢ It does not have duplicate records in the train collection, so more regular records would not be skewed against the classifiers.

➢ T he proposed test sets contain no redundant data; hence, the performance of the learner is not influenced by techniques for higher frequency detection thresholds.

➢ The number of records chosen at each category's degree of complexity is inversely proportional to the

percentage of records in the original data set of the KDD. This allows it possible to evaluate various learning approaches more easily by defining several computer teaching strategies.

➢ The amount of train data and test sets is fair enough that the whole range of experiments can be conducted economically without the need to pick a single item arbitrarily. As a consequence, the findings of analyzing several research articles will be accurate and equivalent.

Entropy Estimation

Initially, the entropy of FSD traffic data is determined. Functions are used for entropy estimation for flow size distribution (FSD), for source/destination packet count and for source/destination byte counts. It consists of two FSD features, like the NSL-KDD dataset: source bytes and destination bytes. The reason behind the FSD feature is that during a DDoS attack, zombie hosts would present the victim with an immense amount of packets.

Network Traffic Co-clustering

The next move is to split network traffic data into three clusters, i.e. the Spectral co-clustering algorithm. Network traffic separation is targeted at reducing the amount of data to be categorized by removing the usual sorting cluster. At times, the latest unseen intermittent traffic accidents lead to raising the false positive rate and reducing classification accuracy. Eliminating irregular network traffic disruptive data for classification is also useful for low false positive rates and consistency of classifications.

Estimating Info Gain of Clusters

Based on the FSD functionality, calculating the data gain ratio allows it possible to differentiate between the two clusters that maintain more DDoS assault details and the cluster of regular traffic. The lower data acquisition ratio is then considered normal, and the other clusters are regarded as strange.

DDoS Traffic Detection using Random Forest

Via taking care of missed details, encoding categorical data and function scaling, the data present in the anomalous cluster is preprocessed for classification.

Ensemble-based trees like Random Forest are used for answering the representational issue of the unvaried decision tree and for better representing attack data. Composite trees are used for classification.
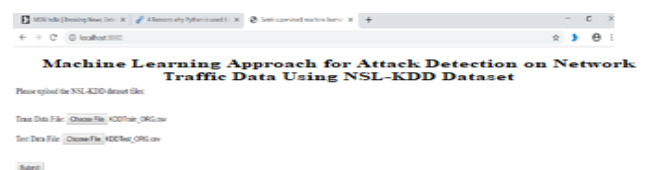
V. RESULTS AND DISCUSSION

Fig.5.1.1 Screenshot of web page to upload Train and Test dataset

Fig 5.1.1 represents the web page where we upload our NSL-KDD training and testing dataset. Submit button is provided, on clicking which the dataset will be uploaded and the further computations takes place.

Fig 5.1.2 represents the data size of each cluster after clustering. After this information gain is calculated for each cluster which helps to remove the irrelevant normal traffic data.
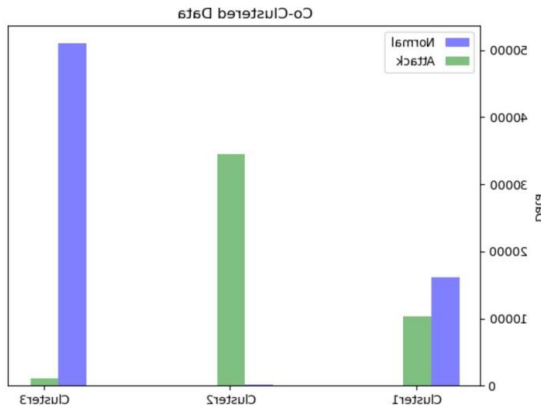

Fig.5.1.2 Screenshot of web page to upload Train and Test dataset

Fig.5.1.3 Screenshot of text file having entropy values

Fig 5.1.3 shows the Shannon entropy, normalized entropy and average entropy values of the whole dataset and the three clusters respectively. These values are stored in a text file.

```
+------------+---------------------+
| Cluster ID |       Info Gain     |
+------------+---------------------+
|     1      |   0.3823283942617106 |
|     2      |   0.4901388405309652 |
|     3      |   0.13424552629960462 |
+------------+---------------------+
```

