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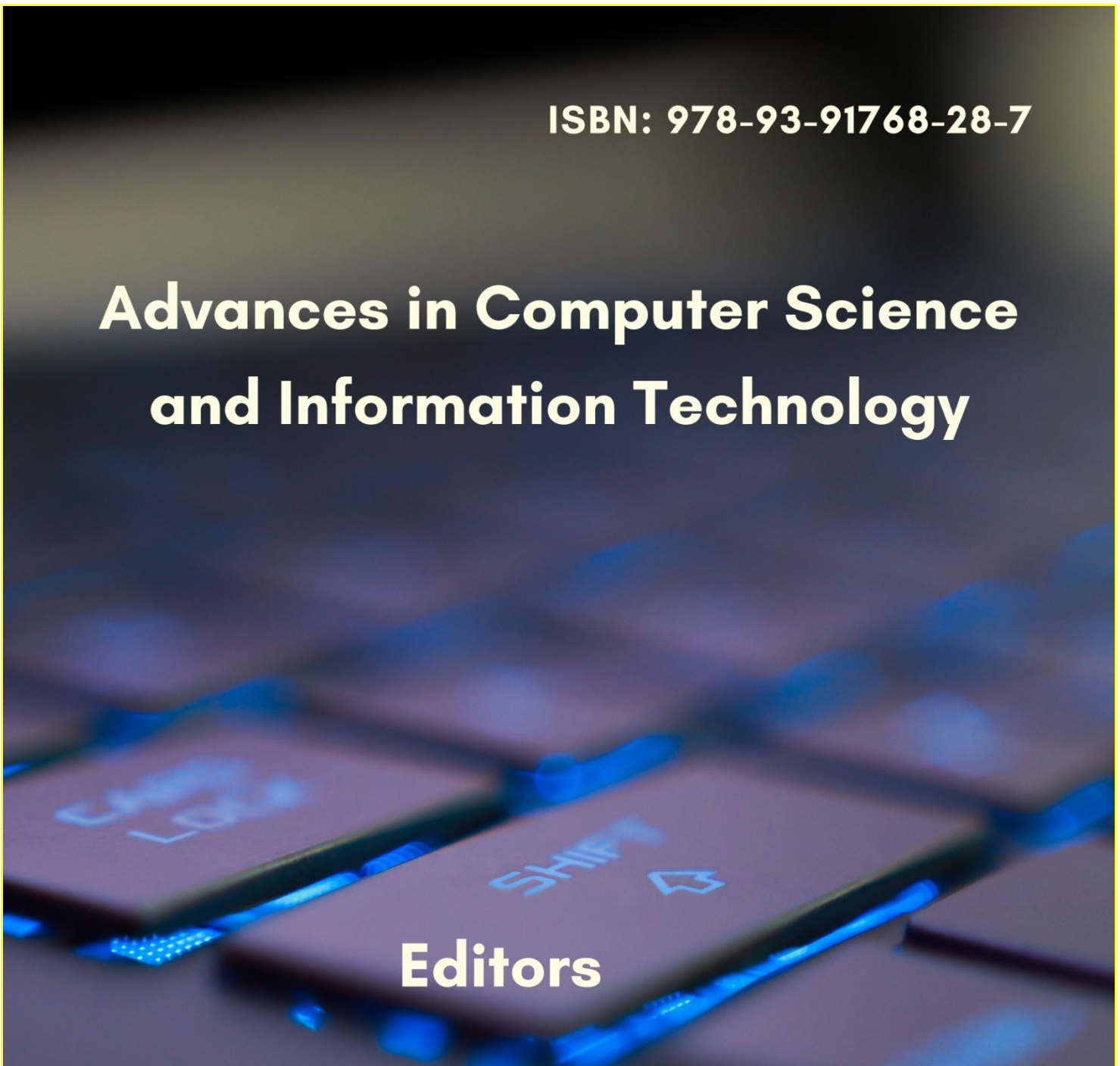
Advances in Computer Science and Information Technology



Editors

Dr. Med Ram Verma
Dr. Manoj Kumar Chande
Dr. Nana N. Shejwal
Mr. Sanjay L. Gaikwad

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PREFACE

We are delighted to publish our book entitled ***"Advances in Computer Science and Information Technology"****. This book is the compilation of esteemed articles of acknowledged experts in the fields of basic and applied Computer Science and Information Technology.*

This book is published in the hopes of sharing the excitement found in the study of Computer Science and Information Technology. Information technology can help us unlock the mysteries of our universe, but beyond that, conquering it can be personally satisfying. We developed this digital book with the goal of helping people achieve that feeling of accomplishment.

The articles in the book have been contributed by eminent scientists, academicians. Our special thanks and appreciation goes to experts and research workers whose contributions have enriched this book. We thank our publisher Bhumi Publishing, India for taking pains in bringing out the book.

Finally, we will always remain a debtor to all our well-wishers for their blessings, without which this book would not have come into existence.

- Editors

Advances in Computer Science and Information Technology

CONTENTS

COVID-19 PATIENT HEALTH MONITORING USING IoT

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Abstract:

In today's environment, health screening is the most pressing issue. Patients suffer from serious health issues because of insufficient health monitoring. There are several IoT devices available these days that can track a patient's health over the internet. Health care professionals are now using smart technology to keep an eye on their patients. The Internet of Things (IoT) is quickly revolutionizing the healthcare industry, thanks to a slew of new healthcare technology start-ups. During this chapter, we will create an IoT-based Health Monitoring System that will record the patient's heart rate and blood heat, rate of respiration, and oxygen levels, and send a warning when those readings go above critical levels. The LM35 sensor monitors temperature, while the Max30100 monitors oxygen levels and heart rate and displays them on the LCD (Liquid Crystal Display). The WIFI module is used to transmit the monitored data to the server.

Keywords: IoT, Max 30100 sensor, LM35 temperature sensor, Respiratory sensor, LCD, WIFI module, web server.

Introduction:

Wireless technology has grown in popularity in recent years to meet the needs of a variety of industries. In recent years, the Internet of Things (IoT) has dominated the industrial sector, particularly in the areas of automation and control. One of the most current trends in providing improved health care is biomedical. IoT technology has opened doors not just in hospitals, but also in personal health-care facilities. As a result of having a smart system, numerous metrics that use power, cost, and boost efficiency are detected. This work is evaluated using this intelligent system [1].

Doctors play an essential role in health check-ups in the conventional technique. This procedure needs a significant amount of time for registration, appointment, and follow-up. Reports are also generated afterwards. Working individuals prefer to disregard or postpone checks as a result of the lengthy process. This cutting-edge method cuts down on the amount of time it takes to complete the task [2].

In recent years, the usage of wireless technology has grown in response to the need to maintain many industries. In recent years, the Internet of Things (IoT) has engulfed the majority of the industrial sector, particularly automation and control. IoT technology has opened doors not just in hospitals but also in personal health care facilities. As a result of having a smart system, numerous metrics that use power, cost, and boost efficiency are detected. This work is evaluated in line with this intelligent system [3].

Since several decades, healthcare experts are now working in the fields of development and technology to improve health care and pleasure in people's lives. Their work inside the medical field is critical to us and cannot be overlooked. The roots of today's automobile architectures may be found in yesterday's fundamentals. With this technique, early diagnosis of chronic disorders is possible. These technologies can also aid in the early diagnosis of chronic disorders. Body temp, pulse rate, blood oxygen concentrations, and breathing rates are the most crucial factors in determining the severity of the condition. Employing IoT, this solution offers thermometer, oxygen saturation, Respiratory parameters, and pulse rate readings [4].

Throughout recent times, the air quality has deteriorated the environment. People are exposed to harmful concerns as a result of these concerns. As a result, it is necessary to preserve the environment and safe to breathe. In recent decades, several new sensors have been developed. The gas sensor has been the most crucial sensor.

The next sections are as follows. Literature Survey in section II. Proposed methodology for calculating the sensing values are explained in section III. Explaining results and Concluding remarks are given in section IV.

Literature survey:

Afef Mdhaffar and Bernd Freisleben have shown how to use a low-power WAN network to analyze data in a health-care system. They've set up a WAN network with a range of 33m2 at roughly 12 m altitude for communication. They also proved that the LoRaWAN network consumes 10 times less power than GPRS/3G/4G networks. The IOT architecture has been provided as a step-by-step guide to understanding IOT. LoRa WAN's primary goal is to reduce energy usage. In idle state, LoRaWAN consumes 2.8mA of

power, while GPRS (Global Packet Radio Service) consumes 20mA. Hardware costs ten dollars in LoRaWAN and fifty dollars in GPRS. In LoRaWAN, the maximum data rate is 50 kbps (uplink) and 50 kbps (downlink), but in GPRS, the maximum data rate is 86.5 kbps (uplink) and 14 kbps (downlink) (downlink). The total efficiency of LoRaWAN in the demonstration of IoT for health monitoring system is demonstrated by these results [5].

ECG signals were observed at three durations and in varied conditions by Mohammad M. Masud and Mohamed Adel. They took into account issues such as energy conservation, limited computer resources, and network outages. A computational model is constructed to conduct every function sequentially in order to meet these obstacles.There seem to be three techniques to working out all the procedures: machine learning, data mining, andmobile-based monitoring [6].

The creation of a system capable of identifying catastrophic cardiac events is the focus of Ayush Bansal, Sunil Kumar, Anurag Bajpai, Vijay N. Tiwari, Mithun Nayak, Shankar Venkatesan, and Rangavittal Narayanan. Detecting indicators that lead to fatal cardiac events using a sophisticated remote monitoring system [7].

Hamid Al-Hamadi and Ing-Ray Chen provide a confident health Internet of things protocols that includes risk categorization, durability trust, and the chance of losing one's care as design aspects for choice. To test applicability, a comparison of trust-based and benchmark a method was performed [8].

Punitha Ponmalar and Muthuraman Thangaraj Pichaiah proposed the phrase "digital hospital" is used to describe hospital administration. It allows for standardized electronic health records to be created automatically. Also covered is a real-world implementation of collectivistic and individualistic hospital administration using IoT [9].

In view of Maradugu Anil Kumar the android based health care monitory system is needed in recent times to monitor the patient remotely varies location through internet. This helps in connecting the doctor with patients without any contact. Also included the dedicated work space android in medical field [10].

Proposed system or proposed paper:

To address this problem, we developed a remote IoT-based health monitoring system that enables for remote monitoring of covid patients through the internet.

A heartbeat sensor, temperature sensor, pulse oximeter sensor, and respiration rate sensor are used to monitor the patient's heartbeat, temperature, oxygen saturation, and respiration rate, respectively.

The system subsequently connects to a Wi-Fi internet connection and communicates the observed data over the internet using Wi-Fi transmission. IOT Gecko platform transmits and receives data through IOT to show patient data remotely.

A microcontroller-based circuitry controls the entire system. A remote alert is delivered whenever any aberration in the patient's health is identified.

• Doctors may monitor patients remotely without danger of infection with this system.

• A single doctor may treat up to 500 patients at once.

• In the event of a health emergency, the doctor receives an immediate alarm.

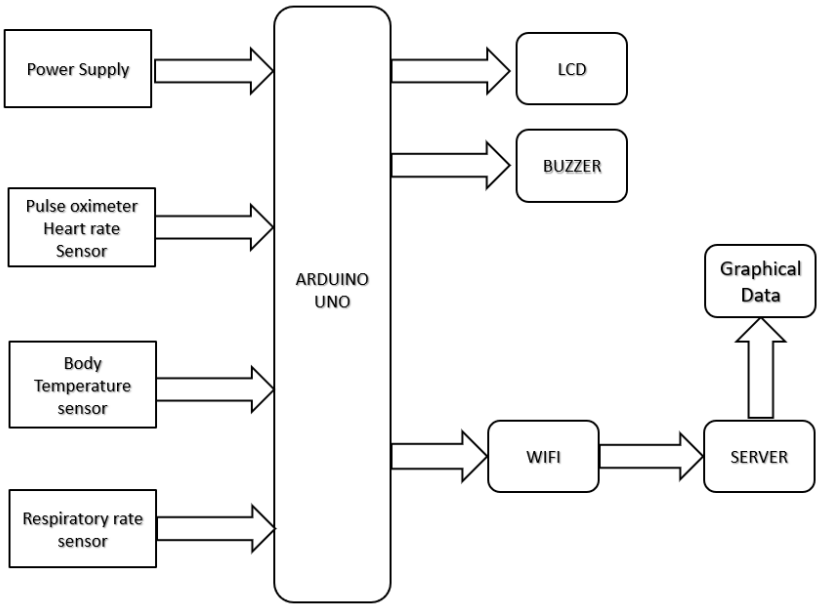


Figure 1: Block Diagram

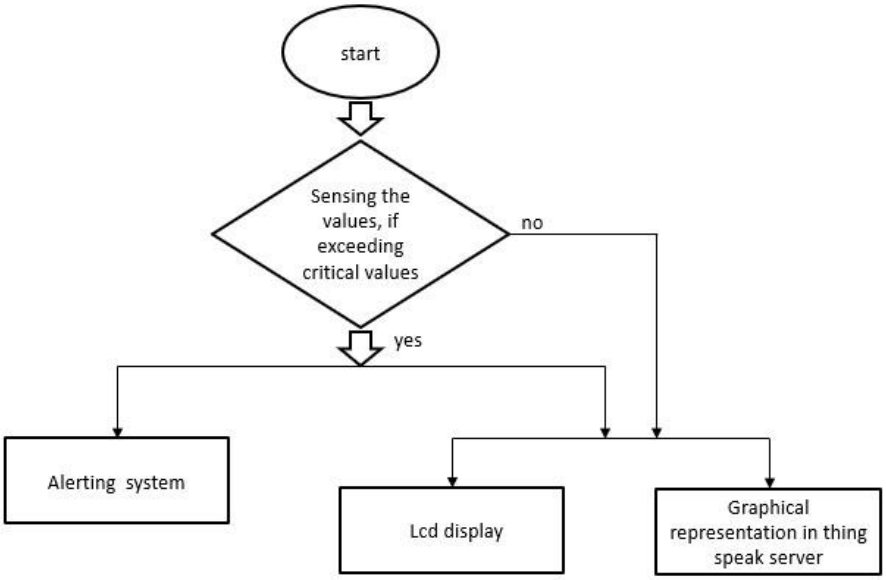
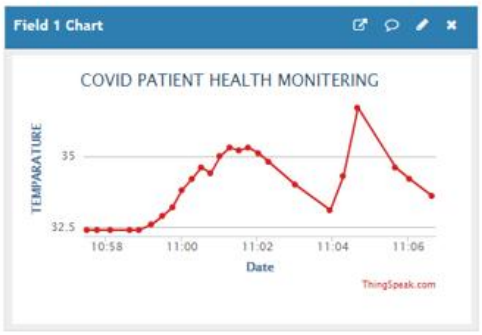


Figure 2: Flow Chart

Result and Conclusion:



The device is meant to create a contact via the internet from everywhere; it has advantages over zigbee and Bluetooth in that doctors can observe patients in instantaneously from whatever location. The Covid 19 patient monitoring system, which is based mostly on Internet of Things, is a slashing technique that enables society. It integrates a healthcare app with the user's device. This technique can be used in places with a large population. The data science technique is also used to handle the big data produced by IoT devices. This system delivers real-time efficiencies. All health care services and applications, such as illness supervision and senior care, can benefit from these strategies.

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A COMPARATIVE STUDY OF 1G TO 5G GENERATIONS IN THE WIRELESS MOBILE TECHNOLOGY: A REVIEW

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Abstract:

The wireless communication is one of the most active thrust areas of technology development of this modern era. This development starts primarily from the transformation of voice telephony into other supporting services such as the transmission of video, images, text and data. The wireless mobile communication system revolutionized the way people communicate, connecting together by communications and mobility. This communication is the most thrust areas with advanced techniques. This area is developing very fast and deals with all the fields of mobile and wireless communications. Evolution of wireless access technologies is about to reach its fifth generation. Looking past wireless communication access technologies have followed different evolutionary paths aim is to provide excellent performance and efficiency in high mobile environment. The first generation was refereed as cellular and which was later abbreviated to cell. The cell phone signals were analog in nature. The first generation device was comparatively less heavy and expensive. It has fulfilled the basic mobile voice. The second-generation mobile phones used Global System for Mobile communications (GSM) technology. The GSM uses digital modulation and it improves voice quality with limited data service. The second generation has introduced the capacity and coverage. The third generation allowed mobile telephone customers to use voice, graphics and video applications. This has quest for data at higher speeds to open the gates for truly mobile broadband experience. The fourth generation is for cell phones or handheld devices, which provides the access to wide range of telecommunication advanced mobile services supported by mobile and fixed networks. It is packet-based service along with a support for low to high mobility applications in accordance with service demands in multiuser environment. The fifth generation wireless development is based upon 4G, which at present is struggling to meet its performance goals. The most important advantage of 5G network is providing myriads of services to end users. The importance of this

review paper is to study the evaluation and development of various generations of wireless mobile technology, to study speed and effective network connection for communication devices along with their significance and advantages of one over the other.

Keywords: Wireless communication, Mobile, 1G, 2G, 3G, 4G, 5G, Network

Introduction:

The wireless communication network refers to any type of communication network that is not connected by cables of any kind. By this method homes, telecommunication networks and enterprise installations avoid the costly process of introducing cables into buildings. This method avoids connections between various equipment locations. Although there are so many technical problems solved in wire line communications, demands for additional wire line capacity could be fulfilled largely with the new infrastructures like optical fiber, routers, switches and so on. The development is started in the wire line capacity in 1990's. At the same time, the demand for new wireless capacity starts growing at a very rapid pace. The considerable research efforts were done for the development of new wireless capacity through the deployment of greater intelligence in wireless networks. A key aspect of these research efforts is that the development of novel signal transmission techniques and the advanced receiver signal methods (Abdullah *et al.,* 2009; Bria, 2010; Kalra and Chauhan, 2014; Mir and Kumar, 2015; Yadav and Singh, 2018; Saradeep *et al.,* 2019).

The wireless communication technology allows for an alternative to installations of physical network mediums like co-axial and fiber optic cables which are very expensive. Many people across the world are now using the wireless communication and today it becomes a part of daily life of common man. This is led to the congestion of network, low connectivity speed and low bandwidth. After research efforts in wireless technology of so many years, the problem and hindrances of effective communications are still present. The wireless communication network is a radio network spread over the earth areas called as cells. Each cell is served by at least one fixed location transceiver and transceiver is known as a cell site or base station. In this communication network, each cell uses a different set of frequencies from the neighboring cell and avoids the interference (Charu and Gupta, 2015).

This communication network helps to save the cost of installation of cable medium, save time of physical installation and creates mobility for devices connected to a network (Mishra, 2004; Janevski, 2009; Bhalla and Bhalla, 2010).

Today without wireless networks, internet browsing, the use of cellular phones for personal communication is impossible. This technology is applicable in the inter-continental

network systems. It is also used in the use of radio satellites to communicate across the world. Nowadays, the cellular phones become very essential part of our everyday life. Their current developments are the outcome of various generations (Farooq *et al.*, 2013; Sharma, 2013; Sood and Garg, 2014). This research paper reviews the various generations of wireless mobile communication technology, their portals, performances, advantages and disadvantages of one generation to other.

Evolution and development of 1G wireless mobile technology

The first generation (1G) wireless communication systems are based on analogue signals technology. Analogue systems are based on circuit switching technology. They are based on voice not for data. The analogue systems are called as a Nordic Mobile Telephone (NMT). It offers mainly speech related services and highly incompatible with each other. In this generation, the efficient use of spectrum and roaming was not possible. 1G stands for first generation which was developed in 1980's and continues in use until replaced by second generation (2G) (TRAI, 2018).

In the first generation, voice call gets modulated at frequency 150MHz. Voice call is transmitted between radio towers. This is done by using a Frequency Division Multiple Access (FDMA) technique. This technique fails in some field due to overall connection qualities. This technique has low capacity and unreliable handoff. There is no security with poor links. Fixed transceivers and telephones are the examples of 1G device. These devices use single cell and if device was moving into more than one cell then call is dropped.

In 1979, the first cellular system in the world becomes operational by Nippon Telephone and Telegraph (NTT) in Tokyo, Japan. Two years later, the cellular epoch reached to Europe. The two most popular analogue systems Nordic Mobile Telephones (NMT) and Total Access Communication Systems (TACS) offered handover and roaming capabilities but the cellular networks were unable to interoperate between the countries. This was one of the inevitable disadvantages of the first generation wireless mobile networks (Toh, 2002); (http://www.elec.qmul.ac.uk/research/thesis/YueChen2003.pdf).

General features of 1G wireless communication technology

The first generation (1G) technology used only Analog systems. All 1G technologies are based on Frequency Modulation (FM) scheme. 1G technology used FDMA multiplexing, which led to low capacity. 1G technology offered only voice calls.

Advantages of 1G wireless communication technology

This technology was a first of its kind which led to standardizing the network. It allowed people to be mobile even when communicating. This technology uses allocated frequency to each caller. It costs is much less as compared to its successors.

Disadvantages of 1G wireless communication technology

The voice quality was poor. Security was scarce as the calls can be easily eaves dropped by a third party. There was only a voice service but no data service. The handoff reliability was also quite poor. The capacity of 1G technology was highly limited as each user needs to be allocated a particular frequency. The mobiles that were to be used so as to support 1G technology were bulky in size which kept away many people from using them.

Evolution and development of 2G wireless mobile technologies

The second-generation (2G) mobile systems were introduced in the end of 1980's. In the second generation, low bit rate data services as well as the traditional speech services were supported. As compared to first generation systems, second generation systems use digital multiple access technologies such as Time Division Multiple Access (TDMA) and Code Division Multiple Access (CDMA). The second-generation system of wireless communication is based on digital system. This system is one step forward of first generation system. It provides the facilities of Short Message Service (SMS). Its bandwidth is 30-200Kbps. It provides good voice quality but limited data services. This technology also offers some additional services like Faxes, Text Messages and Voice mails. The 2G mobiles use Global System for Mobile (GSM) communications technology in 1990's. It also uses General Packet Radio Services (GPRS) which delivers packet switched data to existing GSM network (Mishra, 2004; Pereira and Sousa, 2004). GSM technology provide following services.

(i) Global system for mobile (GSM) communication

The second-generation wireless communication network is capable of providing data services and speech services. GSM network is extension of fixed telephone network.

(ii) GSM and Value Added Services (VAS)

The next advancement in the GSM system is the addition of two platforms, called as Voice Mail Services (VMS) and the Short Message Service Centre (SMSC). The SMS traffic constitutes a major part of the total traffic. The SMSC is proved incredibly commercially successful. Along with VAS, Intelligent Services (IS) also made its mark in the GSM system with its advantages of giving the operators the chance to create a whole range of new services. Fraud management and prepaid services are the result of the intelligent services (Bhalla and Bhalla, 2010).

(iii) GSM and General Packet Radio Services (GPRS)

As the requirement for sending data on the air-interface increased, new elements such as servicing GPRS and Gateway GPRS are added to the existing GSM system. These two services made it possible to send packet data on the air-interface. This type of network handling the packet data is also called as 'Packet Core Network'. This enables wireless access to the internet and the bit transfer rate reaching to 150Kbps in the optimum conditions. GPRS is a radio technology for GSM networks that adds packet switching protocols, shorter setup time for ISP connections. By this technology, it is possible to charge by the amount of data sent, rather than the connection time. Packet switching is the technique where the information to be sent is broken up into packets of a few Kbytes each. After the information is to be broken up, it is then routed by the network between different destinations based on addressing data within each packet. Thus use of network resources is optimized as the recourses needed only during the handling of each packet. GPRS provides flexible data transmission rates and is continuously connected to the network (Sood and Garg, 2014).

(iv) GSM and Enhanced Data Rate for Global Evolution (EDGE)

The need of increase of the data rate is felt, when both voice and data traffic moving on the system at the same time. This is done by using more sophisticated coding methods over the internet. Due this the increase in the transformation of data rate up to 384Kbps possible. Implementation of EDGE is relatively painless and required relatively small changes to network hardware and software. It uses the TDMA frame structure, logic channel and 200 KHz carrier bandwidth. It is the superset of GPRS and functions in any network with GPRS (Toh, 2002); (http://www.elec.qmul.ac.uk/research/thesis/YueChen2003.pdf).

Advantages of 2G wireless communication technologies

Due to low power emissions the major issue of health concerns has been addressed. Digital data services such as SMS and email had been introduced.

Disadvantages of 2G wireless communication technologies

In less populated areas, the weaker signal failed to reach a cell tower.

Evolution and development of 3G wireless mobile technology

The standards for development of networks are different for different parts of the world. Hence, it has decided that the network which provides services should be independent of the technology platform and whose network design standards are same globally. The third generation mobile technology is based on wideband wireless network and fulfills the International Mobile Telecommunications 2000 (IMT-2000) specifications (Pandya, 2015); ITU-

R PDNR WP8F (2002); Zeng *et al.,* 1999). The International Telecommunication Union (ITU) defined the demands for 3G mobile networks with the IMT-2000 standards. 3G is also called as Universal Mobile Telecommunications Standards (UMTS). Its other name is 3GSM, which indicates literally that UMTS is three times better than GSM. As per IMT-2000 standards, a system is required to provide data rates of at least 200Kbps. 3G functions in the range of 2100Hz. Its band width is 15-20MHz. It provides enhanced clarity and perfection in the real conversation.

Third generation wireless network services provide wide area wireless voice telephony, video calls and broad band wireless data, all in a mobile environment. Another additional feature of this technology is that High Speed Packet Access (HSPA) data transmission capabilities able to deliver speeds up to 14.4Mbps on the downlink and 5.8Mbps on the uplink. 3G wireless network support Global Standards to allow for low cost, High Quality of Service especially for voice, multimedia, High Speed Data and Compatibility of service with fixed network. One of the major positive points of 3G is its Global Roaming capabilities. It offers a vertically integrated, top-down and service provider approach to deliver wireless internet access. This technology is for mobile service providers. Mobile service providers use licensed spectrum which provides wireless telephone coverage over large geographic service area. This 3G wireless network technology enables operators to offer users a wider range of more advanced services as well as achieve greater network capacity through improved spectral efficiency (Honkasalo, 2002; Kumar *et al.,* 2010; Churi *et al.,* 2012).

General features of 3G wireless communication technologies

The data speed is significantly higher as compared to the previous generation 2G, 2.5G and 2.75G technologies. 3G technology supports video conferencing which was absent in previous generation and provided better in call audio and video services. The third generation of wireless mobile communication supported TV through internet (IPTV). The advantage of 3G technology over its previous generation is its ability to provide the users with location based services such as Global Positioning System (GPS). 3G provides its users with video-on-demand and provides teleconferencing services which was previously absent. The use of third generation also took multimedia and gaming services to a higher level.

Advantages of 3G wireless communication technologies

The increase in bandwidth has resulted in relieving the overcrowded existing networks. The third generations also provides users with a more reliable and secure way of communicating wirelessly. The major drawback of 1G and 2G is ‘interoperability’ which has finally been allowed in 3G networks. The multimedia services grew manifold over the existing services

which were based upon the previous generations. 3G used the new IP (Internet Protocol) connectivity for data services which is packet based.

Disadvantages of 3G wireless communication technologies

Due to increase in the protocols as well as the bandwidth, the base stations and the cellular devices need to be upgraded to use 3G networks which are a costly affair. Due to more complex modulation or demodulation and also with the wide use of data the power consumption significantly increases. The ability for data and voice to work together was not yet implemented as well as the problems concerning roaming are still significantly present. The third generation requires base stations closer to the users for improved services which are costly.

Evolution and development of 4G wireless mobile technology

The emergence of new technologies in the wireless mobile communication systems and the ever increasing growth of user demands have triggered scientists, researchers, engineers, academicians and industries to come up with a comprehensive manifestation of the fourth generation (4G) wireless mobile communication system (Kamarularifin *et al.,* 2009; Bande *et al.,* 2011). The fundamental reason for the transition to the All-IP is to have a common platform for all the wireless technologies that have been developed so far and to harmonize with user expectations of the many services to be provided. In 4G wireless technologies, the user has freedom and flexibility to select any desired service with reasonable Quality of Services (QoS) and affordable price any time anywhere.

The fundamental difference between 3G and All-IP is that the functionality of the Radio Network Controller (RNC) and Base Station Controller (BSC) is now distributed to the Base Transceiver Station (BTS) and a set of servers and gateways. This means that, in this wireless communication network data transfer is much faster and less expensive (Fumiyuki, 2001; Sun *et al.,* 2001; Khan *et al.,* 2009). 4G frameworks integrates GSM, GPRS, IMT-2000, Wi-Fi, and Bluetooth all these wireless mobile technologies that exist. This is the conceptual framework and provides high speed wireless network that can transmit the multimedia data. This can support 100Mbps peak rates in full mobility wide area coverage and 1Gbps in the low mobility local area coverage. This system does not support traditional circuit switched telephony service, but supports to All- Internet Protocol (IP) based communications. In 4G we can send data as much as faster than previous generations. It has broader bandwidth, high data rate, smooth and quicker handoff. Nowadays, it becomes very easy to send and receive a huge amount of data from Personal Computer to wireless device. E-mails, Messages and Contacts are synchronized easily

and give powers to the end users (http://www.itu.int/net/pressoffice/press_realease/2010/40.aspx; Ibrahim, 2002; Saxena *et al.*, 2013).

General features of 4G wireless communication technologies

4G Technology offers ultra-fast downlink and uplink speeds without compromising on the reliability. The speed offered is almost 50 times that of the 3G and is around 100Mbps. Roaming in a 3G network is complex and difficult and the same is the case with 'Interoperability' across various networks, whereas, roaming in 4G networks is proven significantly easy because of the global standard which ensures global mobility. The difference in terms of coverage area, latency, Data transfer rate, and loss rate is evidently seen in various heterogeneous wireless access networks. 4G communication is cheaper since there is no necessity to completely retool the network architecture. It can be built on existing networks and will work on the same existing spectra which are an advantage to the mobile operators as they are not required to license new spectrum, which is a costly affair.

Advantages of 4G wireless communication technologies

In 4G technology we get Ultra-fast downlink and uplink speeds. The voice quality is improved dramatically. There is an ease of access and less latency. Higher bandwidth when compared to 3G technology.

Disadvantages of 4G wireless communication technologies

This technology uses new hardware components on cell towers because of the use of frequency. The data service cost would be high for the users. Consumers are forced to buy new 4G compatible mobile devices. No backward compatible for 3G mobile devices.

Evolution and development of 5G wireless mobile technology

5G is the newest version of mobile internet. 5G is based on OFDM (Orthogonal Frequency-Division Multiplexing) principles, a method of modulating a digital signal across several different channels to reduce interference. 5G also uses wider bandwidth technologies such as sub-6 GHz and mmWave.

The new 5G standard is much faster and more responsive, and has much greater capacity, which will be a real breakthrough for the massive Internet of Things (IoT), and leveraging machine learning, artificial intelligence and to automate network management and security (French and Shim, 2016; Al-Falahy and Alani, 2017). The Fig.1 shows vision for the 5G wireless mobile communication technologies (Liu and Jiang, 2016; Gandewar *et al.*, 2017).

5G wireless systems is a name used in some research papers and projects to denote the next major phase of wireless mobile telecommunication standards beyond 4G standards. This wireless network technology offers spectral efficiency of 10Gbps peak per terminal. These goals are significantly ahead of 4G wireless communication technology performance. The new tools

that can take us these goals may integrate opportunistic OFDMA, 20-60MHz channel bandwidth, cognitive and opportunistic channel structure, flexible, variable reuse, cooperative methods, interference management, client relay, hierarchical modulation, distributed MIMO and accumulative methods (https://en.wikipedia.org/wiki/5G; Giannini *et al.*, 2008; Aryaputra and Bhuvaneshwari, 2011).

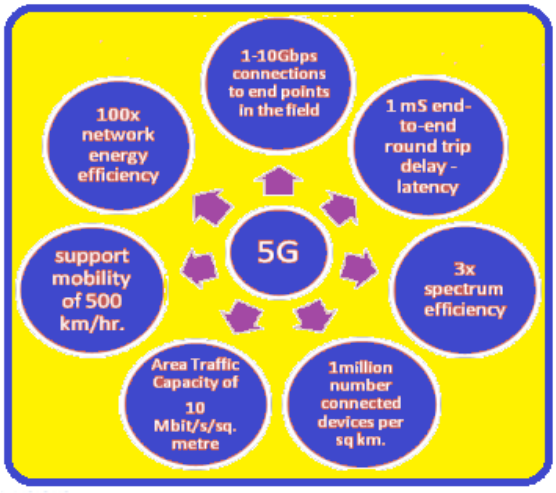

Figure 1: Vision for the 5G Wireless Mobile Communication Technologies

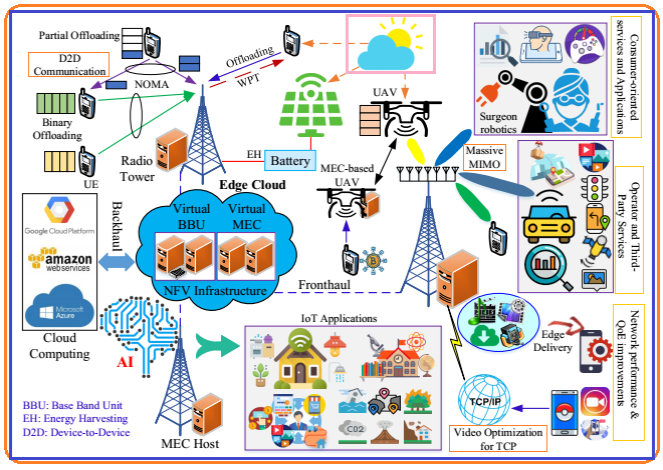

Figure 2: Multi-access Edge Computing (MEC) for forthcoming 5G Technologies

Some sources suggest that the 5G wireless communication network technology will come approximately in 2025. The 5G terminals will have software defined radios and modulation schemes and new error control schemes which can be downloaded from the Internet. The terminals will have access to different wireless technologies at the same time as well as the terminal will be able to combine different flows from different technologies. In the 5G wireless

communication network technology, all the networks will be responsible for handling user mobility (Lu, 2008; Zahariadis, 2009), while the terminals will make the final choice among different wireless access network providers for a given service.

Hence, such choice will be based on open intelligent middleware in the wireless mobile phone. The Fig. 2 shows Multi-access Edge Computing (MEC) for forthcoming 5G Technologies (Mao *et al.,* 2017). The next generation wireless mobile networks alliance defines the following requirements for 5G networks (https://en.wikipedia.org/wiki/5G).

(i) Coverage should be improved.
(ii) Signaling efficiency should be enhanced.
(iii) Latency should be reduced significantly.
(iv) Several thousands of simultaneous connections to be supported for massive sensors developments.
(v) Spectral efficiency should be significantly enhanced as compare to 4G technology.
(vi) 1Gbps to be offered at the same time to tens of networks on the same office floor.
(vii) Data rates of several tens of Mbps should be supported for tens of thousands of users.

It is assumed that 5G wireless communication network technology will provide the following features.

(i) Low battery utilization.
(ii) Better coverage.
(iii) High flexibility and scalability.
(iv) Trustworthy communication.
(v) Low infrastructure costs.
(vi) Latency will be low.
(vii) High bit rates in larger portions of the coverage area.
(viii) More number of devices will be supported at the same time.

It is observed that above are the objectives for 5G wireless communication network technology in several research papers for study.

Advantages of 5G wireless communication technologies

5G network is less likely to be affected by overcrowding as compared to previous networks. The aim is to provide data speed in Giga Bytes per Second (Gbps). 5G network can easily be incorporated with previous generation 3G and 4G networks to ensure availability to voice and data anywhere in the world by 2025. The new emerging technologies such as Internet of Things (IoT) and Cloud Computing require huge amounts of data. The aim of 5G network is to bring all networks under a single platform.

Table 1: General comparison between 1G to 5G wireless communication network Technologies

Sr. No.	Technology/ Features	Mobile Generation Technologies				
		1G	2G	3G	4G	5G
1	Start	1970	1980	1990	2000	2010
2	Development	1984	1999	2002	2010	2015
3	Data/ Bandwidth	2Kbps	14.4 to 64 Kbps	2Mbps	2000Mbps to 1Gbps for low mobility	1Gbps and higher
4	Standards	AMPS	2G TDMA, CDMS, GSM2.5, GPRS, EDGE	WCDMA, CDMA 2000	Signal unified standard	Signal unified standard
5	Technology	Analog Cellular Technology	Digital Cellular Technology	Broad Bandwidth CDMA, IP Technology	Unified IP and seamless combination of broadband, LAN/WAN/PAN and WLAN	Unified IP and seamless combination of broadband, LAN/WAN/PAN and WLAN and www
6	Services	Mobile technology (Voice)	2G:Digital voice, Short Messaging 2.5G: Higher capacity Packetized data	Integrated Higher Quality audio, video and data	Dynamic Information Access, Wearable devices	Dynamic Information Access, Wearable devices with IA capabilities

7	Multiplexing	FDMA	TDMA,CDMA	CDMA	CDMA	CDMA
8	Switching	Circuit	2G: Circuit, 2.5G: Circuit for access network and air interface, Packet for core network and data	Packet except service for air interface	All packet	All packet
9	Core Network	PSTN	PSTN	Packet network	Internet	Internet
10	Handoff	Horizontal	Horizontal	Horizontal	Horizontal and Vertical	Horizontal and Vertical
11	Requirements	No official requirements. Analog Technology	No official requirements. Digital Technology	ITU's, IMT-2000 required, 144Kbps mobile 384Kbps pedestrian, 2Mbps indoors	ITU's, IMT-2000 advanced requirements include ability to operate in up to 40MHz radio channel bandwidth and with very high spectral efficiency	Opportunistic OFDMA, ability to operate in up to 60MHz radio channel bandwidth and with very high spectral efficiency, at least 1Gbps or more data rates to support ultrahigh definition video and virtual reality

Disadvantages of 5G wireless communication technologies

This is a new emerging technology and a lot of research still needs to take place for the technology to be functional. The speed that is being said to be achieved by using 5G looks impractical as the technological support to implement it is absent in most parts of the world. The implementation is a costly process as new infrastructure needs to be developed and implemented. Also the old devices are obsolete and cannot access 5G technology the users need to get new devices which is a costly process. The main concern for any technology is the security problem. It is still present at large and needs to be resolved.

Comparative study of 1G to 5G wireless communication networks

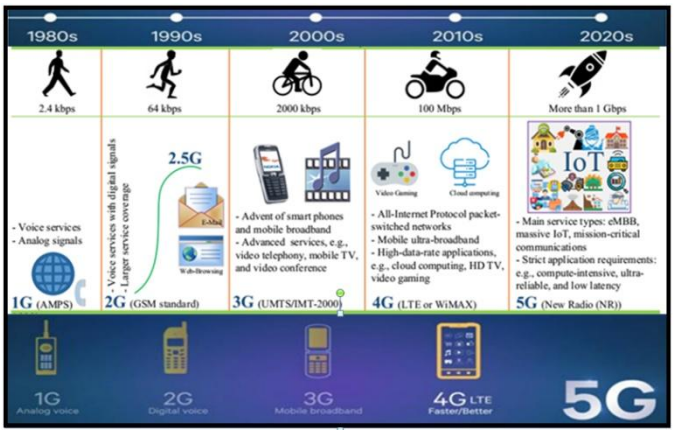

Figure 3: Evolution of 1G to 5G Wireless Mobile Communication Technologies

The Fig. 3 shows Evolution of 1G to 5G Wireless Mobile Communication Technologies (Tripathi *et al.,* 2019; Pham *et al.,* 2020). The Table 1 shows the comparison between the 1G to 5G wireless network technologies (Honkasalo, 2002, Sun *et al.,* 2001; Berezdivin *et al.,* 2000; Pereira, 2000; Huawei Technologies; Khan *et al.,* 2011; Pachauri and Singh, 2012; Sapakal and Kadam, 2013, http://www.rysavy.com/PR/3GA_PR_2010_09.pdf; Ge *et al.,* 2019; Noohani and Magsi, 2020)**.** To understand the requirements and uses of the 5G could be raised once the 4G rollout is completed and experienced. This technology would be mainly used in back hauling telecom networks rather than end user access. The 4G technology offers theoretically closer to Gigabit Ethernet whereas users expect multiple Gigabit speed from the 5G technology (Rappaport *et al.,* 2002; Minoli, 2010; Orlosky *et al.,* 2017; Sung *et al.,* 2018; Ullah *et al.,* 2019; Addad *et al.,* 2020).

Conclusion:

Mobiles have become very essential part of our everyday life. Their current developments are the outcome of various generations. The history of wireless mobile

communication shows, attempt has been made to reduce a number of technologies to a single global standard. The first generation has fulfilled the basic mobile voice, while second generation has introduced capacity and coverage. The third generation technology has quest for data at higher speeds to open the gates for truly mobile broadband experience. This will be further realized by the fourth generation technology. The 4G systems are full IP based wireless internet technology, which provides access to the wide range of telecommunication services. This technology provides advanced mobile services, supported by mobile and fixed networks. This technology is packet based and supports for low to high mobility applications. It provides wide range of data rates, in accordance with service demands in multiuser environment. This network technology encompass all systems from public to private, operator driven broadband networks to personal areas and ad hoc networks. In this review research paper, it is observed that some problems like unending problems of communications with poor coverage, bad interconnectivity and poor quality of service are still unable to solve. The advent of 5G technology will change the field of communication domain bringing wireless experience to a completely new level. This technology has more processing power and more memory on board. This technology helps to promote stronger links between people working in the different fields and environments. This will become a reality in the fifth generation wireless communication technology.

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THE POWER OF ARTIFICIAL INTELLIGENCE IN CUSTOMER SERVICE

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Abstract:

Artificial Industry is in a general sense changing the manner in which we work across a few distinct ventures. Customer service has established parts of these areas for many years that have a retail, finance or law. Experts are assumed next year, which can reach the point that we cannot distinguish between human agents and Artificial Intelligence. This article discusses about thevalue, some of the use cases that AI brings to customer serviceand examine the capability of the technology in this industry. Artificial intelligence is built into customer service to improve human endeavours and lay off certain employees. This leads to increased customer satisfaction and reduced customer service costs.

Keywords: Artificial Intelligence, Customer service

Introduction:

Customer Relationship Management (CRM) is an important part of all successful Business. Today, more businesses are utilizing artificial intelligence (AI) in order to systematise and progress their CRM. Advanced Technology for example, chatbots and AI-empowered correspondence, imply that nonstop connections and customer service is currently a reality. Artificial intelligence is built into customer service to improve human endeavours and lay off certain employees. This leads to increased customer satisfaction and reduced customer service costs. Bureau of Labour Statistics states that there are nearly 3 million customer service workers employed in the USA, and they are getting paid $35 170 a year on average. Artificial intelligence is still far from perfect for fully performing all customer service and completely transforming people, but it can easily take a little work.

Customer service challenges

Customer satisfaction is never easy, especially with changing consumer wants and preferences, as well as changing purchase habits. Because of limited resources, turnaround time, lack of knowledge, and too many requests to address at one time, as well as round-the-clock working hours, businesses are attempting to retain customers through fitting services.

Understanding customer service

Customers are king, and firms who recognise this are reaping the benefits. The key to success is unfailing client service. To provide one, firm first understand its customers inside and out; not only that, but providing excellent service to clients before, during and after their purchase experience is important for customer retention. Finally, it's all about pleasing customers at every point of their journey and persuading them to return. Simply put, it's all about ensuring that customers are satisfied and loyal to company.

Artificial Intelligence for customer service

According to a recent poll, a few firms have grasped that AI and customer personalisation is the upcoming marketing trends. And the most effective and efficient approach to gratify clients is to automate the customer service process. There is a slew of options, but leading firms are betting on Artificial Intelligence to automate and improve customer support. The process of responding to client enquiries, complaints, and grievances is simplified, faster, and easier with an AI solution.

Working of Artificial Intelligence

There are three parts to AI for customer service. Part automation is the most important of them all because it minimises people, costs, and time while increasing efficiency. Depending on the specific company objectives, automation can be accomplished using chatbots or virtual assistants. Chatbots/virtual assistants that are powered by Natural Language Programming can initiate automated conversations with clients, freeing up time and effort for customer care executives to focus on business growth programmes. They even assist with the routing of some complex enquiries to humans during encounters to ensure complete client satisfaction.

Customer Engagement

Collecting a large number of consumer data from many touch points and deep digging into analysis to produce customised offers is the most difficult challenge for any organisation. This is a time-consuming and exhausting process that requires a significant amount of time, effort, and resources. The use of an AI-powered chatbot can make the entire procedure much easier and more uncomplicated. According to a study, most clients prefer texting over speaking with a representative. As a result, having an AI chatbot will assist your brand in automating the service process and connecting with customers more effectively/ML-trained bots can respond to the majority of client questions. Deep learning is required to answer difficult queries since it allows the bot to understand individual client enquiries about products/services from various demographics. Customers' names, contact information (emails or phone numbers), interests, styles, and personality are all gleaned from conversations with virtual assistants.

Manage Customer Data

Managing customer data and establishing buyer personas to approach them with customised offers is a major challenge for organisations. The data acquired by chatbots across many interaction points makes mapping the customer journey and generating buyer personas a breeze. Marketers will soon have a large amount of consumer data, and breaking it down into silos and establishing a buyer persona will just take a few minutes. Targeting customers with customised offers is straightforward when firms have in-and-out customer data.

Real-World Use Cases of AI in Customer Service:

1. Virtual assistants or chatbots for continuous engagement

Top brands utilise virtual assistants, often known as chatbots, to connect with customers. These useful tools, which come with an AI interface, are fantastic for quickly responding to consumer questions. They are, however, generally utilised to handle simple queries and are less convincing when dealing with sophisticated ones. Chatbots/Virtual Assistants have a lot of advantages, including speed, efficiency, and the ability to work around the clock without taking breaks.

2. Employs sentiment analysis for understanding customer mood

When it comes to dealing with consumers' inquiries, it's vital to understand their intentions. Every consumer is different, and so are their questions. Before delighting with a suitable response, marketer must first determine whether the customer is neutral or angry. When it comes to satisfying furious consumer vs a neutral one, the strategy should be different. Furthermore, sentimental analysis gathered by AI is useful for anticipating customers' feelings and offering relevant solutions.

3. Automates routing to support customers connect with real human

Even chatbots with extensive NLP training are unable to handle some sophisticated requests from consumers today. When users are looking for something really specific, it is vital to route the call to a human. It is inevitable that the calls will be transferred to humans in such circumstances. AI can assist organisations in routing such calls to humans directly, allowing them to better grasp the importance of the calls and consumer mood swings, resulting in improved customer satisfaction and retention.

4. Helps customers to buy improved products

Customers' personal preferences can be deduced from chat history, allowing bots to intervene with an improved product/technology rather than the one they're looking for. This

results in a win-win situation for the brand as well as the customers. Such interactive engagements result in creating loyal customers to the brand, and subsequently improve ROI.