Fig.5.1.4 Screenshot of text file having info-gain values of clusters

Fig 8.1.4 represents the calculated information gain ratio value of each cluster which is stored in a text file.
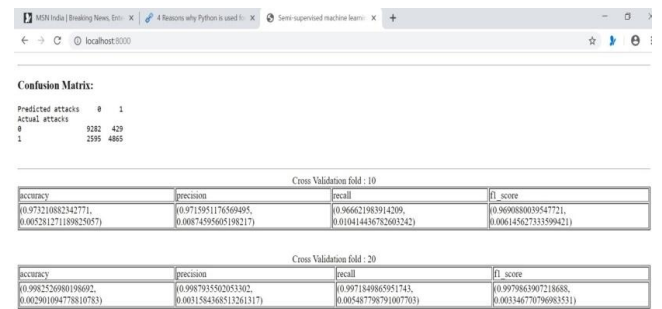

Fig.5.1.5 Screenshot of result page

Fig 5.1.5 shows the result page in which confusion matrix and k-fold cross validation result is generated. A uncertainty matrix is a table which is sometimes used on a collection of test data on which the true values are identified to explain the output model. The four fundamental words are shown: true positives, actual negatives, fake positives, and false negatives.

A mathematical approach used to estimate the ability of machine learning models is cross-validation. A technique used to estimate the ability of the model on new data is k-fold cross validation. Four efficiency measurements have been estimated: precision, consistency, recall and f1-score in each fold, as seen in Fig 5.1.55.

➢ **Accuracy** - The most intuitive indicator of success is precision and it is literally a proportion of correctly expected measurement to overall observations.

$$Accuracy = TP+TN/TP+FP+FN+TN$$

➢ **Precision** - Accuracy is the percentage of positive observations correctly estimated to the overall positive observations predicted.

$$Precision = TP/TP+FP$$

➢ **Recall** (Sensitivity) - Recall is the percentage of optimistic findings accurately forecast to all observations in the real class - yes.

$$Recall = TP/TP+FN$$

➢ **F1 score** - The F1 Score is the Precision and Recall Weighted Average.

$$F1\ Score = 2*(Recall * Precision) / (Recall + Precision)$$

Classification Report

	precision	recall	f1-score	support
Normal Data	0.78	0.96	0.86	9711
Attack Data	0.92	0.65	0.76	7460
micro avg	0.82	0.82	0.82	17171
macro avg	0.85	0.80	0.81	17171
weighted avg	0.84	0.82	0.82	17171

Fig.5.1.6 Classification report

Fig 5.1.6 represents the Classification report of the proposed approach.
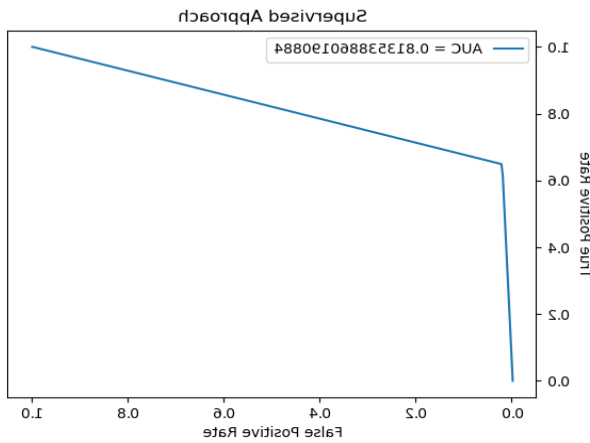

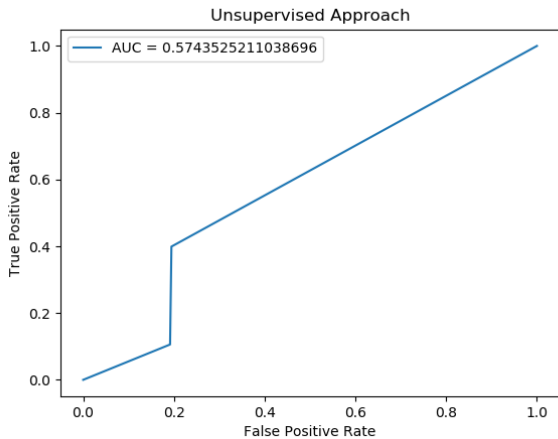**Fig.5.1.7 Graph of Supervised approach**