5. Prevents fraud during payments to ensure security

The growth of technology such as Artificial Intelligence and Robotic Process Automation is causing havoc in the payments landscape. To avoid cart abandonment, the eCommerce environment has migrated to mobile, and delivering friction-free payments at checkouts is virtually a necessity. Automated payments are inherently risky. By knowing customer preferences and detecting changes in buying or payment behaviours, AI-enabled payment automation helps to avoid fraud. Customers' payment security is ensured, and their faith in the brand is enhanced.

6. Ensures faster and accurate customer response when combined with RPA

Robotic Process Automation (RPA) is used to automate tedious, repetitive processes that are difficult for people to do. The bots connect to the backend to obtain the data that consumers have requested and to respond to users in real time. These bots, on the other hand, follow a set of rules. With AI, the bots will be able to perform even better and provide with more accurate and timely results. Both AI and RPA are critical components of today's most successful businesses because they can revolutionise the way customer care is delivered and achieve 100 percent client satisfaction. Simply put, the advancement of Artificial Intelligence has begun to disrupt the business environment, regardless of firm size or vertical, and organisations who adapt to the new norm are outperforming their competitors.

Benefits of Artificial Intelligence:

1. Handling Large Volumes of Data

As the number of interactions with customers increases, so does the amount of data generated about them. Obtaining such vast volumes of data, however, would be futile without AI. Humans are limited in their ability to process large volumes of data. As a result, AI is a priceless tool.

2. Reduce Average Handling Time

One of the most striking advantages of AI in customer service is this. Customers used to complain about how long they had to wait for service and support, thus this is why it is so important.

Chatbots now respond to basic questions and requests very instantly. Customers also receive advance reminders and notifications. They can get their products in as little as 24 hours

and track them via delivery methods and programmes. Some intangible products and services are supplied online, and clients can use them virtually immediately.

3. Customize Products Offerings to Drive Up Sales

The future frontier of customer service is customization. Customers are increasingly demanding it because they know they can receive it. What's more promising is the fact that personalization can be applied to a variety of service levels. It may, for example, begin with customised emails that take into account preferences, tastes, geo-localization, previous purchases, and other factors. Chatbots and customer service representatives can then utilise it to better their interactions with them.

4. 24/7 Availability

Global firms, who have consumers from all over the world in various time zones, need to be available 24 hours a day, seven days a week. Customers also have new patterns of behaviour because they sleep and work on various timetables. As a result, individuals require various methods of communication and interaction with customer support departments. AI is the answer because it can be connected and interacting 24 hours a day, 365 days a year. Customers continue to receive assistance while staff is unavailable by allowing AI to answer first, whether through chatbots or self-directed knowledgebase searches.

Conclusion:

This technology is now present in practically everything we do. And one of the most benefited areas is customer service. After all, the purpose of its creation and evolution was to make people's lives better. If we were to pick one outstanding benefit, it would undoubtedly be data collecting and management. This will undoubtedly result in a significant shift in the way we conduct business. Every other AI advancement, in some way or another, is reliant on data.

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RECONFIGURABLE COMPUTING FOR ELECTRONIC ENGINEERING AND EDUCATION

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Abstract:

The paper discusses importance of reconfigurable computing in electronics engineering curriculum, especially in industry 4.0 education and effective teaching-learning and design methods and tools. It includes laboratory submission templates, animated tutorials, project-based learning, problem-based learning. Reconfigurable computing provides remote deployment and prototyping of systems and a economic reconfigurable hardware co-simulation environment. The primary aim of these methods and tools is to explore and provide more options for teaching and learning in engineering education. We present our latest achievements and experience in undergraduate& postgraduate teaching of Digital System Design, Digital IC Design, Embedded Systems Design by exploiting our prototyping hardware and software environment.

Keywords: Reconfigurable Computing, Hardware, Software, Co-education

Introduction:

Reconfigurable Computing is a domain where programmable logic devices are used to speed up computation of complex systems. This field gains popularity with the advent of programmable logic devices around 9180s. It gains commercial adaption with the cheaper fabrication cost. Reconfigurable hardware is popularly identified as Field-Programmable Gate Arrays (FPGAs). The innovative development of FPGAs helps to reconfigure the hardware unlimited number of times in a field with no additional cost. This invention of a upgrading or debugging of hardware gains popularity in almost all fields of hardware computing. Software algorithms are mapped to hardware device which speed up the processing in many times as compared to software [1]. The speed of execution is increased in FPGA nearly 10 to 100 times

than software. These advantages attracted many fields of complex computing like cryptography, parallel processing and Digital Signal Processing (DSP), System developers. FPGAs offer advantages over the conventional hardware like Digital signal processors, specific purpose microcontroller and general-purpose microprocessors for high performance.

Application specific integration is preferred for high volume application whereas low-volume applications FPGA as reconfigurable device is used, particularly for applications that can exploit customized bit widths and massive instruction-level parallelism. FPGAs contain digital logic gates, multiplexers and large amounts of SRAM. All those components are combined together with regular interconnected digital logic blocks. All those programmable devices follow the International Technology Roadmap for Semiconductors (ITRS) roadmap [2]. ITRS map follows prediction of memory technology rather than processors technology and often leading new fabrication. It is more evident from ITRS map that reconfigurable computing technology is faster and economical as compared to fixed microprocessor or hard non-configurable technology. Reconfigurable Computing domain is a new computing environment where the changes are done field and currently it is major breakthrough after introduction VLSI Technology. On software to FPGA migrations, many applications are migrated to ASIC to FPGA designs with wide variety application areas reports speed-up hardware acceleration with very economical products. Day by day cyber infrastructure requirements are increasing with speed as major factor for optimization [3].

The main focus worldwide almost 15 million software programs will shift towards hardware computing productivity. Currently Reconfigurable Computing using FPGA for High Performance computing is new and soon it will be used in much application with online hardware debugging and upgrades. Our goal is to provide a strong theoretical and practical background for teaching and learning.

Rest of the paper is organized as follows, section-II discusses about importance of reconfigurable computing education, section-III discusses about teaching methodologies adapted for reconfigurable computing, section-IV discusses about hardware and software tools which should be adapted for teaching and learning. Paper is concluded in section-V

Importance of Reconfigurable Computing Education:

Reconfigurable systems are high in demand as they have short time to market. Indirect effect is they are economical. They are simple and can be implemented in the fields. This feature makes it possible to consider hardware systems to soft hardware systems even ASICs. Field programmable devices are hardware circuits that can be designed, debug, monitored and

physically implemented and tested remotely. This is completely new paradigm shift as compared to the older rigid very large scale integration. This technology opened many new segments of opportunities in the current market. Now a days almost all new equipment and gadgets with reconfigurable capability and online debugging supports. Reconfigurable systems are plug and play support and easily can be interfaced. Most of the embedded systems today are based on reconfigurable computing devices.

Large number of workshops and conferences are arranged every year on the field programmable devices theme. Also, the growth of electronics devices and mobile phones, laptops and accessories witnessed the use and share of programmable logic devices, particularly the FPGAs.

Teaching Methodology:

The Reconfigurable Computing based subjects required theory and practical sessions. Theory should cover hardware description languages, Synthesis and verification of circuits. The curriculum should also focus of testing. For effective use of the teaching and learning problem or project-based learning should be used. There are various stages of implementation of any project in reconfigurable computing. Digital design process or design flow for student experiments should be in the following order:

1. Briefing about the problem/problem and solution
2. Problem or Project description
3. Describing the detailed specification
4. Detailed block diagram of the working modules
5. Design entry through schematic capture
6. Design Entry through Hardware Description Languages(VHDL / Verilog)
7. Functional simulation using tools
8. Design verification using tools
9. Design synthesis using tools
10. Design implementation on FPGA
11. Post Place and route simulation
12. Bit Stream Generation
13. FPGA programming /dumping.
14. Design verification by testing and debugging.

For submission of practical laboratory templates are prepared and attached to the Google classroom which facilitates the students to submit the practical in organized manner. Also, these templates are useful for evaluation of practical. Various online project and additional learning materials are also uploaded on Google classrooms that might be useful for novice learners. Various tutorials are also can be planned according the syllabus coverage. FPGA based digital circuits designed using hardware description languages, standard mapping of input and output pins for of typical peripheral devices, are to be targeted to reconfigurable systems.

Field Programmable Gate (FPGA) array are devices that allows quick and easy implementation of digital designs and small design projects at an affordable cost. These devices are useful when designing practical based on digital designs or digital system design. FPGA prototyping platform is economical and portable for students practical on the internet number of online resources available for reference. Specialized virtual laboratories can be used for exploring the additional features of designs or practical. Through use of online resources, tutorial, recording, problem or project based learning the students can be encouraged for active and participative learning. Many open-ended experiments can be explored for enthusiast learners.

In undergraduate colleges, Digital System Design is subject where VHDL language along with FPGA is taught. In addition to that CMOS VLSI Design subject is optional/ elective subject. FPGA is validation platform used for practical and prototyping device for projects. Practicals can be divided into three parts namely, data flow modeling, combinational design, sequential design and followed by testing of design. Guided exercises can be given to students to learn the VHDL or Verilog language. EVITA is best platform for guided learning for hardware description language

Through hardware description languages students can learn design an entire system starting from given specifications to the final product. From the feedback given by students it evident that the project based learning or assisted tutorials are best for reconfigurable computing:

Teaching Tools:

The complete course is divided into theory sessions and practical laboratory sessions. Theory sessions are based on combinational and sequential logic design and assisted with language support. Students are provided with slide presentations and tutorial sheets. Additionally, many online tools were given to students for exploring FPGA-specific hardware and software.

A. FPGA prototyping hardware

Various FPGA hardware platforms are available from different vendors. For performing laboratory practical of reconfigurable computing various supporting boards are available from Altera [4] and Xilinx. Xilinx boards are available from Digilent and AVNET and other third-party vendors. Xilinx XUP boards are best suited for undergraduate and postgraduate program students [5, 6] Popular Xilinx boards includes ML505, ML605, Nexys-3, Nexys-4, Zedboard etc. From Altera UP-1, UP-2, UP-3, NIOS II Cyclone Board, DE-0, DE-1, DE-2 boards are popular [7, 8, 9].

B. Software Tools

The software tools used for reconfigurable computing are Xilinx Vivado, Xilinx ISE, Altera Quartus II. Both tools supported schematic entry and hardware description language[10,11] entries. High level synthesis is also supported in both the software.

Conclusion:

This paper highlights the importance of reconfigurable computing subject in electronics engineering stream. Steps of teaching abstraction for teaching reconfigurable hardware design to students. Current system focuses on discrete components only and not on rapid prototyping methods. Many changes are required in the traditional teaching environment. In this paper, we recommend from our study to emphasize the effective use of recorded media, use of project-based learning, power point presentations, readymade code templates. This will help students in understanding the subject with constantly changing terms and changing technology. This subject would be beneficial to students who are going for core companies and decide for higher studies and research in the reconfigurable computing domain.

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SUPPORT VECTOR MACHINE AND K-MEANS ALGORITHM FOR WEED CLASSIFICATION IN THE CROPS

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Introduction to the Weed Classification Concept:

Controlling weeds is a significant duty in agriculture because weeds contend with crops in the arena, funding to a lesser garner yield. The complete damage of yield owing to weeds is projected to be more than 30% for wheat, rice, maize, potatoes, soybeans, and cotton if weeds are not well-ordered (Oerke, 2006). Today, the majority of Indian agricultural land is cultivated conventionally. Weeds are orderly chemically by applying herbicides to the arena. Weeds can also be well-ordered mechanically or thermally, but it needs larger accuracy than substance weed controller, and thus, the dimensions is abundant lesser. Moreover, the applicability of mechanical or thermal weed control is limited in cereal fields because the machines require a certain safety margin to the crops, which is not practical as the crop row distance is typically about 12 cm. Non-chemical treatments is, therefore, primarily utilized in organic farmland, which only represents 6.3% of the total agricultural area in India. As of 2011, India had a big and varied farming zone, secretarial, on middling, for about 16% of GDP and 10% of trade wages. India's arable land area of 159.7 million hectares (394.6 acres) is another major in the world, afterward the United States. Its uncultured moistened crop zone of 82.6 million hectares (215.6 million acres) is the major in the world. India is between the highest three global producers of several crops, comprising wheat, rice, pulses, cotton, peanuts, fruits and vegetables. Universal, as of 2011, India had the biggest crowds of buffalo and cattle, is the biggest creator of milk and has one of the biggest and wildest growing fowl trades. In Madhya Pradesh Cultivation is the backbone of the State's budget and 74.73 per cent of the persons are countryside. As abundant 49 percent of the property part is cultivable. Agriculture (Land Utilization) (2017-2018) Zone permitting to township Papers (Lakh in Hect.)

The most precise degree of weed control is a per-plant treatment, where each weed is detected and treated. This method will typically require an online weed detection system and has nowhere near the capacity that the other solutions have. In return, herbicide savings of more than 99% can be expected (Graglia, 2004; Søgaard and Lund, 2007).

Therefore, when the farmer is to spray his fields using a conventional sprayer, it is necessary to know which weeds are in the field, and the thickness of the different weed species, in command to define what herbicides to choose. At the same time it can be a laborious task to inspect the fields and determine which weed species are present. Partly because it is time-consuming to go through the field, partly because it requires knowledge of biological traits of the individual weed species in order to distinguish them from each other. As a result, many farmers choose to use an agricultural advisor to undertake this work. Yet, the decision on which herbicides to choose, is often based on a regional recommendation by the local agricultural advisory center.

In current centuries, several schemes have allocated with automatic gratitude of weeds exhausting cameras with the goal of increasing novel farming machinery that can rheostat the weeds extra logically This puts heavy demands on automatic image analysis, which must be able to operate under uncontrolled field conditions.

The variance within the same weed species is a big challenge in the domain of automated plant recognition. Plants are soft and sensitive to factors such as wind, light, and nutrition, which have a visual impact on the plants. Some species also change significantly through the different early growth stages, making them hardly recognizable, as the plant will show only little resemblance between the early and later growth stages, as can be seen for the scentless mayweed in Figure below. Moreover, at early growth stages, different plant species often look alike as the plants have not yet grown their true leaves, which are the leaves carrying most of the “visual identity” of the plants. Therefore, the classification of weeds is further complicated.

Figure 1: Different species that have many visual similarities at early growth stages (a) Field-pansy (b) Chickweed (c) Shepherd's purse (d) Speed-well (e) Fat hen (f) Dead-nettle (g) Hemp- Nettle (h) Common Poppy

Novel, perception-controlled weeding schemes proposal the potential to execute a action on a per-plant level, for illustration by choosy spewing or motorized weed controller. This, though, wants a plant arrangement system that can examine image statistics noted in the arena in actual period and labels separate plants as harvest or weed. In this broadsheet, we discourse the difficulty of categorizing customary RGB images noted in the harvest arenas and recognize the weed plants, unevenly at the edge rate of the camera.

This statistics can in seizure be used to implement spontaneous and directed weed controller or to observer arenas and offer a status shot to the agriculturalist deprived of human communication. There exist numerous methods to vision-based crop-weed cataloging. A big amount of methods, especially those that produce a high cataloging presentation, do not only rely on RGB statistics but moreover need supplementary spectral cues such as close infra-red data. Frequently, these methods also rely on a pre-segmentation of the shrubbery as well as on a big set of hand-crafted topographies.

In this broadsheet, we aim RGB-only crop-weed sorting deprived of pre-segmentation and are specifically fascinated in computational competence for real-time action on a mobile robot. The key involvement of this effort is a novel method to crop-weed sorting using RGB data that trusts on convolutional neural nets (CNNs). We object at nourishing supplementary, task-

relevant contextual data to the net in command to quickness up exercise and to improve simplify to novel crop fields.

We attain that by supplementing the input to the CNN with supplementary stations that have before been used when scheming hand-crafted structures for cataloging [11] and that offer pertinent data for the cataloging procedure. Our tactic harvests a pixel-wise semantic division of the image statistics and can, given the edifice of our network, be calculated at close the frame-rate of a distinctive camera. In addition, we sort three key dues, which are the succeeding: Our method is capable to (i) precisely execute pixel-wise semantic division of crops, weeds, and soil, appropriately allocating with profoundly overlapping substances and pointing a big range of evolution steps, deprived of trusting on luxurious nearby infra-red data; (ii) act as a healthy feature extractor that simplifies well to igniting, soil, and weather circumstances not seen in the teaching set, wanting little figures to acclimate to the novel atmosphere; (iii) work in real-time on a even GPU such that process at close the frame-rate of an even camera becomes conceivable.

Previous Work in the weed Classification:

Yajun Chen *et al.* "Weed and Corn Seedling Detection in Field Based on Multi Feature Fusion and Support Vector Machine" To identify and detect corn seedlings and weeds in a corn seedling field, a small image dataset for algorithm testing was established, and a method for identifying and detecting corn seedlings and weeds based on multi-feature fusion and SVM was proposed

Inbal Ronay *et al.* "Inbal Ronay elt.al.Hyper spectral Reflectance and Indices for Characterizing the Dynamics of Crop–Weed Competition for Water" Hyper spectral and physiological measurements were combined in this study in an attempt to characterize the spectral response of corn leaves to water competition in the presence of weeds. The results supported the hypothesis that competition will lead to changes in the SWIR.

Jian-Wen Chen *et al.* "A Smartphone-Based Application for Scale Pest Detection Using Multiple-Object Detection Method It is most important to supply a real-time discovery method for scale disease for farmers in the agrarian field. Hence, this study employed thing investigate model to accomplish recognizance responsibilities. Due to complicatedness in collect a big number of pest imagery in the real field, data amplification approach of replacement and flat flip be use to add to the number of pest imagery as the preparation data in this study

Chiranjeevi Muppala *et al.* "Machine vision detection of pests, diseases and weeds" In this evaluate paper, a diversify of tool donative method planned for classification and identification of pests, malady, and weed in the farming grassland were obtainable and their key

point were tabulate. In the near future, farming wants to grow more like a mechanical factory to take on supply for the world. Increase the inefficiency of crop construction and is probable with technical support

Saba Rabab *et al.* "A template-free machine vision-based crop row detection algorithm" This paper proposed a new crop row revealing algorithm that does not need pre-information such as number of crop row and spacing among crop row The just in organize the algorithm wants is the ejective strength of weed

Aichen Wang *et al.* "Semantic Segmentation of Crop and Weed using an Encoder-Decoder Network and Image Enhancement Method under Uncontrolled Outdoor Illumination." In this effort, an encoder-decoder deep learning system was inspected for pixel-wise semantic segmentation of harvest and weed. Dissimilar put in demonstration include different color gap conversion and color index were evaluated to optimize the put in of the system. Three image enhancement techniques were examined to enlarge model strength beside different lighting conditions.

Sajad Sabzi *et al.* "An automatic visible-range video weed detection, segmentation and classification prototype in potato field." The aim was to establish a visible-range effort of fiction, instinctive and right video commerce out device exposure technique and meta-heuristic classifier archetype in potato plant categorization and cataloging of five wild plant beneath real background potato field condition, comprise 1- Malva neglecta, 2-Xanthium strumarium, 3-Secale cereal L, 4-Chenopodium album L, 5- Solanum tuberosum (Marfona potato plant) and 6-Portulaca oleracea. Results show that utilizing the intended prototype, classification of potato plant and weed with an on the entire accuracy of 98% over the evaluation set is promising. key result showing here are précis next to conclude:

To end, it is documented that a right time gap in tidy to know and create out all five class weeds considered here, would be concerning five weeks behind the plant of potato plants take location, as learn weed generates bounded by this juncture margin gap approximately.

As additional effort, it remains free to approximate and examine the worth and velocity of potato plant enlarge subsequent site-specific spraying in connection with the non-spraying counterpart, in order to calculate plant growth optimization and add to Marfona potato place yield [7].

Why Need Weed Classification:

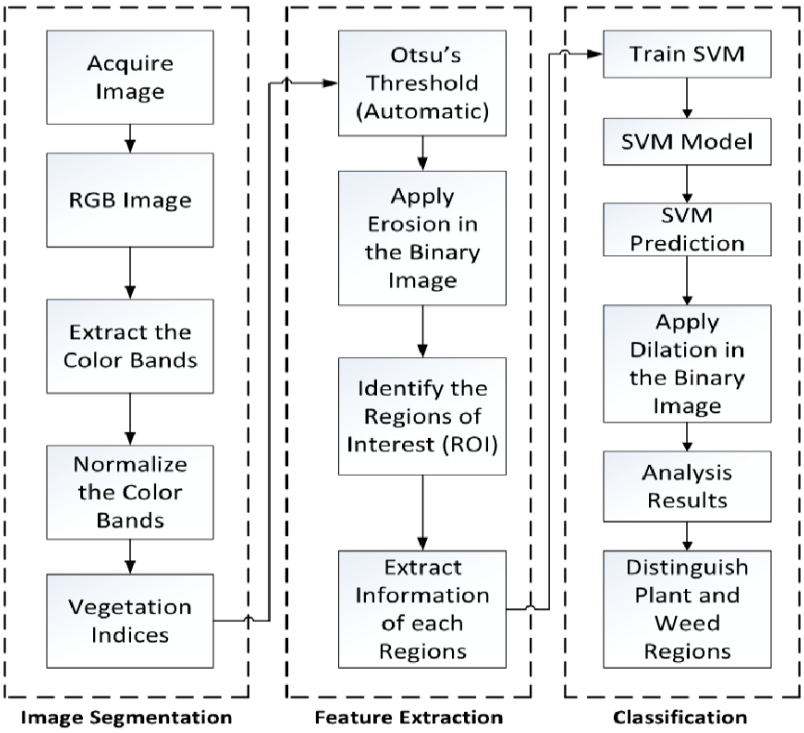
Although improvements have been made in identifying weed regions, the above techniques are not suitable for detecting weeds when overlapped with crop plants. Weed

development is stochastic in environment and thus intersection is a very actual incidence it is thus valuable to focus on those regions and remove the unwanted foliage around the intended plants. In this way, more plants can be considered for cultivation. So, well-organized procedures are necessary to recognize overlying harvest areas so that other plants can be recognized from the infected areas. This problem becomes more challenging when both plants and weeds have the same green color and texture. In that instance, only an experienced farmer can manually identify the plants from the agricultural fields. However, this manual process for weed identification is time-consuming and the accuracy of detection is subject to human error.

Algorithm Flow Chart for Weed Classification:

The proposed system has taken these issues into account and performs selective spraying on plants. Selective spraying minimizes the wastage of products required for the effective control of weeds, diseases, and pests to ensuring that plants receive adequate nutrients. The method uses SVM for decision-making, which has two main advantages. First, the model is robust that is numerous features can be included in the system which helps to maximize the width of the SVM margin.Here proposed method working in three part

1. Image Segmentation
2. Feature Extraction
3. Classification



The flow chart for classifying and decision-making process

The system can be split into three principal modules: Image Subdivision, Story Abstraction, and These components are critical for region classification and discerning plants from weeds. The tasks carried out in each component are described in the following subsections.

$$\text{NormalizedRed} = \frac{\text{red}}{\text{red}^2 + \text{blue}^2 + \text{green}^2} \quad (1)$$

$$\text{NormalizedGreen} = \frac{\text{green}}{\text{red}^2 + \text{blue}^2 + \text{green}^2} \quad (2)$$

$$\text{NormalizedBlue} = \frac{\text{blue}}{\text{red}^2 + \text{blue}^2 + \text{green}^2} \quad (3)$$

Equations 1 through 3 are used to find the value of each color band from an RGB image. Then, by using the set of equations below [15], the normalized component values of the image are calculated. These normalized values are then used as a means of highlighting the "greenness" regions.

$$r = \frac{\text{NormalizedRed}}{\text{NormalizedRed} + \text{NormalizedBlue} + \text{NormalizedGreen}} \quad (4)$$

$$g = \frac{\text{NormalizedGreen}}{\text{NormalizedRed} + \text{NormalizedBlue} + \text{NormalizedGreen}} \quad (5)$$

$$b = \frac{\text{NormalizedGreen}}{\text{NormalizedRed} + \text{NormalizedBlue} + \text{NormalizedGreen}} \quad (6)$$

The "greenness" part of the image relies on the common Vegetation Color Index (VCI) in Equation 7 to further emphasize the greenness part of the plant. This equation applies more weight to greener regions of the plant and removes other color bands from the image.

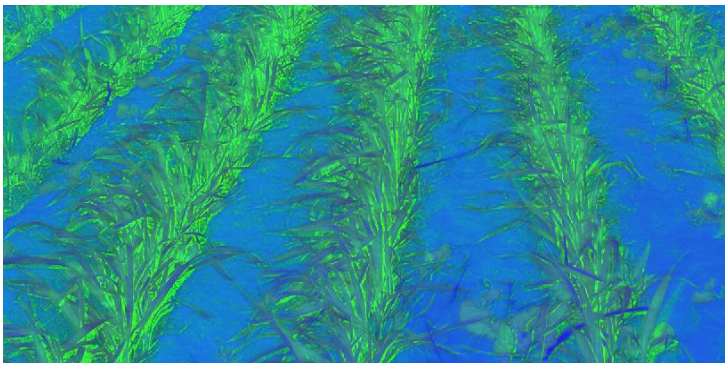
$$\text{Excess Green} = 2 * (g) - (r) - (b) \quad (7)$$

After the selection of color we will extract ROI in image and selection of color region of image. After the binary we apply SVM to detect weed from the image.

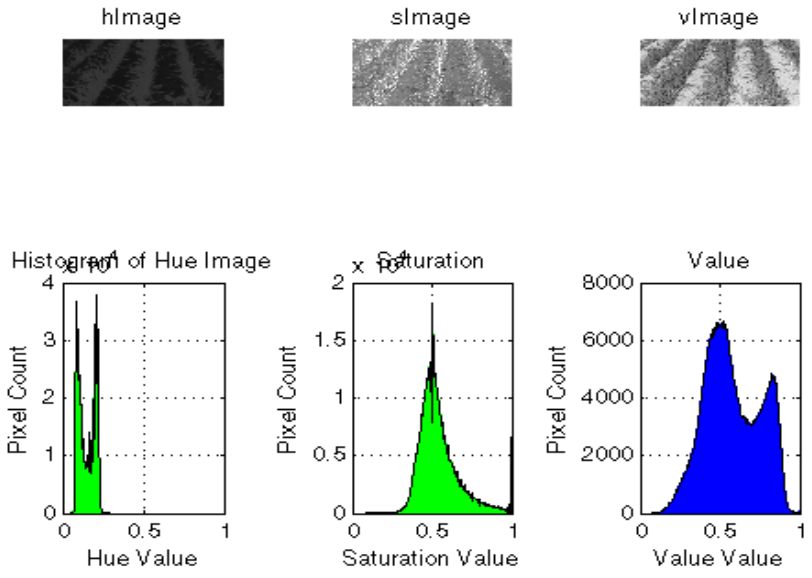
Result Analysis:

Here we take input from the agriculture land by any camera and process it in the local system. Here we classify images in RGB And HSV to extract colour Region. Classify objects with their property.

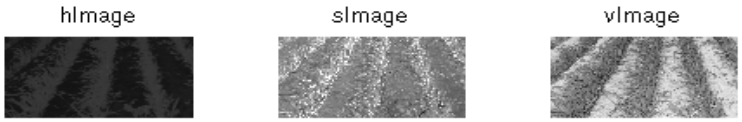
After the input image we are process it for color reorganization. We are separate select R, G and B color then convert it to HSV. After converting this kind of image is displayed

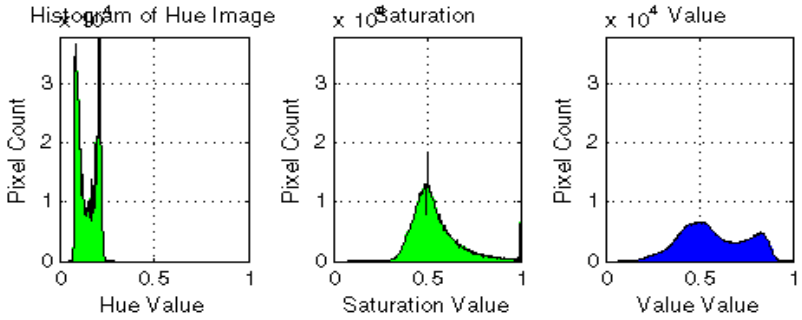


This image is conversion of RGB to HSV and select separate color of H,S and V from the image.

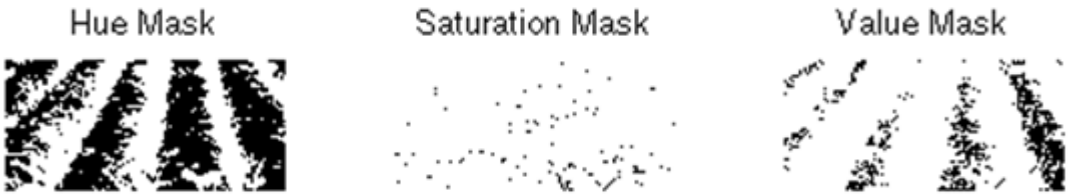


Histogram value of separate image

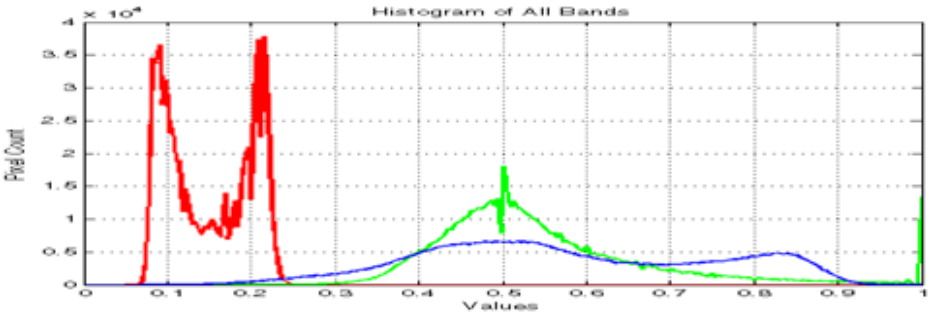




Thresholding output of color image. This is an optimization graph of color image



After Masking of every color



Research Contribution and Future Direction:

Implemented method is to get the best classification output through image segmentation, feature extraction and object classification. From the proposed method we can classify any image which is captured by any camera and detect weed. In the proposed method K-means clustering algorithm is used to classify objects from image and detect green color also used SVM to select weed from the image. It will use in future as practical form. It is assemble in machine (sprinkler) and detect weed and spray. It is also used and a classifier of object to detect infection on land.

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NOVEL METHOD FOR PRIVATE DATA RELEASE IN CYBER-PHYSICAL SYSTEMS

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Abstract:

It is envisioned that future cyber-physical systems will provide a more convenient living and working environment. However, such systems need inevitably to collect and process privacy-sensitive information. That means the benefits come with potential privacy leakage risks. Nowadays, this privacy issue receives more attention as a legal requirement of the EU General Data Protection Regulation. In this paper we devise an approach using pareto front principle which intends to minimise the privacy leak value of individual CPS nodes. This helps in formulating an upper bound on the privacy leak for the whole CPS ecosystem. Our experimental studies show that this approach uses factor which minimise the severity of privacy leak and amount of privacy leak also.

Keywords: Cyber-Physical Systems, Privacy, Trust, Sensor, Pareto, Data Minimization

Introduction:

Cyber-Physical Systems (CPSs) are interrelated to Internet of Things (IoT) and in explicit cases to Industrial IoT (IIoT), in which CPS uses IoT and IIoT for robotization of genuine obligations, for example, process control of offices, waste and water treatment, brilliant transportation, and so forth From now on, in this paper, CPSs are considered as an umbrella to address both IoT and IIoT organizations. The IoT is blasting as the new insurgency of the data and innovation time; fifty billion IoT things are projected to flawlessly convey each other by means of the Internet by 2021. IoT gadgets are described to have delicate individual information of the clients including photos, installment records, passwords, contacts, location, and so forth Consequently, a significant privacy effect of digital protection answers for these frameworks is the high affectability of the property revelation[1].As pushed by numerous scientists, Wireless Sensor Networks (WSNs) just as IoTs, are dependably under the interest of vindictive gatherings, thus the privacy of the clients may be at risk.IoT frameworks have a similar privacy issue, for example in home robotization frameworks, exercises of the house occupants perhaps gathered and correlated[2].Similarly, other IoT applications can distinguish clients while they are

performing exercises in explicit spots which may likewise additionally uncover their location data at explicit occasions. Reception of fog and cloud computing ideas by IoT will assist these privacy issues, as the responsibility for information will be an extraordinary test to be addressed. Privacy of the IoT clients in the CPSs should be ensured; hereafter philosophies and calculations should be planned thusly. Yet, IoTs have some exceptional properties which makes it trying to plan calculations, particularly the ones identified with the location privacy of the clients.

Obliged assets: Some IoT end-gadgets are of extremely minimized measure and in this way have restricted energy assets. These compelled end-gadgets ought to be working little calculations that are planned in consistence with the rest wake patterns of the end-gadgets for having a long lifetime [3]. Furthermore, these little end-gadgets additionally have restricted correspondence and calculation assets. These imperatives will decide the plan model of the privacy preserving strategies and calculations of the IoT.

Heterogeneity: IoTs are ordinarily heterogeneous organizations as they comprise of different kinds of gadgets, administrations, advances, and clients. Interoperability of this multitude of things presents a monstrous issue.

Absence of trust: There is no believed outsider characterized to direct safe activity of the IoT by approving clients and end-gadgets. Scalability: IoTs offer a profoundly adaptable and versatile organization engineering, which may make issues for calculations that are intended for static organizations.

Uncontrolled environment: In many cases, the clients of the IoT are versatile and IoT end-gadgets are available by anybody out in the open spots. Thus, they may be open for actual access whenever.

In the new past, location privacy was not just a major worry for the clients of cell frameworks, yet additionally for the clients of Internet. The IETF (Internet Engineering Task Force) has consequently utilized a devoted gathering to concentrate on privacy and geographic location [4]. As IoT will be the following mechanical jump following Internet, location privacy identified with the clients of the end-gadgets will be an essential worry in some particular situations particularly for CPSs and brilliant urban communities. For a cure, we propose a Location Privacy Preserving Scheme (LPPS) for IoT clients of the CPSs, which use the idea of blend zone alongside location-obscurity. LPPS is an improved and more organized rendition of LPAIoT scheme. Individuals' locations are gathered at a huge scope by a wide reach of elements (e.g., Uber and Google Maps), regularly through versatile advances. Such information is very private, for a considerable length of time, social, and monetary reasons. In any case, having the option to investigate what's more model area designs is exceptionally important to different

organizations what's more specialists (and society in general) to empower a huge reach of area based applications, from following infection spread to lessening gridlock. The dramatic development in ubiquity of (open) information science has seen an always developing interest for the distribution of an assortment of area datasets (e.g., geotagged Tweets, taxi venture starting points and objections, web-based media registrations). In any case, the dangers concerning the infringement of people's privacy present a significant hindrance to the free sharing of such information. All things being equal, the crude information must be essentially disinfected before it tends to be distributed. This can include conglomeration into predefined locales, area irritation, or then again truncation of longitude-scope information. In this setting, the sterilization activity is controlled and performed by the information proprietor, whose essential concern is to limit the privacy hazard to the information subjects and their subsequent risk. By and large, this significantly restricts the utility of the distributed information. Similar organization as the first information can give greater adaptability in how customers can utilize the distributed information. In numerous pragmatic situations, the beneficiary of a dataset will need to utilize their in-house information investigation apparatuses with practically no limitations from the information supplier on the way in which the information can be utilized, or the kind of inquiries that can be inquired. In this paper, we foster methodologies for creating sensible manufactured information from genuine area information, while additionally fulfilling the severe necessities of differential privacy (DP). The point is to expand the likeness between the first and engineered datasets, while securing the presence and area of any person.

Literature Survey:

Since DP has become the state-of-the-art privacy model, it has been applied to many domains, including medical, financial, and social network data. Using DP for spatial data is a continued area of focus given the significance and sensitivity of location data. For example, previous work has developed differentially private spatial decompositions, released spatial histograms, and protected temporally correlated location data. There is an increasingly large body of work on private trajectory publication and synthesis. Although these appear to be complex variants of the location privacy problem, the solutions therein all produce outputs that correspond to arbitrary grid cells (which is not concordant with the format of the original data), whereas we generate co-ordinate data (i.e., the same form as the input data). While one could extend these solutions to generate individual points (e.g., by using uniform sampling), we show in our work that achieving high-quality results by synthesizing exact locations (while preserving

the underlying characteristics of the real data) is a significant challenge. Furthermore, almost all existing works fail to fully utilize publicly-known information to boost utility at no cost to privacy. Other context-aware work uses the local setting of DP, as well as relaxed privacy definitions, which makes them incompatible with our objectives.

Privacy preservation is the procedure of safeguarding sensitive information from exploitation by adversaries while still allowing it to be effectively processed on the network [5], [6]. Privacy preservation in CPS appeared in 2008 in work by few researchers, and was designed to both provide data utility whilst eliminating the ability for adversaries in the network to gain access to the CPS sensitive data storage[7]. As previously outlined, CPS systems generate large measures of heterogeneous data from multiple sources, and there is therefore a need for developing privacy preservation methods across this data, whilst still allowing existing network security measures, like irregularity detection, to operate effectively [18], [19]. Given that CPS systems draw in motivated, skilled attackers over a significant time period, one objective is the potential access and exfiltration of control system data, for example, power information, user credentials for further system access, and an understanding of key nodes to cause significant kinetic impact. There are extensive research studies that have been proposed to maintain the data privacy and security of CPS environments against cyber-threats, specifically for ensuring their confidentiality and integrity, [8]. There are multiple methods of classify methods for privacy preservation, however the best and intuitive is to classify according to the purpose of data transformation [9]. This classication has three categories: data generalization; data transformation; and data aggregation. Generalization techniques maintain data condentiality by converting sensitive features into general values. Paradoxically, transformation techniques [10] modify the original data with new values and use some projection techniques to reduce the data's dimensionality. Aggregation techniques work by [4] splitting the original data into little parts and altering each part's private values with the average of that part. Other studies introduced in [8] focused on data aggregation for maintaining system security and privacy. These techniques are effective to preserve sensitive data from illegitimate access. However data heterogeneity techniques are still nascent in CPS research given the difficulty in effectively managing different data types [17]. Given the large variety of data in CPS ecosystems, this is a non-trivial issue in the field. An alternate method for categorizing privacy preservation techniques is based on their characteristics. The categories in this structure are; heuristic-[3], reconstruction [4], cryptographic [5] and Blockchain-based [5]. These techniques are considered to be effective in data protection, yet they still have problems of providing few cryptographic details, incur high computational expenses, need describing data standards if it is crude or aggregated and can't

scale well [5]. Several methods based on Data Mining (DM) and Machine Learning (ML) [5], perturbation (i.e., Differential Privacy (DP)) [1] and encryption [2] were deployed to change, alter, distribute and conceal system information from exposure during processing or transmitting them however networks [3]. In control systems, like power grids, there are security, privacy and commercial limitations on data, and as such it is not available within the public domain or for research purposes [3], [7], therefore, it is difficult to obtain relevant data from different sources. Therefore, mitigating the cyber and privacy threats attacking CPS ecosystems is still an active area of research, and several research studies have been conducted with the express aim of protecting CPS physical and network confidential data [8]. Encryption techniques are traditionally used to safeguard sensitive data yet they have issue in further analysis and data management while latelyMachine learning, data mining and statistical approaches are extensively applied [11].

Proposed Method:

Data minimization is a direct method for limiting privacy leakage. Intuitively, the less data there is to collect, store, and share by savvy devices, the easier it is for users to protect their personal information. Another level of meaning in "data minimization" is to limit the knowledge discovery. For example, if the objective of a service is to recommend an exercise routine, it ought to be restricted to infer locations of users without the explicit permission of customers. Therefore, developing novel data minimization technologies or hiding sensitive mining results merit studying.

We consider a model for Cyber-Physical System where we have to restrict the privacy leak so we formulated an equation as given below:

$$P_L=\min(f(x_1,x_2,x_3,..x_n)) \quad (1)$$

In the above equation, $x_1,x_2,x_3,..x_n$ are the privacy leak values of components $X_1,X_2,X_3,..X_N$ which belong to the CPS ecosystem. They may be sensor nodes, communication channels,application programs or any other CPS entities.We utilise the privacy leak values to advocate the designer,so that privacy leak values are reduced with a lowest possible extent.

Pareto optimal solutions; that is, solutions that cannot be improved in any of the objectives without degrading at least one of the other objectives. So, the privacy leak of component X1 will impact the privacy leak value of component X2 only in certain conditions.
These conditions are stated below:
P_L of X_1<=P_L of X_2<=P_L of X_3<=….<=P_L of $X_n$then we say X_1 is upper boundary for the

privacy leak in the whole CPS system.

We now discuss how the Privacy leak values of a component can be reduced.It depends on the factors which influence the values of Privacy leak.The first factor is the strength of Algorithm used in a CPS entity to preserve the privacy values.Let it be represented as $SAPL(X_i)$. The second factor is the amount of data used by the CPS component which is directly proportional to the amount of private data released. This is denoted by $D(X_i)$.The last factor is the trust value embedded in the CPS component. It is represented by $Tr(X_i)$.Overall we arrive at the below equation to express the privacy leak value:

$$P_L \text{ of } X_i = SAPL(X_i).\ D(X_i).\ Tr(X_i) \qquad (2)$$

We take the scalar product of all the 3 factors which impact the privacy leak values of a CPS component X_i. Now to find an upper bound on the privacy leak values of the whole CPS system we proceed as shown further.

$$\text{Upper } (P_L) = \text{minimise } \left(\sum_{k=1}^{n} PL(Xi) \right) \qquad (3)$$

Once we obtain the upper bound of privacy leak value on each individual CPS nodes, we can perform summation and arrive at a value, which should not be crossed else the performance of the system cannot be accepted.

Experimental Results:

Below plots show how the privacy leak values get affected by the values of strength of Privacy algorithm, amount of private data released and the trust value embedded in the CPS component.

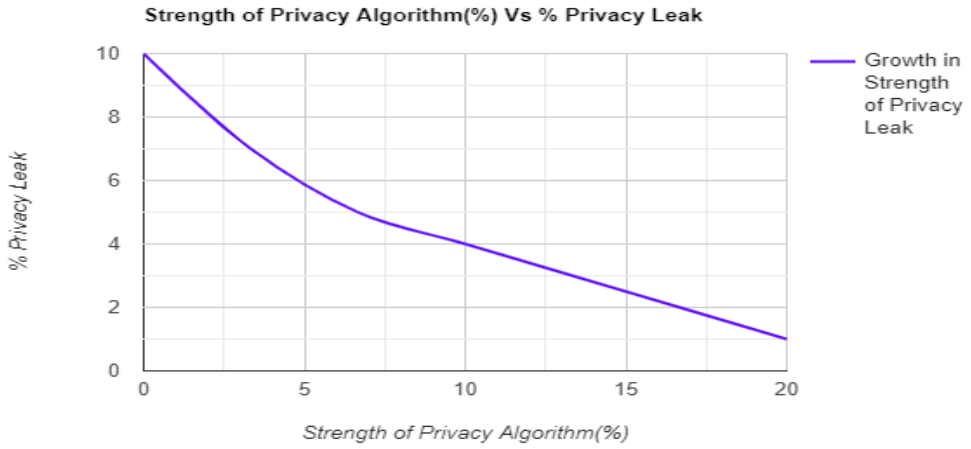

Figure 1: Graph of Strength of Privacy Algorithm (%) Versus Privacy Leak (%)

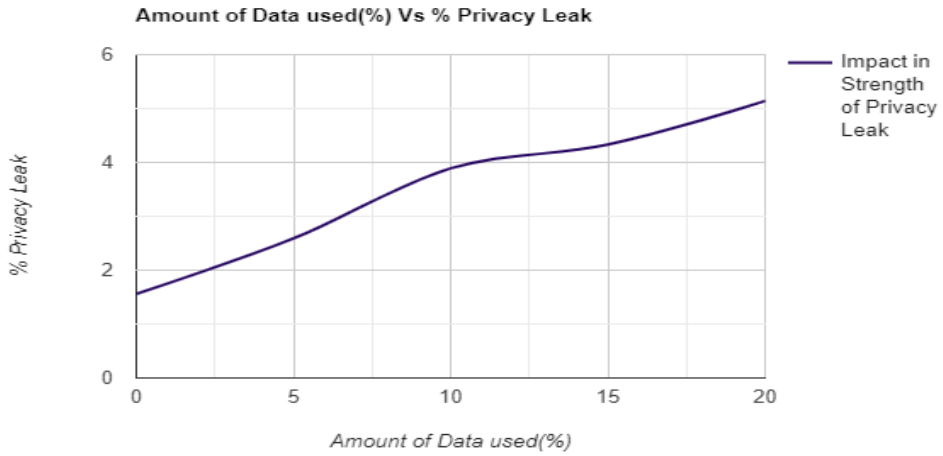

Figure 2: Graph of Amount of data used (%) Versus Privacy Leak (%)

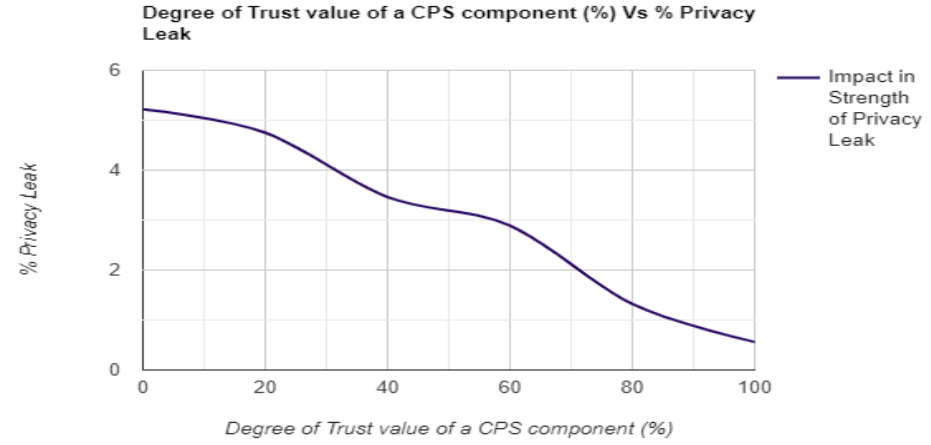

Figure 3: Graph of Degree of Trust value of a CPS component (%) Versus Privacy Leak (%)

Conclusion:

In this paper we have used a novel mechanism to minimise the privacy leak using data minimisation principles. In specific we have used the Pareto front principle to devise an upper limit on the privacy leak values. We have used factors which can immensely create impact on the privacy leak such as the relative strength of privacy algorithms used in the CPS components; the amount of data used by a CPS entity as well the degree of trust related to a CPS entity. These factors are directly proportional to the amount of private data released by the CPS ecosystem. An attacker may try to exploit these loopholes to pose a considerable threat to the CPS, so our paper gives these factors due importance so that the CPS security and privacy designers don't ignore the role of this factors.