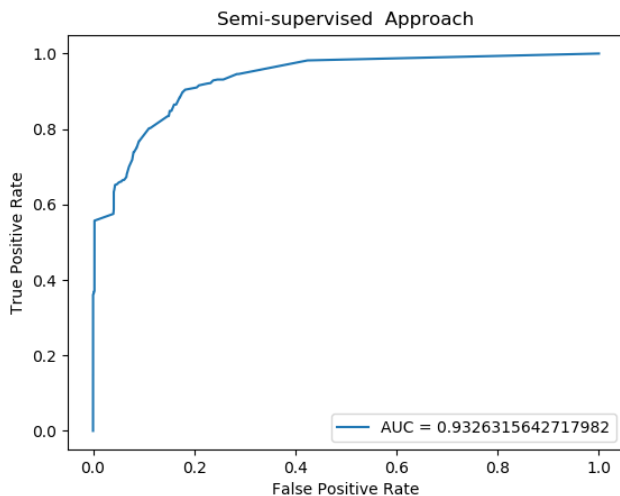**Fig5.1.8 Graph of Unsupervised approach**

Fig.5.1.9 Graph of Semi-supervised approach

Fig 5.1.9 shows the graph with increased accuracy and decreased false positive rate of proposed approach as compared to the supervised and unsupervised approach shown in the Fig 8.1.7 and 8.1.8 respectively.

VI. CONCLUSION

The key goal of this project is to implement the Semi-Supervised DDoS Detection ML Methodology. The estimator of entropy measures which analyzes the entropy of network traffic results. The co-clustering algorithm separates the traffic data from the network into three clusters. A knowledge-benefit ratio is then calculated on the basis of the average entropy of the network header functions for the current dataset and of each cluster. Network data clusters that produce a large data gain ratio are called anomalous and are chosen from the pre- and classification Random Forest algorithm using ensemble classificators. Compared to specialized DDoS approaches, the findings are sufficient in terms of precision and false positive incidence. Since the suggested solution's strong performance with the public benchmark data sets must be checked in real-world scenarios. We must deploy the suggested approach in the real world and measure it against several DDoS instruments.

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Determinants of Social Media Usage by Women Entrepreneurs

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Abstract— The aim of this paper is to recognize the enabling aspects for Women Entrepreneurs to use Social Media as a tool for advertising. With the advent of Digitalization in India, it has opened up new avenues of business in all parts of the country whether it is rural or urban. Social Media business is a part of the Digital India advancement. The extent to which Social Media is used as an enabler for Women Entrepreneurs to do business is what this paper tries to understand. This paper focuses on understanding the motivating variables that lead Women Entrepreneurs in using Social Media. It identifies the determinants and their impact on the Usage of Social Media as tool for advertising. The study tries to understand the determinants of social media usage and the relatability amongst them. Since, Social Media is the way froward and Women Entrepreneurs are using it as their only platform of doing business as well as advertising. The paper also tries understand the effect of the advertising through Social Media and analytics.

Index Terms— Women Entrepreneurs, Social Media, Social Media Advertising, Social Media Usage

Simulation and Analysis of Different Piezoelectric Materials in MEMS Cantilevers for Energy Harvesting

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Abstract— MEMS Energy Harvesting(EHs) devices excepted to grow in the upcoming years, due to the increasing aspects of MEMS EHs devices in vast applications. In Recent advancements in energy harvesting (EH) technologies wireless sensor devices play a vital role to extend their lifetime readily available in natural resources. In this paper comparative study of different piezoelectric materials (Zinc oxide, Lead Zirconate Titanate-PZT-8, Tellurium Dioxide, Polyvinylidene fluoride-PVDF) in MEMS Cantilever are used to simulate at low frequency at 100 Hz. The results are analyzed with various parameters such as Electric potential voltage, von mises stress, displacement, and finally discussed which material is excellent and is suited for cochlear implantable sensor application.

Index Terms— Piezoelectric Materials, MEMS Cantilevers, Energy

A Comparative Study Between the Ward 14 and Ward 24 on The Basis of KAP (Knowledge, Attitude and Practice) Regarding Dengue in Kolkata-A Public Health Study

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Abstract— The author carried on his research in the capital city of West Bengal named as Kolkata in the country India. The main objective of the study was to study and compare the two wards in the urban city of Kolkata, on the basis of KAP (Knowledge, Attitude and practice) of people living in these wards regarding the Dengue. The ward number 14 and 24 is under study. Here in this study a random sampling was done in both of these wards 14 and 24 where each and every household were surveyed and the results were analyzed with the help of Microsoft excel software. In the concluding part the author would like to say that while comparing the KAP score between the two wards, the ward 14 was seen more infected than the corresponding ward 24, infecting more people in ward 14.

Index Terms— Ward 14, Ward 24, KAP, Knowledge, Attitude and Practice

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