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MULTIPURPOSE DELIVERY ROBOT CONTROLLED WITH OTP ANDSECURITY FOR THE PACKAGE

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Abstract:

This is the generation full of robotics and automation.Robotics has the potential to transform the livelihood in an easy manner with the human involvement.As the COVID pandemic has increased the need for touch-free interactions. So, to boost e-commerce and food deliveries without the spread of infections due to contact we here propose an autonomous delivery robot system. The robot is designed with an Arduino UNO board to ensure the complete robot working. The robot is controlled by a 4-wheel drive and remotely controlled via a gsm remote. Also, the robot has an upper section to carry packages on it that can be opened only to intended recipients.

Keywords: Arduino, GSM, VOLTAGE DRIVER IC L293D,16X2LCD

Introduction:

The word "Robot" is one of those volatile terms that have defied a unique definition. One reason for this is that its use changes all the time. Initially, a robot was a humanoid or human-like being. The word "Robot" is derived from the Czech word meaning slave and was coined by Kapec, Rossum‟s Universal Robots in 1921 [1]. These robots were biochemical – what we would now call androids. This was copied soon by several films featuring robots such as Fritz Langes 1922 Metropolis that excites the imagination [2] of both the public and science and engineering communities. Science fiction books such as Asimov's I Robot‟, from that we got the term robotics, were also popular at this time.

As in this currentsituation, covid cases are increasing very rapidly. Many people have a perception that covid has increased due to high contact culture. This is the main ground for the decrement of e-commerce applications [3] which is based on one-to-one delivery. To avoid this problem, we proposed a chapter called multipurpose delivery robot controlled with GSM and OTP security for the package. a multipurpose delivery robot is a robot that ensures contact-free

delivery with high security to the package. Security to the package includes a GSM modem with OTP.OTP is provided to the user to collect the package. If the case user enters the wrong otp then it will generate a message. This robot incorporates an Arduino board for working and it considers 4wheels with 2DC motors driven by driver IC. [4] To avoid stick-up of the package we provide a buzzer to alert the person. It will deliver Maxima of 10kgs.

Literature survey:

[1] This paper is proposed by Ad F. Carrera, T. Canas, and A. Silva. 2006. We found the technic Mobile\Robot to Deliver Meals inside Health Services.The Technic mobile \robot to deliver meals inside the health care centers is a chapter which was proposed to create a device that acts as a delivery system between the kitchen and the patients or the emergency ward as the temperature difference is seen in the rooms like ICU, UICUs the food transfer will be easier. This chapter failed as the trolly was too huge and there need to be one for one floor so we have taken a basic idea of the system and changed the drawback of being complex and huge.

[2] This paper is from the International Journals of Science and Technology which was proposed by M. Dhivya and M. Pushpavalli. 2014. This paper was found efficient as they have used GPS. The above Paper which was done by T.Canas [1] they have to infuse GPS which had a clash as the distribution was been located at the same location. We found the technic Automatic Delivering System in Hospital Using GPS Technology and Efficient Fault Management. So we have taken a basic working of the chapter and used in our chapter.

[3] The paper is proposed by the Roman Osorio C., Jose A. Romro, Mario Pena C and Ismael Lopez Juarez. 2006. We found the technic Intelligent Line Follower Mini Robot System. International Journals of Computers, Communications, and Control. I (2): 73-83 from this paper, This research has the simple change which is the line follower robot technique is used which can complex the delivery issue in building new lines just for a robot to deliver. We have considered this also as a stopper in our chapter and also no prototypic evidence is present.

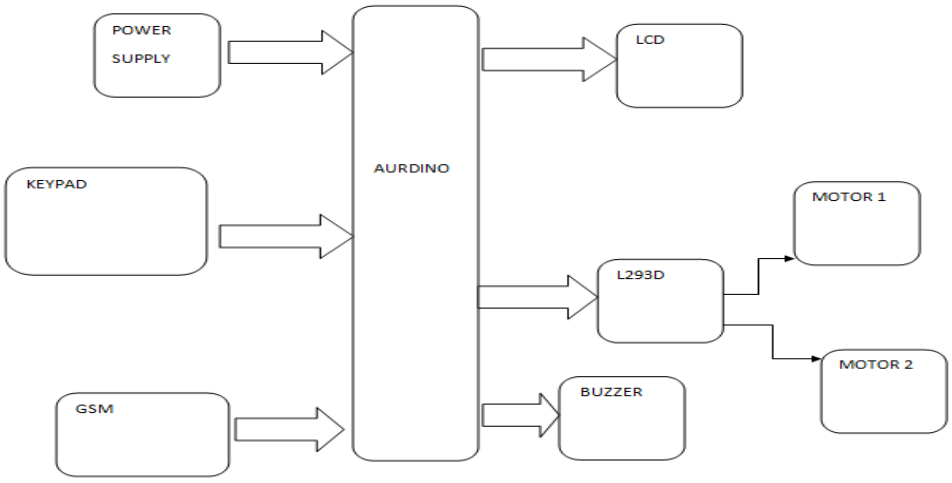
[4] The paper is proposed by Nirmal T M We found the technic “Multipurpose Robot for Patient and Military Applications”, International Journal of Electronics Communication and Computer Technologies (IJECCT), 2014. As per the author's view this chapter is where a robot is sent to find and detect the patient or a soldier who is injured and bring him back to the base for treatment which also has no prototypic Evidence, we have taken the structure from this paper, as this is a military application.

Proposed system:

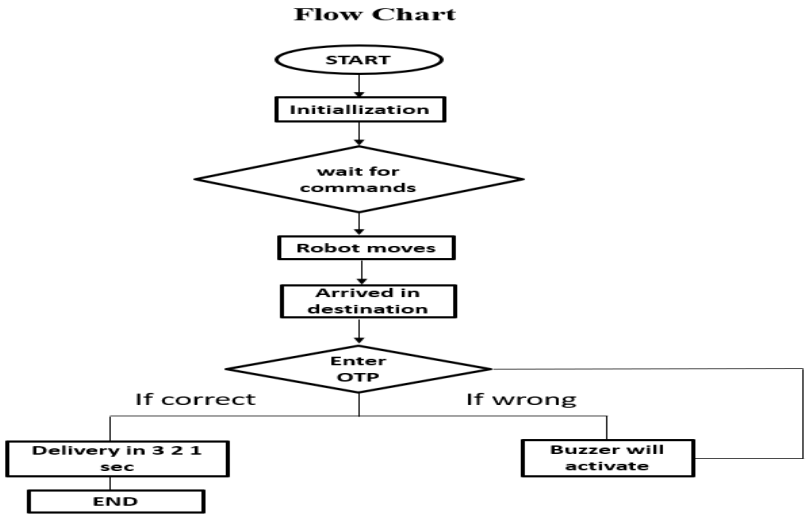
In this chapter we proposed a system called Multi-Purpose delivery robot with GSM and OTP security for the package.It is a system with a GSM modem which work in remote areas efficiently.It can deliver the package with high security using gsmotpsystem.It works on certain commands given by the delivery boy.It can assure a contactless delivery which is mainly used in this pandemic situation.

The main aim of this chapter is to explain the monitoring method used to operate the robot, with the help of an android phone, clean and pick and place Objects. Check Whether the switched on the system the message displayed on the LCD or not. If the system is properly working then in the absence of the owner it will properly work.Finally, the microcontroller decides to give commands to the motor driver to drive the motor in different directions by commands.

Block diagram:



Flow chart:



Conclusion and Result:

Result:

The implementation and realization of "Design and Implementation of Multipurpose delivery robot controlled with Gsm and Otp using Embedded Systems" is done successfully. The communication is properly done without any interference between different modules in the design. Design is done to meet all the specifications and requirements.

Conclusion:

The main aim of this chapter is to explain the monitoring method used to operate the robot, with the help of an android phone, clean and pick and place Objects. Check whether switched on then the system shows the message displayed on the LCD or not. If the system is properly working then in the absence of the owner it will properly work. Finally, the microcontroller decides to give the command to the motor driver to drive the motor in different directions.

The chapters main outcome satisfies, no contact delivery, and also a safe delivery this chapter reduces efforts of lifting and transporting of the goods to be shipped at higher altitudes (apartments) as this is secured with the OTP system, any misusage of the device storage alerts is generatedthis is also to reduce time and effort the delivery would be smooth fast and secure.

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NON-PARAMETRIC REGRESSION ANALYSIS

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Introduction:

The exchange rate fluctuations remain a source of concern for countries, or companies, because they are synonymous with risks and uncertainties. And, it is well documented in the literature that countries, or companies, which are open to the international, are particularly sensitive to the volatility of exchange rates. In this sense, the management and use of the exchange rate, requires a better understanding of the dynamics of rates, where the problem associated with forecasting is crucial for decision-makers, nationally or in the businesses, which seek, fundamentally, to minimize the harmful impact of uncertainty on national well-being, or entrepreneurial activity.

Economists have both approaches and methods of time series analysis to make forecasts. Two main classes of models emerge in the statistical literature, namely: parametric models (ARMA - AutoRegressive-Moving Average models, ARCH - AutoRegressive Conditional Heteroskedastic- / GARCH - Generalized Autoregressive Conditional Heteroskedastic models) and non-parametric models (regressogram method, kernel method, smoothing spline method).

In the study of two-dimensional variables, and in general, of multi-dimensional variables, it may be interesting to investigate the possible existence of a dependency relationship between the variables involved and the construction of a mathematical model that allows describing said relationship, in the assumption of that it exists.The purpose of the study of regression models is to build mathematical models that make it possible to explain the dependency relationship between a response variable Y and one or more independent variables. We can use these models as a tool to predict new values of the response variable based on a certain particular value that the explanatory variable has taken. The use of non-parametric regression techniques is essential when trying to predict a response variable that is impossible or very expensive to measure. Two types of regression models according to the assumptions established about the regression function, these are,

Parametric Regression Model, which assumes that the regression function has a default shape

Non-parametric regression model, which only assumes the hypothesis of smoothness (in the sense of continuity and differentiability) on the regression function. Neither is any predefined form assumed like the above for the regression function.

Non-Parametric Regression:

In nonparametric regression, the estimator of the regression function called the local linear estimator stands out for its good properties. Non-parametric methods are more appropriate when there is no prior knowledge of the relationship between the variables under study since they only start from assumptions of smoothness on the regression function. Nonparametric regression has four main purposes for estimating a regression curve:

- Provide a versatile method for studying the general relationship between two variables.
- Give predictions of the observations even if they have no reference to any fixed parametric model.
- Provide a tool to find false observations and thus study in isolated points.
- The creation of a flexible substitution method for missing values or interpolation between adjacent X-values.

These non-parametric methods are computationally expensive due to the large number of operations involved and are only applicable in practice with the help of a computer program. The local polynomial regression estimator does not present the border effect. The bias in such a region is of the same order as that existing in the interior, so that, unlike what happens with other non-parametric regression methods, no modifications of the estimator are needed in that region.

Comparison between the different methods:

If bandwidth is chosen as an appropriate function of sample size n all the estimators presented converge. Among the regression kernel estimators, the bias of the Nadaraya-Watson estimator takes on a more complicated expression than that of the convolution kernel estimator. These two estimators have the same variance under a fixed design, although the variance of the Nadaraya-Watson estimator is more favourable than that of the nucleus by convolution estimator. Besides the e science asymptotic minimax from the Nadaraya -Watson estimator m̂N - W equals 0. In a sense minimax, the kernel-type convolution regression estimator it is optimal under a fixed design.

Bandwidth selection:

The regression core estimator, especially the convolution estimator, can be a good choice due to its mathematical simplicity and easy interpretability. Although the local polynomial estimator is asymptotically equivalent to the kernel-type estimator by convolution in a fixed design, under a random design it is superior in terms of its asymptotic variance, its bias

remaining the same. This, together with the fact that it does not need any correction for the border effect, makes it a magnificent choice between the different estimators of the regression function.

Method depends on a parameter whose optimal selection determines a balance between the degree of fit to the data and the smoothness of the estimator. Given that a nonparametric regression model establishes a hypothesis of smoothness on m, the points of an environment of x contain information about the value of m in x. It is therefore possible to make a local average of the observations

- Y i with abscissa in such environment. This is the general basic idea of smoothing. At each estimation point, a local average of the observations is made
- Y i included in a vertical band with an interval centred on that point. The width of the band depends on the value of the parameter h, who will we call bandwidth.

Bandwidth h therefore determines which observations are involved in calculating the local average. If the selection of large would involve using many observations to calculate the estimate of m in each x, this leads to an increase in the estimation bias and an estimator is obtained with an appearance of excessive softness. Instead, a value of h Small significantly reduces the number of observations that influence the local average and we obtain a poorly smoothed estimator and an increase in the variability in the estimate.

It would be desirable to have a bandwidth selection method that provides optimal bandwidths, in the sense of achieving a balance between variance and estimator bias. That is, find a value of h that enables a reasonable fit to the data without excessively increasing the variability of the estimator. There are generally two alternatives to achieve a fair amount of smoothing. A subjective choice of bandwidth that allows the researcher to choose the value of h looking at the scatter plot. The main drawback of this method is that it cannot be automated and is difficult to use when working with observations of more than two dimensions. However, a data-driven bandwidth selection method allows the researcher to choose h in an automatic and objective way, and is very useful in multivariate regression analysis.

Error criteria:

In this section we focus on the most relevant automatic methods of bandwidth selection in non-parametric regression. To analyse the Behavior of a regression core estimator, it is necessary to specify error criteria that measure the precision of the estimation. The smaller the values provided by these criteria for a given estimator, the better that estimate. We can measure the error made in the estimation at a single point or by means of a global error measure that allows us to know how the estimator behaves over the complete domain of definition of the

regression function. The most common point error criterion is the Mean Square Error (MSE), which is defined by:

MSE (h) = E [mph (x) – m (x)] two (1.1)

Among the global measures, a natural error criterion for estimators of the regression function is the AND ∫ Integrated Quadratic Error (ISE). For a bandwidth kernel estimator h, ISE is home to:

ISE (h)w (x) [mph (x) – m (x)] two = dx (1.2)

Where w is a non-negative weight function. Suppose this function has a continuous second derivative. w it can be chosen so that it is constant inside its support [a, b] Y 0 in an appropriate boundary region of said interval. A rationale for choosing this weight function is that it underweights the errors at the boundary, which usually dominate the error committed within the interval. Although there are situations in which it is not necessary to consider such a function, its use drastically simplifies the theoretical developments.

Estimator Adapted to Discontinuities:

An advantage of the bandwidth selection methods built using a correction factor (including CV and GCV) is that it solves the problem, definitional motto that exist at the points where m ≡ 0, adapting from shape ∫ automatic in this case. An important consequence of theorems (1.2) and (1.3) is that they imply that the method plug-in bandwidth selection, even if two Y (m) two are known, has a convergence ratio no greater than a bandwidth obtained by the methods proposed above, which may call into question the use of these methods. However, and given that these results are asymptotic, there are occasions in which the methods plug-in provide better results than other automatic selection method. Most of the traditional non-parametric regression methods work under the hypothesis of smoothness, this produces smooth estimates of the regression functions, but they tend to show their trend if there is any discontinuity.

The Breidt and Opsomer estimator:

In many sample studies in finite populations, it is easy to obtain auxiliary information from the population, which can be used to improve the precision of the estimators. Model-assisted estimation provides a framework for incorporating overpopulation models into design-based estimation. The local polynomial regression estimator adapted to the design. Under hypothesis of smoothness on m (x) they obtained an asymptotically unsigned and consistent estimator for the mean. Various simulation studies indicate that this estimator is more efficient than the regression estimator when the model is not correctly specified, whereas if the model is correctly specified then both estimators are approximately equally effective.

This estimator improves the efficiency of the design of the regression estimators in the case where it is difficult to see a priori the relationship between the variable of interest and the auxiliary variable. As in any non-parametric regression method, the practical characteristics of the estimator depend on the choice of the smoothing parameter (bandwidth). It uses a fixed bandwidth;however, they did not study how to select the best value for it to proposed a method to select the best bandwidth by minimizing a certain cross-validation criterion.

Simulation Study:

Small relative efficiency with respect to REG when the population is linear, but dominates REG for other populations. When the bandwidth is large, the local linear regression estimator is equivalent to the classical regression estimator and the MSE they tend to coincide. Clearly, bandwidth has an effect on MSE of LPR1, However, given that this study is independent of the choice of bandwidth, we can see that LPR1 is better than HT for all populations and that dominates REG for all populations except linear. This shows that the local linear regression estimator is probably an improvement on the estimator of Horvitz-Thompson and of the classical regression estimator, when the relationship between the auxiliary variable and the variable of interest is not linear.

Estimates based on the model:

Rueda and Sánchez-Borrego (2009) present another assessor dependent on the model as indicated by the nearby polynomial relapse. This assessor has appealing properties and is based on overpopulation models ξ. As a rule, parametric strategies are utilized to speak to the connection between the helper information and the examination variable, nonetheless, the task of such a relationship is normally improper or cannot be checked. A characteristic option proposed by Kuok (1988) for the dissemination work is to receive a non-parametric way to deal with the assessor dependent on the model that does not put any limitations on the connection between the helper information and the investigation variable. Other significant chips away at this point are Chambers *et al.* (1993), Dorfman (1993), and Dorfman and Hall (1993). The target in this segment is to utilize the assistant data to improve the assessment utilizing a non-parametric model. To accomplish this, we receive a model-based methodology, which utilizes the nearby polynomial relapse assessor to foresee the non-test estimations of Y. The subsequent assessor has great properties from a hypothetical and common sense perspective. To pick the transfer speed we will think about the cross-approval strategy. The proposed methodology is characterized for an overall testing plan and is a legitimate option in contrast to other known assessors.

Estimator adapted to discontinuities:

An assessor of the populace mean is proposed dependent on an adjusted adaptation of the centre nearby direct assessor (Sánchez-Borrego *et al.*, 2006) to assess the irregular relapse work.

This strategy is the aftereffect of joining the methodology of the extended perceptions (Wu and Chu (1993) along with the nearby straight relapse type core (Fan and Gijbels (1996). The proposed technique is introduced in two stages:

To start with, the bounce focuses are assessed, and second, the relapse work and the populace mean are assessed utilizing the hop focuses as of now assessed.

The extended perceptions are a strategy to reuse the accessible information and, thusly, include ground-breaking perceptions in the restricted area of the bounce point, assisting with improving the assessment of the hop focuses.

These evaluations are indicated by you k (k = one, ..., q) and we think about that you k - one ≤ you k for k = one, ..., what + one, de niendo t 0 = 0 Y t what + 1 = one.

Model-Assisted Estimates of points of change:

The IBEX 35 (Iberia Index) is the primary benchmark record for the Spanish financial exchange created by Bolsas y Mercados Españoles (BME). It is comprised of the 35 most fluid organizations recorded on the Electronic Stock Market Interconnection System (SIBE) on the four Spanish Stock Exchanges (Madrid, Barcelona, Bilbao and Valencia). It is a list weighted by market capitalization; that is, not all the organizations that structure it have a similar weight. In this segment, the issue of assessing the populace mean of the IBEX-35 offers is contemplated, considering the purposes of progress and thinking about that the connection between the factors under examination is from the earlier obscure. There are various models, given the circumstances, where there are defining moments. Defining moments can happen in circumstances, for example, the monetary effect of a district, a cataclysmic event brought about by a tremor or the effect of abrupt environmental change. Models can be found in medication, physical sciences, financial matters, quality control, and so forth

We consider the model-helped assessor of Breidt and Opsomer (2000). An alternate guess to gauge the mean is given by the model-based assessors, which just foresee the non-test esteems. Said assessor is given by Müller and Stadtmüller (1999) presented a non-parametric relapse technique dependent on the cross-approval work, to decide the quantity of hop purposes of the spasmodic relapse work. On the off chance that there are discontinuities, a variation of the nonparametric relapse assessor is essential. We first gauge the bounce focuses and second the relapse work utilizing the assessed hop focuses. The spasmodic relapse work is assessed because of joining the nearby polynomial relapse, presented by Fan and Gijbels (1996) among others, along with an adjusted variant of the extended perceptions strategy (more subtleties in Sánchez-Borrego *et al.* (2006).

Comparison between the model-based estimator and the model-assisted estimator:

The examination between the model-based assessor and the model-helped assessor is certainly not a straightforward issue since they depend on various standards. The Breidt and Opsomer (2000) assessor utilizes the model to join assistant data, however thinks about derivation under plan as the genuine target of the inspecting. The Breidt and Opsomer assessor is fair under the plan however not fair-minded under the model. Model-based assessors will in general have littler fluctuations than their plan-based rivals, particularly for little example sizes where configuration-based assessors might be inadequate. In the event that the model is inadequately indicated, model-based surmising gives more regrettable derivations than configuration-based ones. The absence of heartiness of some model-based assessors is one reason for inclining toward configuration-based induction (Kuk and Welsh (2001). Besides, the proposed assessor has the benefit of model-based assessors and does not experience the ill effects of the absence of heartiness like parametric assessors.

Calibration estimation of the distribution function using nonparametric regression:

In this case, the objective is to estimate α , and there are many estimation methods: for example, least squares method, maximum likelihood method. However, as Ruggiero (1992) notes, "a parametric approach is not immune to a lack of robustness and a loss of efficiency of the estimators when the chosen parametric family badly fits the distribution of the data" (p.36). It is sometimes difficult to match the parametric model with the real data. To overcome this obstacle, nonparametric models are developed. For nonparametric models, however, the function of the link . In the absence of any hypothesis on this function, it is ...between X a random variable of IR p ($p \in IN *$) and Y a real random variable of IR , is unknown. Indeed, no parametric assumption is imposed in this model, no assumption on the distribution of X (it is left entirely undetermined - a fortiori), only the assumptions of regularity of the function of the link are imposed):

In this case, the objective is to determine r (X). The current idea is to estimate r (X) by local smoothing. Smoothing means: "let the data show us the shape of the regression function" (Latraverse, 2000: 18). For Hardle and Luckhaus (1984), the nonparametric method is robust. Gannoun (1991) adds that it is easy to deploy and does not require any seasonal adjustment exercise associated with the observed process. Indeed, the interest of the results found with this approach no longer needs to be proven: many comparative empirical studies of these two approaches and statistical tests show a sensitivity of the outcomes according to the statistical measurements, but with very favourable for the superiority of nonparametric predictors over parametric predictors.In addition, multiple and fascinating developments in the literature, make it possible to be convinced of the diversity of the economic phenomena which can be treated by

this type of approach. Despite its relative effectiveness, the nonparametric approach is, however, only insufficiently employed in forecasting exchange rates. To our knowledge, no study has applied this approach in forecasting the CFA franc exchange rate.

This empirical study proposes a nonparametric method based on the use of the regressogram and three types of smoothing (by the moving average, the moving median and the moving line) for the estimation of the autoregression of a nonlinear autoregressive process constituted by the daily exchange rates of the US dollar against the CFA franc.The FCFA is linked to the euro. The FCFA exchange rate per ...from Central Africa; compares the results obtained by these methods over three forecast time horizons. The regressogram method was chosen for its simplicity.

This work is all the more especially centred around two focuses. Most importantly, the philosophy embraced is clarified; at that point, we analyse the figure results, which are gotten by the models picked, and the way to deal with arrangements on improving these estimates. In Rueda et al. (2010) a model-helped alignment assessor is proposed for the dissemination work, utilizing non-parametric relapse strategies. The subsequent assessor is a dispersion work that has a few alluring properties. At the point when helper data is accessible, there are a few general assessment strategies to acquire more productive assessors of the mean and of the populace aggregates. These overall systems have been applied to the assessment of the dissemination work. Nevertheless, because of the particular idea of the dissemination work, the subsequent assessors will in general have unfortunate properties.

Empirical Study:

The efficiency of nonparametric regression methods for the variable's population with university degrees (independent variable) and female workforce (dependent variable). The full incorporation of women into society and the strong growth in immigration are the two most outstanding features of the second half of the 20th century. The illiteracy rate of the population went from 63% in 1900 to 2.4% in 2001; This reduction has been even more intense among the female population (from 71.4% in 1900 to 3.4% in 2001), the percentage of illiterate women continued to be higher than that of the male population, although within the parameters that can be considered normal, given the greater life expectancy of women (3.36% of illiterate women compared to 1.55% of men).

The spectacular improvement in the level of training of Spanish women is one of the main changes experienced by the Spanish population since the middle of the 20th century. Thus, while in 1960 the percentage of women with higher education was 0.14%, 13% of the female population had a university education in 2001, slightly exceeding the percentage of men with this

qualification (12.6%). Therefore, an extraordinary evolution of the situation of women is observed, which started from a reality of clear discrimination. This fact has been especially notable since the middle of the 20th century, coinciding with the years of strong take-off of the Spanish economy and with the territorial fracture that took place then, as a consequence of the strong interprovincial migratory movements.

A brief descriptive study of the variables was carried out " Active population women" Y " Active population men "). With the scatter plots, it was found that the active population of men is much higher than the active population of women in all the municipalities of the province of Granada, in the case of men, the municipality with the lowest number of active men It is 30 (Lentegí) and the highest is 5588 (Almuñecar). The bandwidth parameter, for the model-based estimator, is selected by minimizing the cross-validation function (1.18). He bandwidth for estimator • MA has been selected according to criterion (2.17). Both parameters take values in the interval [0.05, 1]. The random generations, the calculations and the estimators were obtained using the R program. With Table (4.3) we observe that the non-parametric regression estimators generally demonstrate a satisfactory performance with respect to the alternative estimators. The regression, ratio, and difference parametric estimators work well when the regression model is well specified. However, non-parametric estimators present a higher efficiency when the model is not specified, as is our case.

Conclusion:

First, this empirical research establishes what the regressogram refers to in the spirit of the non-parametric approach. The analysis of the literature has enabled us to identify three models linked to the nature of the smoothing and in particular: smoothing by the moving average, smoothing by the moving median and smoothing by the moving line.Secondly, the estimation of the autoregression of a nonlinear autoregressive process constituted by the daily exchange rates which has been divided into three time horizons of the forecast, is performed. It was found that the further the time horizon of the forecast, the more the quality deteriorates considerably, whatever the model considered.

In the context of this study, the moving middle is nearly as significant, if not as significant as the moving normal, or the moving line. It is a subtlety information, since it is seen that the smoothing by the moving middle levels the pinnacles. As Gannoun recommended to take care of this issue, a mix of the middle and the mean determining strategy was actualized, which brought about the best gauges. This examination is unquestionably restricted. Without a doubt, its cutoff points are those of any examination which resorts to the worldview of the nonparametric methodology, of which the different techniques are not the slightest bit consistent

and of which the different models do not lead boundlessly to changeless outcomes. Nonetheless, she had the option to show the enthusiasm of the regressogram strategy for a superior comprehension of trade rates.

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NEW GROUP STRUCTURE OF COMPATIBLE SYSTEMS OF FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS

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Abstract:

Group theory plays a vital role in mathematics, physics, chemistry, and computer science. Group theory has applications in geometry, symmetry and transformation puzzles like Rubik's Cube. Partial differential equations are used in problems involving functions of several variables, such as heat or sound, elasticity, electrodynamics, fluid flow, etc. In this article we have established relation between first order partial differential equations and group theory. If g(x,y,z,p,q) is the given first order partial differential equation, the set of all partial differential equations f(x,y,z,p,q) which are compatible with g(x,y,z,p,q) form group under usual addition of two functions. Furthermore this group form an abelian group.

Keywords: Group Structure, Abelian, Compatible, Partial Differential

Introduction:

Group structure is used to creating algorithms for solving the problems of the group analysis of differential equations. Symmetry Groups of Linear Partial Differential Equations and Representation Theory used The Laplace and Axially Symmetric Wave Equations introduced by (Craddock 2000).A new approach to resolving the problem to group classification of nonlinear partial differential equations (LAHNO 2002).

In this article in first collect the set of all function partial differential equations f(x,y,z,p,q) which are compatible with g(x,y,z,p,q). Next part, by defining trivial operation of function we proved that it form Abelian Group Structure.

Basic Definitions:

Group structure:

A non-empty set G with operation * is said to be *group* if it satisfies following four conditions:

a) Closure property hold w.r.t.* i.e. x*y is in G ,for every x , y in G

b) Associativity property hold w.r.t.* i.e.(x*y)*z=x*(y*z) , x , y , z in G

c) Identity element exits in G i.e. there is e in G such that x*e=e*x=x for all x in G

d) Inverse element exits in G i.e. there is x' in G such that x*x'=x'*x=e for all x in G.

Abelian Group: Group G is Abelian group if x*y=y*x, for every x, y ∈G.

Compatible:

Consider the partial differential equation $f(x,y,z,p,q) = 0$, where $z = z(x,y)$ and $p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$. The partial differential equations $f(x,y,z,p,q) = 0$ and $g(x,y,z,p,q) = 0$ are said to be *compatible* if they have a common solution.

New Group Structure of Compatible system:

The necessary and sufficient condition that the two partial differential equation f(x,y,z,p,q)=0 and g(x,y,z,p,q)=0are compatible if [f,g]=0.

Where, $[f,g]= \frac{\partial(f,g)}{\partial(x,p)} + p\frac{\partial(f,g)}{\partial(z,p)} + \frac{\partial(f,g)}{\partial(y,q)} + q\frac{\partial(f,g)}{\partial(z,q)}$

$$= \begin{vmatrix} f_x & f_p \\ g_x & g_p \end{vmatrix} + p\begin{vmatrix} f_z & f_p \\ g_z & g_p \end{vmatrix} + \begin{vmatrix} f_y & f_q \\ g_y & g_q \end{vmatrix} + q\begin{vmatrix} f_z & f_q \\ g_z & g_q \end{vmatrix}$$

$= (g_p f_x - g_x f_p + p\, g_p f_z - p g_z f_p + g_q f_y - g_y f_q + q g_q f_z - q g_z f_q)$

Result 1: Consider the set G={ f(x,y,z,p,q)=0 : [f,g]=0 , where g is g(x,y,z,p,q)=0 }

i.e. the set of all P.D.E.'s f which are compatible with g. Then the set G is a group with respect to trivial addition of functions.

Proof:

let f =f(x,y,z,p,q) , h =h(x,y,z,p,q)∈G .

Therefore, [f,g]=0 and [h,g]=0

i.e. $g_p f_x - g_x f_p + p\, g_p f_z - p g_z f_p + g_q f_y - g_y f_q + q g_q f_z - q g_z f_q = 0$ and $g_p h_x - g_x h_p + p\, g_p h_z - p g_z h_p + g_q h_y - g_y h_q + q g_q h_z - q g_z h_q = 0$ -------(1)

Consider,

$[f+h, g]= \frac{\partial(f+h,g)}{\partial(x,p)} + p\frac{\partial(f+h,g)}{\partial(z,p)} + \frac{\partial(f+h,g)}{\partial(y,q)} + q\frac{\partial(f+h,g)}{\partial(z,q)}$

$$= \begin{vmatrix} f_x + h_x & f_p + h_p \\ g_x & g_p \end{vmatrix} + p\begin{vmatrix} f_z + h_z & f_p + h_p \\ g_z & g_p \end{vmatrix} + \begin{vmatrix} f_y + h_y & f_q + h_q \\ g_y & g_q \end{vmatrix} + q\begin{vmatrix} f_z + h_z & f_q + h_q \\ g_z & g_q \end{vmatrix}$$

$= g_p(f_x + h_x) - g_x(f_p + h_p) + p\,[g_p(f_z + h_z) - g_z(f_p + h_p)] + g_q(f_y + h_y) - g_y(f_q + h_q) + q[g_q(f_z + h_z) + g_z(f_q + h_q)]$

$= g_p f_x + g_p h_x - g_x f_p - g_x h_p + p\, g_p f_z + p\, g_p h_z - p g_z f_p - p g_z h_p + g_q f_y + g_q h_y - g_y f_q - g_y h_q + q g_q f_z + q g_q h_z - q g_z f_q - q g_z h_q$

$= (g_p f_x - g_x f_p + p\, g_p f_z - p g_z f_p + g_q f_y - g_y f_q + q g_q f_z - q g_z f_q) +$

$(g_p h_x - g_x h_p + p\, g_p h_z - p g_z h_p + g_q h_y - g_y h_q + q g_q h_z - q g_z h_q)$

$= 0 + 0$ ---------- by (1)

$= 0$

Therefore , f + h ∈ G ------- (a)

Now for any f=f(x,y,z,p,q) , h=h(x,y,z,p,q) and k=k(x,y,z,p,q) ∈ G .

As, f+(h + k)=(f + h)+k for any f , h , k .

Therefore , associativity property holds in G. ------- (b)

Now consider , 0=0(x,y,z,p,q) and

$[0 , g]=\frac{\partial(0,g)}{\partial(x,p)} + p\frac{\partial(0,g)}{\partial(z,p)} + \frac{\partial(0,g)}{\partial(y,q)} + q\frac{\partial(0,g)}{\partial(z,q)}$

$= \begin{vmatrix} 0 & f_p \\ g_x & g_p \end{vmatrix} + p \begin{vmatrix} 0 & f_p \\ g_z & g_p \end{vmatrix} + \begin{vmatrix} 0 & f_q \\ g_y & g_q \end{vmatrix} + q \begin{vmatrix} 0 & f_q \\ g_z & g_q \end{vmatrix}$

$= 0 + 0 + 0 + 0$

$= 0$

Therefore , 0 ∈G .

Also , f + 0 = 0 + f = f , for any f ∈G .

Hence e = 0 is an identity element in G .------- (c)

Now consider,

$[-f , g]= \frac{\partial(-f,g)}{\partial(x,p)} + p\frac{\partial(-f,g)}{\partial(z,p)} + \frac{\partial(-f,g)}{\partial(y,q)} + q\frac{\partial(-f,g)}{\partial(z,q)}$

$= \begin{vmatrix} -f_x & -f_p \\ g_x & g_p \end{vmatrix} + p \begin{vmatrix} -f_z & -f_p \\ g_z & g_p \end{vmatrix} + \begin{vmatrix} -f_y & -f_q \\ g_y & g_q \end{vmatrix} + q \begin{vmatrix} -f_z & -f_q \\ g_z & g_q \end{vmatrix}$

$= -g_p f_x + g_x f_p - p\, g_p f_z + p g_z f_p - g_q f_y + g_y f_q - q g_q f_z + q g_z f_q$

$= -(g_p f_x - g_x f_p + p\, g_p f_z - p g_z f_p + g_q f_y - g_y f_q + q g_q f_z - q g_z f_q)$

$= 0$ --------by (1)

Therefore, -f ∈G .

As , f + (-f) = (-f) + f = 0 = e , for any f

Hence inverse exists for every element in G .-------(d)

From (a), (b), (c) and (d) G is group w.r.t. usual addition of functions.

Result 2: The set G is an Abelian group w.r.t. usual addition of functions.

Proof: For any f=f(x,y,z,p,q) and g= g(x,y,z,p,q)

We have , f(x,y,z,p,q)+ g(x,y,z,p,q) = (f+g)(x,y,z,p,q)

=(g+f)(x,y,z,p,q)

= g(x,y,z,p,q)+ f(x,y,z,p,q)

Therefore , f(x,y,z,p,q)+ g(x,y,z,p,q)= g(x,y,z,p,q)+ f(x,y,z,p,q)

Hence G is Abelian group with respect to trivial addition of functions

Example 1:

Let G *be a* Set of all Bijective functions G = $\{f: R \rightarrow R \mid f \text{ is bijective function}\}$ .The set G is a group with respect to composition of functions.

Solution:-

Consider $G = \{f: R \rightarrow R \mid f \text{ is bijective function}\}$

a) Closure Property:-

Let f , g ∈ G => f , g *are bijective functions*.

We know that , if f and g are bijective functions then so is $f \diamond g$

Therefore ,$f \diamond g \in G$

Hence , closure property is hold in G.

b) Associative Property:-

Let f , g , h ∈ G

For any x ∈ R

$$\big(f \diamond (g \diamond h)\big)(x) = \big(f \diamond (g \diamond h)(x)\big)$$

$$= f(g \diamond h(x))$$

$$= f(g(h(x)))$$

$$= (f \diamond g)(h(x))$$

$$= ((f \diamond g) \diamond h)(x)$$

$\big(f \diamond (g \diamond h)\big)(x) = ((f \diamond g) \diamond h)(x)$for all x ∈ R

Therefore ,$f \diamond (g \diamond h) = (f \diamond g) \diamond h$

Hence Associative property hold

a) Existence of Identity Element:-

$I: R \rightarrow R$defined by I(x)=x this is identity function

We know that identity function is bijective function

Therefore $I \in G$

Also ,

$$(f \diamond I)(x) = f\big(I(x)\big) = f(x) \quad \ldots\ldots \text{for all } x \text{ in } R$$

$$(I \diamond f)(x) = I\big(f(x)\big) = f(x) \quad \ldots\ldots \text{for all } x \text{ in } R$$

Therefore ,I *is identity element* in G.

b) Existence of Inverse Element:-

As $f \in G \Rightarrow f$ *is bijective function*

We know that , f is bijective function if and only if f has inverse function

Therefore ,f^{-1} *exist* such that $(f \diamond f^{-1})(x) = I(x) = (f^{-1} \diamond f)(x)$

Since ,f^{-1} *is an inverse of* f *and* f *is bijective , so* f^{-1} *is also bijective*

Therefore $f^{-1} \in G$

Hence , every element in G has inverse element in G.

From a),b),c) and d),

Therefore G is a group with respect to composition of functions.

Example 2:

$$G = \{f(x,y,z,p,q)/z = z(x,y)\ , p = \frac{\partial z}{\partial x}\ and\ q = \frac{\partial z}{\partial y}\}$$

Then set G is group with respect to usual addition of functions.

Solution:-

Let $G = \{f(x,y,z,p,q)/z = z(x,y)\ , p = \frac{\partial z}{\partial x}\ and\ q = \frac{\partial z}{\partial y}\}$

a) Closure Property:-

$$Let\ f(x,y,z,p,q)\ , g(x,y,z,p,q) \in G$$

$$f(x,y,z,p,q) + g(x,y,z,p,q) = (f+g)(x,y,z,p,q)$$

$$But\ (f+g)(x,y,z,p,q)\ is\ also\ function\ in\ x,y,z,p,q.$$

So, $(f+g)(x,y,z,p,q) \in G$

Therefore, $f(x,y,z,p,q) + g(x,y,z,p,q) \in G$

Hence, closure property holds in G.

b) Associative Property:-

$$Let\ f(x,y,z,p,q), g(x,y,z,p,q)\ and\ h(x,y,z,p,q) \in G$$

Consider,

$$\big(f(x,y,z,p,q) + g(x,y,z,p,q)\big) + h(x,y,z,p,q)$$

$$= ((f+g)+h)(x,y,z,p,\mathrm{q})$$

$$= (f+(g+h))(x,y,z,p,q)$$

$$= f(x,y,z,p,q) + (g(x,y,z,p,q) + h(x,y,z,p,q))$$

$$\big(f(x,y,z,p,q) + g(x,y,z,p,q)\big) + h(x,y,z,p,q)$$
$$= f(x,y,z,p,q) + (g(x,y,z,p,q) + h(x,y,z,p,q)$$

Hence, associative property holds in G.

c) Existence of Identity Element:-

O(x,y,z,p,q)=0 (Zero function) $\in G$

$$f(x,y,z,p,q) + \mathrm{O(x,y,z,p,q)} = (\mathrm{f+O})(\mathrm{x,y,z,p,q})$$

$$= f(x,y,z,p,q)$$

$$f(x,y,z,p,q) + \mathrm{O(x,y,z,p,q)} = f(x,y,z,p,q)$$

Therefore, $\mathrm{O(x,y,z,p,q)}$is an additive identity element in G.

d) Existence of Inverse Element:-

$$As, if\ f(x,y,z,p,q) \in G$$

then$-f(x,y,z,p,q) \in G$

Now

$$f(x,y,z,p,q) + \big(-f(x,y,z,p,q)\big) = \big(f + (-f)\big)(x,y,z,p,q) = O(x,y,z,p,q)$$

Therefore ,$-f(x,y,z,p,q)$ is an inverse of $f(x,y,z,p,q)$, $\forall f(x,y,z,p,q) \in G$

Hence , every element in G has inverse element in G.

From a),b),c) and d),G is a group with respect to usual addition of functions

Example 3:

The equations $xp - yq = x\ , x^2p + q = xz$ are compatible

Solution:-

Given ,$xp - yq = x\ , x^2p + q = xz$

$$xp - yq - x = 0\ ,\ \ x^2p + q - xz = 0$$

Let $f(x,y,z,p,q) = xp - yq - x\ \ and\ g(x,y,z,p,q) = x^2p + q - xz$

$$f_x = p - 1\ , f_p = x\ , f_y = -q\ , f_z = 0\ , f_q = -y\ \ and$$

$$g_x = 2xp - z\,, g_p = x^2\,, g_y = 0\,, g_z = -x\,, g_q = 1$$

Consider ,

$$[f,g]= \frac{\partial(f,g)}{\partial(x,p)} + p\frac{\partial(f,g)}{\partial(z,p)} + \frac{\partial(f,g)}{\partial(y,q)} + q\frac{\partial(f,g)}{\partial(z,q)}$$

$$= \begin{vmatrix} f_x & f_p \\ g_x & g_p \end{vmatrix} + p\begin{vmatrix} f_z & f_p \\ g_z & g_p \end{vmatrix} + \begin{vmatrix} f_y & f_q \\ g_y & g_q \end{vmatrix} + q\begin{vmatrix} f_z & f_q \\ g_z & g_q \end{vmatrix}$$

$$= \begin{vmatrix} p-1 & x \\ 2xp-z & x^2 \end{vmatrix} + p\begin{vmatrix} 0 & x \\ -x & x^2 \end{vmatrix} + \begin{vmatrix} -q & -y \\ 0 & 1 \end{vmatrix} + q\begin{vmatrix} 0 & -y \\ -x & 1 \end{vmatrix}$$

$$= x^2(p-1) - x(2xp-z) + p(0+x^2) + (-q+0) + q(0-xy)$$

$$= x^2p - x^2 - 2x^2p + xz + px^2 - q - qxy$$

$$= -x^2 + xz - q - qxy$$

$$= -x^2 + x^2p - qxy \qquad \ldots\ldots x^2p + q - xz = 0$$

$$= -x^2 + x(xp - qy)$$

$$= -x^2 + x(x) \qquad \ldots\ldots\ldots xp - yq - x = 0$$

$$= -x^2 + x^2$$

$$= 0$$

[f,g]=0

Therefore, $f(x,y,z,p,q)\ and\ g(x,y,z,p,q)$ are compatible.

$i.e.\ xp - yq = x\,, x^2p + q = xz$are compatible.

Example 4:

The equations

$z = px + qy\ and\ xy + z^2 = py^2$are compatible.

Solution:-

Given ,$z = px + qy\ and\ xy + z^2 = py^2$

$$px + qy - z = 0 \; and \; xy + z^2 - py^2 = 0$$

Let $f(x, y, z, p, q) = \; px + qy - z \;\; and \; g(x, y, z, p, q) = xy + z^2 - py^2$

$$f_x = p \, , f_p = x \, , f_y = q \, , f_z = -1 \, , f_q = y \;\; and$$

$$g_x = y, g_p = -y^2 \, , g_y = x - 2py \, , g_z = 2z \, , g_q = 0$$

Consider ,

$[f,g] = \frac{\partial(f,g)}{\partial(x,p)} + p\frac{\partial(f,g)}{\partial(z,p)} + \frac{\partial(f,g)}{\partial(y,q)} + q\frac{\partial(f,g)}{\partial(z,q)}$

$$= \begin{vmatrix} f_x & f_p \\ g_x & g_p \end{vmatrix} + p \begin{vmatrix} f_z & f_p \\ g_z & g_p \end{vmatrix} + \begin{vmatrix} f_y & f_q \\ g_y & g_q \end{vmatrix} + q \begin{vmatrix} f_z & f_q \\ g_z & g_q \end{vmatrix}$$

$$= \begin{vmatrix} p & x \\ y & -y^2 \end{vmatrix} + p \begin{vmatrix} -1 & x \\ 2z & -y^2 \end{vmatrix} + \begin{vmatrix} q & y \\ x - 2py & 0 \end{vmatrix} + q \begin{vmatrix} -1 & y \\ 2z & 0 \end{vmatrix}$$

$$= -py^2 - xy + p(y^2 - 2xz) + (0 - (x - 2py)y) + q(0 - 2yz)$$

$$= -py^2 - xy + py^2 - 2xzp - xy + 2py^2 - 2yzq$$

$$= -2xy - 2xzp + 2py^2 - 2yzq$$

$$= -2xy + 2py^2 - 2z(xp + yq)$$

$= -2xy + 2py^2 - 2z(z) \ldots\ldots\ldots \; z = px + qy$

$$= -2xy + 2py^2 - 2z^2$$

$$= -2xy + 2(py^2 - 2z^2)$$

$= -2xy + 2xy \qquad \ldots\ldots \; xy + z^2 = py^2$

=0

[f,g]=0

Therefore, $f(x, y, z, p, q) \; and \; g(x, y, z, p, q)$ are compatible.

$i.e. \; z = px + qy \; and \; xy + z^2 = py^2$ are compatible.

Theorem 1:

The first order partial differential equation px+qy=z is compatible with any equation f(x,y,z,p,q)=0 that is homogeneous in x,y,z.

Solution:-

We know that first order partial differential equations f(x,y,z,p,q)=0 and g(x,y,z,p,q)=0 are compatible if $[f,g]=0$,

Where, [f,g]= $\frac{\partial(f,g)}{\partial(x,p)} + p\frac{\partial(f,g)}{\partial(z,p)} + \frac{\partial(f,g)}{\partial(y,q)} + q\frac{\partial(f,g)}{\partial(z,q)}$

Here $g(x,y,z,p,q)=px+qy-z$

$$g_x = p\,, g_p = x\,, g_y = q\,, g_z = -1\,, g_q = y$$

Let f(x,y,z,p,q)=0 be any partial differential equation that is homogeneous in x,y,z

Consider ,

, [f,g]= $\frac{\partial(f,g)}{\partial(x,p)} + p\frac{\partial(f,g)}{\partial(z,p)} + \frac{\partial(f,g)}{\partial(y,q)} + q\frac{\partial(f,g)}{\partial(z,q)}$

$$= \begin{vmatrix} f_x & f_p \\ g_x & g_p \end{vmatrix} + p\begin{vmatrix} f_z & f_p \\ g_z & g_p \end{vmatrix} + \begin{vmatrix} f_y & f_q \\ g_y & g_q \end{vmatrix} + q\begin{vmatrix} f_z & f_q \\ g_z & g_q \end{vmatrix}$$

$$= \begin{vmatrix} f_x & f_p \\ p & x \end{vmatrix} + p\begin{vmatrix} f_z & f_p \\ -1 & x \end{vmatrix} + \begin{vmatrix} f_y & f_q \\ q & y \end{vmatrix} + q\begin{vmatrix} f_z & f_q \\ -1 & y \end{vmatrix}$$

$= xf_x - pf_p + p\,xf_z + pf_p + yf_y - qf_q + qyf_z + q\,f_q$

$= xf_x + yf_y + f_z(px+qy)$

$= xf_x + yf_y + zf_z$ ……. $px+qy=z$

= n.f …..Euler's theorem on homogeneous function

=0 …… f(x,y,z,p,q)=0

Therefore , $[f,g]=0$

Hence, the first order partial differential equation px+qy=z is compatible with any equation f(x,y,z,p,q)=0 that is homogeneous in x,y,z .

Conclusion and Future Work:

In this article new set is defined which contain of all partial differential equations$f(x, y, z, p, q)$ which are compatible with fixed function $g(x, y, z, p, q)$. using trivial addition of functions the given set form a group. Furthermore, this new group structure forms an Abelian group. In Future we want to extend our work whether this set form Ring Structure, Vector Space, Field and Integral Domain etc.

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E-LEARNING PLATFORM FOR ENGINEERING EDUCATION

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Abstract:

This paper shows how to shorten the laboratory learning curve for Electronics System Design and Digital System Design Course. The demands for VLSI design professional are increasing day by day in industry regarding curriculum upgradation with reference to Electronics System Design with knowledge of VLSI and FPGA prototyping skills. Simply taking laboratory on software and boards is not sufficient for learning and evaluation of work. We proposed a new model of teaching and learning through internet. This method we developed specially for digital and electronic system design. Experimentation with changing values and parameters is possible without any additional equipment. Full access of laboratory equipment is made possible through internet

Keywords: E-learning, Course Management System, ICT

Introduction:

Pandemic has forced whole society to change the use of internet for education. We never imagined the online classes through mobile phones and laptops. Mode of conversation is changed to mode of communication, teaching, submission and information exchange. The use of technology-based teaching and learning is one of major trends in the field of human resource development. Various new terms are coined during this period namely Project Based learning, Problem based learning, Flipped Classroom, Web-Based learning, Distance Learning and more many more. These methods improved the learner's skill and knowledge manifold. New applications and platforms are emerged due to the popularity of this change.

Electronics engineering has facilitated the new developmental changes and new approaches. The major development in the electronics industry is because of semiconductor chips. These chips are manufactured using silicon, which is abundant available from sand, easily

extracted. This material is thoroughly studied over a longer time. A semiconductor chip follows Moore's law and hence the manufacturing cost is also lowering down day by day. The indirect effect of this is wide spread use of electronic devices in society among all segments [1]. Rest of the paper is organized as follows. Section-2 describes background of learning and main objective of E-learning. Section-3 describes our proposed methodology for teaching and learning, section-4 describes proposed methodology and concluding remarks are in section-5.

Background:

Pandemic has forced entire our working culture to new online domain. The mode of working has changed is changed. Physical classes turned to online mode and this change brought many challenges in content delivery. Critical thinking subjects like design courses are facing major challenges in teaching. Teaching those subjects required different patterns for pedagogy. E-learning modules are required to teach those subjects. Pandemic forced the physical distance and the lack of facilities and resources make us unable to perform experiments at home This happens when the equipment and tools are costly and are in limited numbers. The best solution to this problem is internet-based courses which addresses these issues and involve more students in bridging this gap by two participating institutions and also sharing costly resources has always been a challenge. Present-day handheld computing environment like mobile phones, laptop, tablets are available with the students [2]. The physical limitation imposed due to the Covid can be overcome by internet technology. This will improve the skills and knowledge of students. Also, costly instruments and equipment can be shared with virtual experiment setup with all students with extent possible. Internet enabled practical can be designed for remote performance and viewing so as to encourage students, make students curious. In this paper, modules and methodology are discussed and studied for efficient online platform.

The primary objectives of E-learning modules are:

- Assist the academia to set up the design environment
- Provide an easy access to course literature
- Promote the internal cooperation
- Introduce more advanced learning Environment

Design courses require required critical thinking related exercises and unsolved problems. Particular in VLSI design courses templates are provided and proper titles many online platforms like Zoom, Google Classroom, Moodle. Students perform the practical on the tools available with them and submit it on the available portal available to them.

Proposed solution:

A. Simulation Lab:

A simulated lab is a virtual laboratory performed by the student with simulation software on general purpose computers. Many times, this software is available in laboratory. Simulation laboratory labs do not have any physical restriction factors of space, time and physical presence as with traditional practical laboratory. Also, they these practical are very flexible in the sense that the simulation of any practical can performed at any time and stopped any time. Changes can be imposed at any time and corrected at any time. Most of the simulation practical are specific in software and do not require any hardware device or equipment. The results and data involved in a simulation experiment is fed through computer and virtual and can be easily corrected and post processed. Simulation experiment laboratory can be setup with minimum cost as compared to traditional hardware setup laboratory.

B. Remote Labs:

In remote laboratory, the equipment setup is at remote location consisting of server. Hardware equipment and Software are installed on the remote severs. The server is capable of handling requests and communication with hardware protocols [3]. All the laboratory equipment are remotely can be accessed through internet as medium of communication. This is simply a lab which can be accesses anytime, anywhere with full accessibility. This concept is relatively new and has emerged in the pandemic period. This lab required less space as compared to traditional laboratory. All the equipment is connected to the sever and online cooling is required to long running. This method of practical has many numbers of advantages like, many number of users can be connected at a time with multiple locations. The cost of setting up the lab is minimum as compared to traditional laboratory. As compared to simulation laboratory, the results obtained are more accurate and reliable. To properly assess the above learning environment, the students were given choices and practical accordingly. Experiments were performed in virtual and simulation mode. These experiments were evaluated on the accuracy. The problem statement and exercises quizzes were given to the students during class time. Once they finished the practical, they were taken into account for assessment. The maximum grade possible on the experiment 10 points. The evaluation shows that the purpose and objective were met.

4. Proposed Methodology:

The introduction of handheld devices with internet connection opened the new door to education system. This has given the different approach for teaching in laboratory and theory lectures. The traditional form of performing practical is the doing experimentation at the lab site

and students involve in handling equipment and noting reading and preparing charts and analysis. While theory sessions are in classroom with interaction with students[4]. All these methods required the physical presence and different and traditional pedagogical methods. Most preferred method is performance in laboratory and classes in classrooms. Traditional laboratory for VLSI is equipped with FPGA related kits in campus that has power supply, internet connection, and support equipment. The support equipment on every lab bench might include a power supply, frequency generator, logic analyzer, CROs. This involves physical setup and presence every time the practical is performed. Also, after performance of practical, all the equipment is to be restored properly at their place. This more important in almost all cases where the lab is shared with the all batches of practical of all semester. This is major limitation of traditional laboratory setup. In this paper, we proposed blended approach of teaching and learning where simulation and virtual practical can be performed.

5. Practical Exercises:

In laboratory, prepared templates of MS-Office (Word, Powerpoint and Excel), for our students for ready reference. We also use Windows Netmeeting for sharing demonstration and files in network, also shareware software's like SPICE, Students were given problems based on theoretical work in the classroom and were asked to perform the practical on the proposed simulation or remote access laboratory. Students can submit their newly acquired understanding of theoretical work in the labs following the lecture. The evaluation of course was done separately, one on classes conducted and quizzed attempted in theory class and another on the practical submission in online classroom. The theoretical section comprised on multiple choice questions on the class conducted. It included all the unitize course material shared with a primary focus on design considerations taught in the class and based on the different design entries learned during the course. The laboratory/practical section is on the problem statements given in the lab session. Especially real-life problems and understanding of design philosophy in which students had to understand a concept of RTL coding using VHDL or Verilog through design entry and interpret it. The objective of both the evaluation was to give the students necessary experience to compare the electronics design tools used in the industry and methods learned throughout the course. After learning they can able to discriminate the advantages and disadvantages of the different design implementation in the lab. The course was divided into theory sessions of three hours and practical session of one hour.

6. Concluding Remarks:

Pandemic has forced entire education system into new domain of teaching and learning platform. New creative and innovative methods are required to pace and match the requirement

of industry. Use of more ICT is required for current situation. These tools are important in development of system and enable educational reform processes improving both *access* to education, and the *quality* of that education. The educational goal can be expanded with the use of more ICT tools to and more industry standard curriculum, online student assessment system, new pedagogical approaches in the classroom will improve the educational system.

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ANALYSIS OF DECISION TREE CLASSIFICATION ALGORITHMS FOR BREAST CANCER DETECTION

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Abstract:

Analyzing massive amounts of data is becoming a requirement. People do not have time to examine extraordinarily huge data sets such as medical, marketing, or financial data. As a result, we'll need a method for automatically analyzing data. The process of extracting valuable information from vast amounts of data and analyzing, classifying, and summarizing it into useful information from big data is known as data mining. For the diagnosis of breast cancer, a data mining classification technique is applied. In this study, we compare the performance of several classifiers on the basis of accuracy, recall, precision, F-measure, computing time, correctly classified instances, and kappa statistics, MAE, RMSE, RAE, RRSE on a breast cancer dataset. To easily assess the classifiers, we include confusion matrices from various classifiers. We looked at a variety of data mining classification methods in order to find the best ones for efficiently classifying the Breast Cancer dataset.

Keywords: Data Mining, WEKA tool, Breast Cancer Patients dataset, Decision Tree Classification algorithm

Introduction:

Data mining is the process of converting a significant volume of data into knowledge. Exploratory data analysis, data-driven discovery, and deductive learning are other terms for it. The most often used data mining approach is classification. To aid in more accurate prediction and analysis, classification assigns categories to a collection of data. In India, breast cancer affects a huge number of women, and it is a difficult condition to diagnose. The main purpose of this study is to classify a breast cancer dataset using several decision tree classifiers in order to detect whether or not a person has a recurrence. We examine multiple classifiers to find the best one for correctly classifying the Breast cancer dataset and diagnosing the condition at a lower cost.

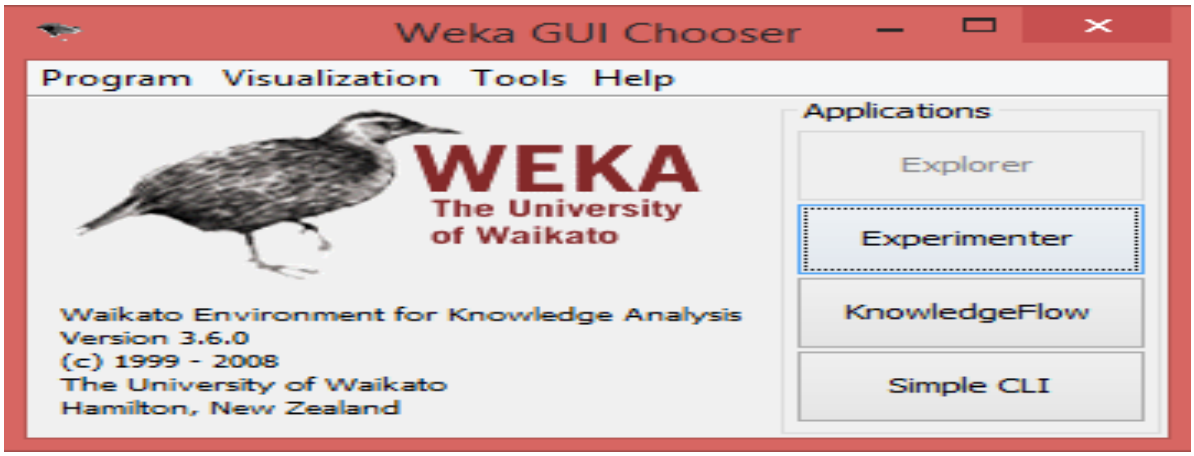
We employ patient characteristics such as age, menopause, tumor-size, inv-nodes, node-caps, Deg-malig, breast, breast-quad, and irradiate to identify the disease. We classify this dataset using several decision tree classifiers in order to determine which is the most effective classifier for accurately classifying the most number of instances in the shortest amount of time.

WEKA (Waikato Environment for Knowledge Analysis):

The Waikato Environment for Knowledge Analysis (WEKA) is a prominent Java-based machine learning software suite developed at New Zealand's University of Waikato. It is GNU General Public License (GPL) licensed free software.

WEKA is a data analysis and predictive modeling workbench [1] that includes a variety of visualization tools and algorithms, as well as graphical user interfaces enabling quick access to these operations. It is mostly used to import datasets, execute algorithms, and plan and run experiments with statistically sound results that may be published.

The WEKA tool includes decision tree-based classification methods such as the J48 decision tree, rule-based classification methods such as Zero R and decision tables, and probability and regression-based classification methods such as the Nave Bye's algorithm. WEKA requires a dataset file in the ARFF format (Attribute Relation File Format), with the extension dot ARFF (.arff). WEKA can be found at www.cs.waikato.ac.nz/ml/weka on the web.



Classification:

The practice of classifying data into categories for the most effective and efficient use is known as data categorization. Decision trees, logistic regression, neural networks, and other classification methods are used in data mining. For classification, we use the decision tree approach in this study. The following steps are involved in the classification process:

1. Create a data set for training.
2. Determine the attributes and classes of each class.

3. Identify classification attributes that are useful (Relevance analysis).

4. Use the training examples in the Training set to learn a model.

5. Apply the model to the unknown data samples to classify them.

Decision tree classification methods:

A decision tree is a network with a root node, branches, and leaf nodes. Each internal node represents an attribute test, each branch represents a test result, and each leaf node represents a class label. The root node is the highest node in the tree.

The decision tree below is for the notion buy computer, and it indicates whether or not a company's consumer is likely to buy a computer. A test on an attribute is represented by each internal node. A class is represented by each leaf node.

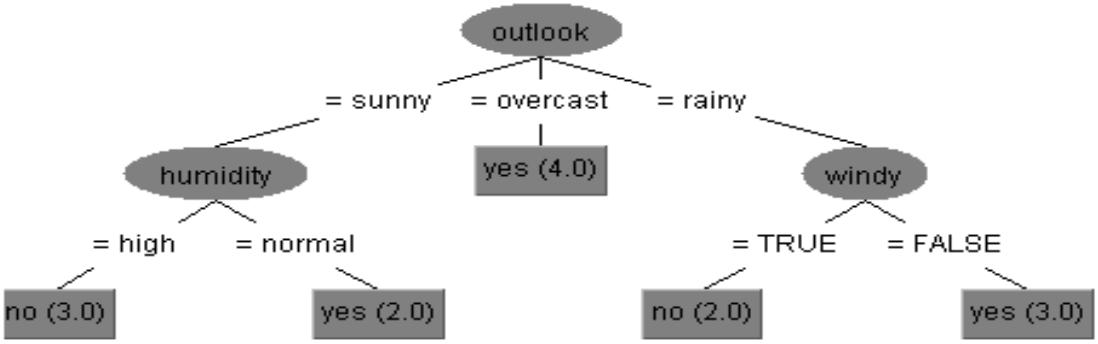


Figure I: Decision Tree

The following are some of the advantages of using a decision tree:

1. It does not require subject knowledge.

2. It is simple to understand.

3. A decision tree's learning and categorization phases are simple and quick.

Classifiers based on decision trees

1. J48: Algorithm WEKA the enhanced version of C4.5 is J48. For decision-making, the algorithm employs a greedy strategy. Different nodes, such as the root node, intermediate nodes, and leaf node, make up the structure of the output decision tree. Each internal node in the tree represents a separate property, whereas the terminal nodes represent the dependent variable's final value.

2. Simple CART: CART, or Classification and Regression Tree Classification Technique, was developed by Leo Brejman, Jenome Friedman, Richard Olshen, and Charles Stone in 1984. The classification tree and regression tree are used in this process.

- Classification Tree- In this case, the huge variable is categorical, and the tree is used to determine which "Class" a target variable would most likely fall into.
- Regression Tree- A regression tree is used to predict the value of a continuous variable.

3. ADTree- An alternating decision tree (ADTree) is a classification machine learning method that generalizes decision trees and is related to boosting.

An AD Tree is made up of a series of decision nodes that indicate a condition and prediction nodes that carry a single integer. An AD Tree classifies an instance by tracing all pathways that lead to it.

4. BFTree-

The best node is the node whose split leads to the highest decrease in impurity (e.g. Gini index or information gain) among all nodes available for splitting in the Best First Tree Algorithm [7]. When fully developed, the final tree will be identical, but the sequence in which it is constructed will differ. The tree-growing approach aims to maximize within-node homogeneity. Impurity is defined as the extent to which a node does not represent a homogeneous subset of cases. A homogeneous node is one in which all cases have the same value for the dependent variable. It does not need to be split further because it is pure.

DATASET:

A dataset is a grouping of data. A data set is often the contents of a single database table or statistical data matrix, where each column of the table represents a specific variable and each row represents a specific member of the data set in question.

In this paper, we use the Oncology Institute University Medical Centre's Breast Cancer Database, which is available on WEKA.

There are 286 occurrences total in the dataset, with 201 instances of one type and 85 instances of another. There are nine attributes that describe the instances, some of which are linear and some of which are nominal.

Information on the attributes:

1. Your age (10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, 90-99).
2. The Menopause (lt40, ge40, premeno).
3.Tumor–size (0-4, 5-9, 10-14, 15-19, 20-24,25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59)
4. Inv-nodes (0-2, 3-5, 6-8, 9-11, 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-39)
5. Node-caps (yes, no)
6. Deg-malig (1, 2, 3)
7. Breast (left right)
8. Breast-quad (left-up, left-low, right-up, right-low, central)
9. Irradiate (yes, no)
10. Class (no-recurrence-events, recurrence-events)

Results and Discussion:

Evalution matrics

The classification is based on the performance indicators listed below. [1]

1. Time: This is the amount of time it takes to finish training or modeling a dataset. It's measured in seconds.

2. The Kappa Statistic is a statistic that measures how much of a difference there is Nonrandom agreement between observers or measurements of the same category variable is measured using this metric.

3. Mean Absolute Error (M.A.E.): The average difference between expected and actual values in all test cases is the mean absolute error; it is the average prediction error.

4. The Mean Squared Error (MSE) is a measure of how accurate a calculation is. The mean-squared error is one of the most widely used indicators of numeric prediction success. The average of the squared discrepancies between each computed value and its matching true value is used to calculate this value. The square root of the mean-squared-error is the mean-squared-error. The mean-squared error has the same dimensionality as the actual and projected values thanks to the mean-squared error.

5. Root relative squared error: The total squared error created in comparison to the error that would have occurred if the prediction had been the average of the absolute value. The square root of the relative squared error, like the root mean squared error, is used to give it the same dimensions as the anticipated value.

6. Relative Absolute Error: The total absolute error made in comparison to the error that would have occurred if the prediction had merely been the average of the actual values.

The result in Table I is achieved using these measurements.

A confusion matrix is a valuable tool for determining the accuracy of a classifier. The confusion matrix's structure is shown below.

	a	b
a	True Negative	False Positive
b	False Negative	True Positive

Figure II: confusion matrix

The result in Table II is achieved using these measurements.

Positive tuples that were successfully categorized by the classifier are referred to as True Positive (TP). Negative tuples that were correctly categorized by the classifier are referred to as True Negative (TN). Negative tuples that were mistakenly categorized by the classifier are

referred to as False Positive (FP). Positive tuples that were mistakenly categorized by the classifier are referred to as False Negative (FN).

The fraction of tuples properly classified by the classifier is called accuracy.

Accuracy= (TP+TN)/ (TP+TN+FP+FN)

Recall: The proportion of examples identified as class x among all examples that genuinely have class x, i.e. how much of the class was captured, is known as recall.

Recall=TP/ (TP+FN)

Precision:

Precision is the proportion of the examples which truly have class x among all those which were classified as class x.

Precision=TP/(TP+FP)

F-Measure:

The harmonic mean of precision and recall. It is an important measure as it gives equal importance to precision and recall.

F-measure=2*recall*precision/precision + recall

Receiver Operating Characteristic (ROC) Curve:

It is a graphical approach for displaying the tradeoff between true positive rate (TPR) and false positive rate (FPR) of a classifier. TPR is plotted along the y axis and FPR is plotted along the x axis. Performance of each classifier represented as a point on the ROC curve.

Using this metrics the result in **Table III** is obtained.

Result:

The datasets were analyzed using the cross validation approach. For each of the datasets listed in Tables I, II, and III, various performance indicators were calculated. The following is a comparison of various decision tree categorization results:

Table I: Errors measurement for different decision tree classifiers in weka

	J48	**Simple CART**	**AD Tree**	**BF Tree**
Time (Seconds)	0.02	0.18	0.01	0.15
Correctly Classified Instances	216	198	211	194
KAPPA Statistic	0.2826	0.0671	0.329	0.0875
MAE	0.3676	0.393	0.3919	0.3887
RMSE	0.4324	0.4587	0.4333	0.4698
RAE %	87.86	93.93	93.66	92.90
RRSE%	94.60	100.36	94.80	102.78

Table II: Confusion metrics for different decision tree classifiers in weka

Decision Tree	True Negative	True Positive	Correctly Classified Instances
J48	23	193	216
Simple CART	10	188	198
AD Tree	38	173	211
BF Tree	16	178	194

Table III: Performance metrics (weighted avg.) For different decision tree classifiers in weka

Decision Tree	TP Rate	FP Rate	Precision	Recall	F-Measure	Roc Curve Area
J48	**0.755**	**0.524**	0.752	0.755	0.713	0.584
Simple CART	**0.692**	**0.639**	0.632	0.692	0.625	0.593
AD Tree	**0.738**	**0.43**	0.724	0.738	0.727	0.712
BF Tree	**0.678**	**0.605**	0.628	0.678	0.635	0.6

Conclusions:

We looked at four alternative decision tree classification algorithms in this research. Using a Breast cancer dataset, we investigate J48, Simple CART, AD Tree, and BF Tree decision tree classification methods. We found that J48 successfully identified the most instances216 and took 0.02 seconds, whereas AD Tree took 0.01 seconds and correctly identified 211 occurrences. Simple CART takes 0.18 seconds to identify 198 occurrences properly, while BF Tree takes 0.15 seconds to identify 194 instances correctly. Some of these four classifiers are more accurate, while others take less time. According to their purposes, the most appropriate classifier can be employed.

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QUALITY OF SERVICE (QoS) IN WIRELESS SENSOR NETWORKS

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Introduction:

Wireless sensor networks (WSNs) can be defined as self-configured, infrastructure-free wireless networks for physical, environmental and sound monitoring conditions, as well as for the transfer of data via the network to the main location or sink for observing and analyzing data. The WSNs are wireless networks for physical or environmental monitoring as shown in Figure-1.

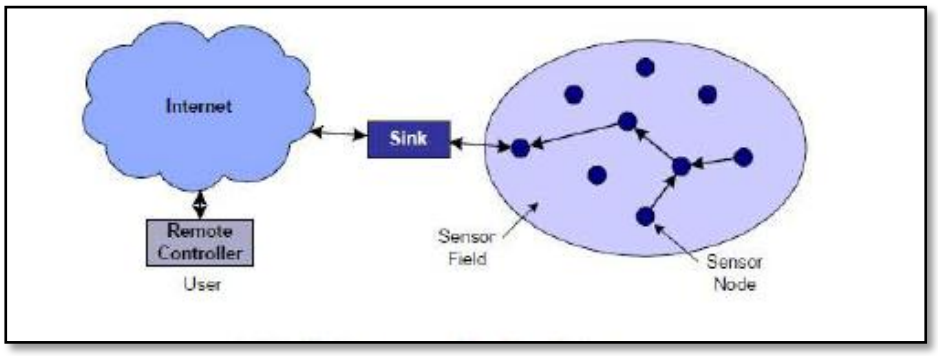

Figure 1: WSN Network structure (Image source Internet)

A vast variety of programmable sensors compose wireless sensor networks (WSNs) that meet the needs of different applications. The WSN node is a low-power device including one or more sensors, storage, a computing unit, a power source, an actuator, and a radio.

Architecture of a typical wireless sensor node:

The wireless sensor nodes are the central elements in a wireless sensor network (WSN). The node consists of sensing, processing, communication, and power subsystems. The communication subsystem is the most energy intensive subsystem and its power consumption should be regulated.

Sensor node is a tiny device that includes four main components as shown in Figure 2.

1) **Power supply:** Which provides power to sensor
2) **Sensing Subsystem:** Which senses the environmental condition
3) **Processing System:** Which processes data
4) **Communication Subsystem:** Which is for communication

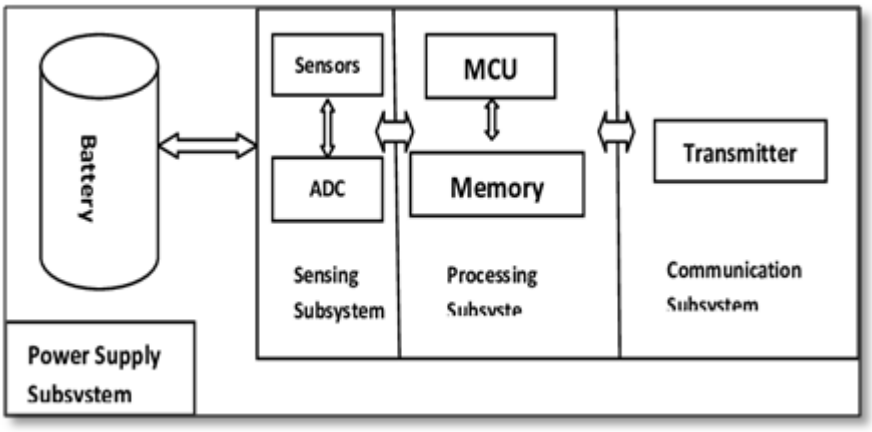

Figure 2: Architecture of WSN node

Quality of Service (QoS) in Wireless Sensor Networks:

Quality of Service (QoS) can be defined as a set of services to be met when transporting packets from the source to its destination, which means that the network underlying QoS is a network that requires a number of service characteristics, like the jitter, time, bandwidth, and loss of packets in order to monitor service quality. The quality of service must be determined. The Network QoS and Application QoS as depicted in Figure 3 are two major QoS viewpoints.

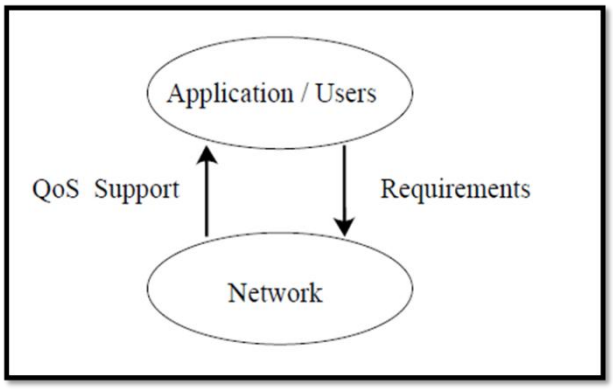

Figure 3: QoS Model

The application/user requires the network to offer the appropriate quality of service under this approach. In turn, the network layer delivers the needed QoS level while optimizing the use of network resources; the network further analyses the application needs and uses many network QoS techniques. The main problems with QoS are,

i) Reducing End-to-End delay
ii) Reducing the packet Deadline Miss Ratio (DMR)
iii) Minimizing the Bandwidth utilization
iv) Providing better energy utilization and load balancing among the sensors

v) Minimizing Collisions

vi) Maximizing Concurrent Transmissions

QoS in Traditional Networks

In traditional networks, like Internet, the QoS can generally be obtained through the network overprovisioning, traffic engineering, and differential packet treatment inside routers, as described in. Traditionally, the emphasis is on maximizing end-to-end throughput and minimizing delay. Overprovisioning of network resources is based on adding huge amounts of resources in the network. However, bandwidth availability and router capacity are not infinite resources and excess resources are expensive, especially in wireless networks. Traffic engineering takes into account available resources and expected traffic on various network links and some paths can be over-provisioned and used for the most demanding packet flows, while others could be left for the best effort traffic. With differential packet treatment inside routers, QoS is assured via adequate packet classification, queuing, and scheduling inside routers. WSNs are fundamentally different from traditional networks because WSNs devices are small and have limited resources and capabilities. Therefore, QoS based protocols from traditional networks cannot be efficiently used in WSNs. As a result, new QoS parameters and requirements for WSNs are defined.

QoS Challenges in WSNs

The most important QoS challenges in WSNs are addressed below:

Limited resources and capabilities:

QoS methods must be aware of limited resources and capabilities in WSNs such as limited energy, bandwidth, memory, and processing and communication capabilities. Furthermore, there should be balance between QoS level and energy consumption.

Node deployment:

Unstructured networks have lower deployment cost than structured networks. However, deterministic deployment solves problems of neighbor and path discovery and as a result QoS methods have available geographical information of the nodes.

Dynamic network topology:

It is standard challenge for mobile WSNs. However, almost allWSNs have dynamic topology due to link failures, node power failures, or different power management mechanisms. QoS should not beaffected with network topology changes.

Scalability:

QoS should not be affected with increasing or decreasing in number of nodes inWSNs.

Multi-source multi-sink systems:

The best examples are wireless sensor-actuator networks that besides standard challenges have issues on platform heterogeneity, service-oriented architecture, resource self-management and security requirements. The state-of-the-art forQoS in Wireless Sensor-Actuator Networks (WSANs) in the context of critical infrastructure protection can be found in.

Various types of applications:

Due to widespreaduse of WSNs, there are a large number of WSNsapplications with various QoS requirements. Themost demanding application can be found in:

- **Real-time WSNs:** Performance-critical applications like intruder tracking, fire monitoring and medical care are mostly used in real-time WSNs. They have high requirements on bandwidth, delay guarantees and delivery time. Real-time QoS guarantees can be categorized into two classes. Hard Real-Time (HRT) and Soft Real-Time (SFT) guarantees. HRT systems must have deterministic bounded delay on the packet delivery and the arrival of the message after its deadline is considered a failure of the system. HRT systems require guaranteed medium access delay in each single-hop and routing delay in multi-hop. HRT is often difficult to achieve due to wireless link unreliability. SRT systems are delay tolerant but have probabilistic end-to end delay guarantee.
- **Multimedia WSNs:** Deliver video and audio streams, still images and scalar sensor data. Therefore, they are bandwidth hungry, needing high throughput, low delay and data redundancy. It also requires predefined QoS level in order to successfully deliver multimedia content.

Various traffic types:

Traffic load depends on the amount of data generated by the node. QoS method should be equal effective during peak and low traffic periods.

Wireless link unreliability:

The wireless links among the sensor nodes can be easily affected by various environmental factors. Shorter links appears to be more reliable than longer links.

Data redundancy:

Is very important in multimedia and real-time WSNs. However, it is usually reduced with different data aggregation technologies. Otherwise, it should be taken into account in QoS methods.

QoS Metrics in WSNs Layers:

QoS provisioning in individual layer depends on layer capability. Therefore, each layer has layer specific parameters that are used for performance evaluation and QoS assessment. In Table QoS parameters are assigned to each layer in a WSN. Since different combinations of proposed parameters could define different QoS levels, WSNs could be categorized and could provide predictable performance.

I just consider QoS metrics at network layer for my work

Table 1: QoS parameters in WSNs layers

WSNs Layers	QoS parameters
Application layer	System lifetime Response time Data novelty Detection probability Data reliability Data resolution
Transport layer	Reliability Bandwidth Latency Cost
Network layer	Energy efficiency Latency Reliability Throughput Network lifetime Adaptivity Robustness
MAC layer	Communication range Throughput Transmission reliability Energy efficiency
Physical layer	Depend on capabilities of sensor components (sensing, data processing and communication component)

QoS metrics at network layer:

The level of QoS provisioning at the network layer is depend on several parameters, often termed as QoS metrics. It represents the QoS requirements of diverse WSN applications. An application may demand a particular QoS by specifying its requirements in terms of one or more QoS metrics. Thus, defining an appropriate QoS metrics used for a specific application is

considered as a challenging task. The most common QoS metrics that can be considered at the network layer are summarized below:

1. Energy efficiency

It is considered as the most predominantQoS requirement because of the battery-operatedsensor nodes. Network layer can contribute to energyefficiency by employing various mechanisms such asclustering, multipath routing, or multiple sinks accordingto the application requirements.

2. Latency

It is characterized as the delay experienced bya source node packet until it reaches the sink node.Network layer can achieve minimum latency or end-to-enddelay by exploring shortest path among the sourceand the sink during the data packet transmission.

3. Reliability (PDR)

It is characterized as the ability ofthe network to transmit real-time information to thesink node with the least packet loss. Reliability atnetwork layer can be guaranteed by establishingmultiple route among the source and the sink forredundant packet transmission under dynamic networkconditions.

4. Throughput

It is defined as the rate of successful packetdelivery over the communication link. Thus, highthroughput should be taken into consideration whileproposing a routing protocol for real-time applications.

5. Network lifetime

It is characterized as the number ofcommunication rounds until the first node dies (FND), for a specific level of nodes dies. The FND metric is usually adopted in sparsely deployed WSNs. However, in densely deployed WSNs, exhaustion of a single node would not affect network connection and sensing activity. Thus, in large or densely deployed WSN, metrics such as HND (half node die) and LND (last node dies) are also considered for the network lifetime evaluation.

6. Adaptivity

The data traffic load, network topology, and wireless channel conditions may vary frequently due to node mobility, wireless channel noise, and failure probability of sensor nodes (example: nodes get disconnect from the network due to battery depletion). Therefore, a QoS mechanism must take into account the continuous adaptation of network operation parameters in order to support the highly dynamic environment.

7. Robustness

It is defined as the ability of the routing protocol to reconfigure the network connectivity against sensor node and communication link failures. In harsh environments, sensor nodes are usually inclined towards the failure because of fast exhaustion of their battery power or some hardware component malfunctions. So, failure of a node disrupts the network connectivity not only with the sink but also with the neighbour sensor nodes. Thus, a routing protocol is required to be robust against the sudden failure of the sensor nodes.

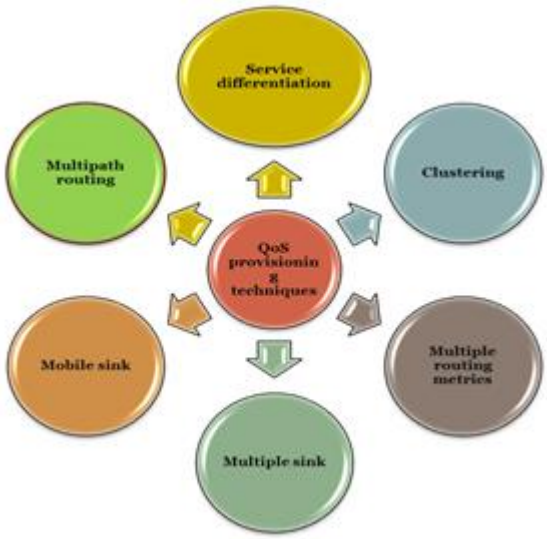

Figure 4: QoS provisioning techniques at network layer

QoS provisioning techniques at network layer:

The basic mechanisms which can be employed by routing protocols to provide QoS in resource constrained WSN. Each of the QoS mechanisms has ability to accommodate the impact of different QoS issues and supports different QoS metrics based on the application. QoS provisioning techniques at network layer in Figure 4

Service differentiation:

Service differentiation is the most predominant technique for QoS provisioning in resource-constrained WSN. It effectively shares the constrained network resources among the different traffic loads by prioritizing the traffic based on one or more criteria such as remaining hop count, remaining time to deadline, residual energy, traffic load, and distance travelled and forms several traffic classes.

Clustering:

Clustering the nodes is an imperative mechanism in WSNs that provides QoS assurance in terms of energy efficiency and reliability. Clustering divides the network into small sized

clusters, in which each cluster has a cluster head (CH) and member nodes. Once the network is set-up, the communication between the nodes is characterized into intra-cluster and inter-cluster communication. The member nodes send their data to the associated CHs, and the CHs then forward aggregated data to the BS either directly or via multi-hop routing.

Multiple routing metrics:

Multi-constraint QoS routing has come across as one of the imperative techniques to support real-time services in WSN. Routing metric is a parameter used to select the best optimal relay node and network path towards the sink node. In order to meet the application-specific QoS constraints at network layer, several routing metrics have taken into consideration such as delay, reliability, hop count, traffic load, and residual energy for optimal route selection.

Multiple sink:

In large-scale WSNs, if a single sink is located at an area that might be far from the source nodes, there is the probability that the network performance degrades very quickly. This is because the residual energy of sensor nodes near to the sink get drained at much faster rate as compared to the far away sensor nodes and hence, leads to the early isolation of the sink.

Mobile sink:

In WSN architecture, when a static sink node is used, sensor nodes close to the sink exhaust their battery rapidly as compared to other nodes, leading to premature network failure. The mechanism of introducing mobile sink to the WSNs framework has received adequate consideration in recent years to maximize the network lifetime. With the deployment of mobile sink in the network, the hotspots around the sink change constantly with its movement and hence, the probability of each node to become the neighbouring node of the sink is also increased.

Multipath routing:

The idea of using multipath routing in WSNs is to deliver QoS support to heterogeneous traffic load by distributing the traffic load along the multiple paths based on their QoS requirements. The traffic distribution also balances the energy consumption load and reduces the probability of network congestion by alternating the forwarding nodes among source and sink. Furthermore, multipath routing can maintain the network reliability by redirecting the network traffic load towards another active node in the case of primary route failure

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EVALUVATION OF SNA SUPERMARKET MALUMICHAMPATTI COIMBATORE USING VARIOUS QUEUEING MODEL

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Abstract:

Customers arrive at a service facility with several queues, each with one server (sales checkout counter). The customers choose a queue of a server according to some mechanism (e.g., shortest queue or shortest workload). This Paper is the review of queuing theory and for empirical study of the sales checkout service unit of a supermarket is chosen as an example. The main purpose of this Paper is to review the application of queuing theory and to evaluate the parameters involved in the service unit for the sales checkout operation in the Supermarket. Therefore, a mathematical model is developed to analyze the performance of the checking out service unit.

Keywords: Queueing Theory, M/M/1 Model, M/M/s Model, Sales Checkout Counters, Expected Total Cost.

Introduction:

Queueing Theory is the Mathematical study of waiting lines or queues. Queueing Theory deals with study of arriving rate, arriving pattern, behaviour, waiting time in queue, waiting time in system, waiting time of customer and service rate, idle time, servicing cost of server. It is important to know that a customer is whatever arriving unit is waiting to get service and not necessary to be a person. Likewise, a server is the person or device that delivers the service.

The main intention of this paper is to review the application of Queueing Theory and to assess the parameters involved in Sales Checkout Operation in Supermarket. A Mathematical Model is developed to analyze the performance of the checking out service unit. Using this Mathematical Model for collection of Data in Supermarket we want to known Two important Results: One is the service rate provided to the customers during the checking out process, and the other is the gaps between the arrival times (inter-arrival time) of each customer per hour.

Customers' perception of the quality of the service is an important part of a business for any Organization. Supermarket understands that the overall service is the key for the success and the service quality is the key for winning the competition in Supermarkets with similar quality and price.

Review of Literature:

Wang, Wen-Cheng *et al.* (2009) conducted a study in the context of Chinese retail supermarket through a survey approach. The researchers used factor analysis to identify the determinants of service loyalty.

Igwe *et al.* (2014) have analysed a single-server queueing system by collecting data through observation from select supermarkets. The focus was on analytical method of analysis of queues at select supermarkets in Makurdi Town, Nigeria. Results revealed that mean service rate was poor and the average time a customer spent while waiting for service was too long. Suggestions were made towards improving service facilities.

A study conducted by Afande *et al.* (2015) on factors affecting customer loyalty at Supermarkets in Nyeri Town, Kenya using descriptive research methods reveal that price, changing customer preferences and brand image are among the top reasons for customer loyalty.

Neupane (2015), in the context of retail supermarket chain in UK studied the inter-relationship between brand image, customer satisfaction and loyalty intention of customers. Data was collected from 120 customers; statistical techniques like correlation and regression were employed. The results indicated significant relationship between the above stated variables.

Vennila (2020) studied the performance of Palakkad Railway Station Reservation Ticket Counters using M/M/C Queueing model and the results are analysed using performance measures of queueing models.

M/M/1 queueing model:

λ: The mean customers arrival rate

μ: The mean service rate

$\rho = \frac{\lambda}{\mu}$: Utilization factor

Probability of zero customers in the system:

$P_0 = 1\text{-}\rho$

The probability of having n customers in the system:

$P_n = P_0 \rho^n$

The Average number of customers in the system:

$L_s = \frac{\rho}{1-\rho} = \frac{\lambda}{1-\lambda}$

The average number of customers in the queue:

$L_q = L * \rho = \frac{\rho^2}{1-\rho} = \frac{\rho\lambda}{\mu-\lambda}$

The average waiting time in the queue:

$W_q = \frac{Lq}{\lambda} = \frac{\rho}{\mu-\lambda}$

The average time spend in the system, including the waiting time:

$W_s = \frac{L}{\lambda} = \frac{1}{\mu-\lambda}$

M/M/s queueing model:

λ: The mean customers arrival rate

μ: The mean service rate

$\rho = \frac{\lambda}{s\mu}$: utilization factor

Probability of zero customers in the system:

$$P_0 = \left[\sum_{n=0}^{s-1} \frac{(s\rho)^n}{n!} + \frac{(s\rho)^s}{s!(1-\rho)}\right]^{-1}$$

The Probability of having n customers in the system:

$P_n = P_0\rho^n$

The Average number of customers in the system:

$L_s = L_q + \frac{\lambda}{\mu}$

The Average number of customers in the queue:

$L_q = P_s \frac{\rho}{(1-\rho)^2}$

The Average waiting time in the queue:

$W_q = \frac{L_q}{\lambda} = P_s \frac{1}{s\mu(1-\rho)^2}$

The Average time spent in the system, including the waiting time:

$W_s = \frac{L_s}{\lambda} = W_q + \frac{1}{\mu}$

Data collection:

We have visited the SNA Supermarket, Malumichampatti, Coimbatore in different days and examined about the arrival of the customers in the supermarket and the manner of service provided to the customers. In this Paper data's are related to the arrivals and service of the customers in the supermarket is provided in this section. The methods employed during data

collection were direct observation and personal interview and questionnaire administering by the researcher. Data were collected for 15 days but in this paper we use only one day data in different time slots. The customers arrivals to the supermarket follows Poisson distribution and the service gives to the customers follows the exponential distribution. The service process is done according to FCFS (First Come First Served) queue discipline. . Hence the queueing model M/M/1 Model and M/M/S Model is suitable for our research problem.

Comparison of single queue-multi server multi queue-multi server:

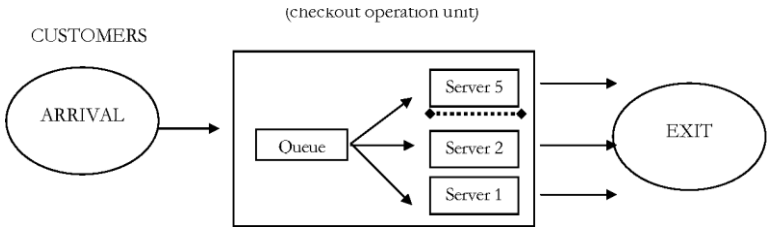

Figure 1: Single stage queueing model with single- queue and multiple parallel servers

Fig 1 describes single stage queueing model with single queue and multiple parallel servers. For this, we will use M/M/S Queueing model.

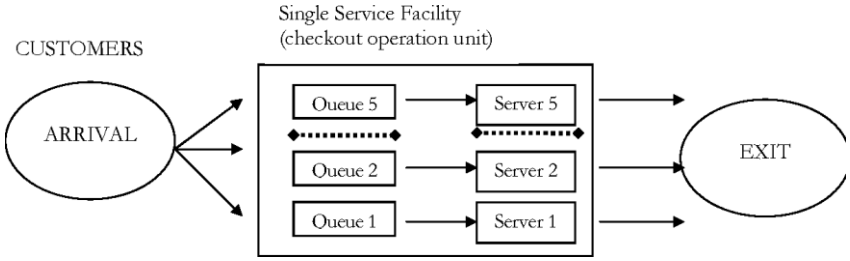

Figure 2: Single stage queueing model with multiple queues and multiple parallel servers

Fig 2 describes single stage queuing model with multiple queues and multiple parallel servers. For this, we will use M/M/1 Queueing system.

If we consider S number of checkout counters in the supermarket, and the customer's arrival rate is λ and the service rate of each checkout counters is μ, if we try to find the values of L_q, L_S, W_s, W_q and in two cases and comparing all these four characteristics in each case. If there is only one queue then the system considered as M/M/S queuing system, in this case we will use multi server queuing model to find L_q, L_S, W_s, W_q .

If there are S queues in the system the queuing system considered as S isolated M/M/1 queuing systems, in this case we will use single server queuing model to find L_q, L_S, W_s, W_q in this case the customer's arrival rate become $\frac{\lambda}{S}$.

The following data is collected through questionnaires and survey for a supermarket which has 4 checkout counters. The data has been divided into 3 slots of morning, afternoon and evening.

Expected total cost for M/M/1 and M/M/S model:

Service level is the function of two conflicting costs

- Cost of offering the service to the customers
- Cost of delay in offering service to the customers.

Economic analysis of these costs helps the management to make a trade-off between the increased costs of providing better service and the decreased waiting time costs of customers derived from providing that service.

Expected service cost E(SC)=sCs Where s is number of servers and Cs is service cost of each server.

Expected waiting cost in the system E(WC)=$L_s C_w$

Where L_s= Expected number of customers in the system and

C_w = Cost of waiting by the customer.

Expected total cost in the case multi queue – multi server model (i.e. S individual M/M /1 models)

E(TC)=S(E(SC)+ E(WC))= s(Cs+$L_s C_w$)

Expected total cost in the case single queue – multi server model (i.e. M/M/s model)

E(TC)=E(SC)+ E(WC)= sCs+$L_s C_w$

Analysis of data:

Present Scenario:

In this Supermarket, the customers join the queue by themselves. The data were collected for s=4 checkout counters. So, there are 4 queues and the customers select their own queue. In this case, customers in any queue switch to shorter queue (jockey behavior of queue).

Table 1: Details of the customers whose arrival and service rates in Supermarket and Finding the Values of L_S , L_q , W_S , W_q

Time Slot	Arrival Rate (λ)	Service Rate (μ)	L_S	L_q	W_s	W_q
10 am to 2 pm	6.5	25	0.3513	0.09135	3.24 min	0.843 min
2 pm to 6 pm	6	15	0.6666	0.2666	6.666 min	2.664 min
6 pm to 10 pm	10	50	0.25	0.05	1.5 min	0.3 min

The following calculations are made using the performance measures of M/M/1 queuing model having 4 isolated checkout counters. In Table-1 we find out the values of L_q, L_S, W_s, W_q.

To find the Expected Total Cost assuming that Service Cost (C_s) is Rs. 250 and Waiting Cost (C_w) is Rs.300. In this s = 4 checkout counters

$$E(TC) = S\big(E(SC) + E(WC)\big) = s(C_s + L_s C_w)$$

$$L_s = \frac{0.3513 + 0.6666 + 0.25}{3}$$

$$= \frac{1.2679}{3}$$

$$= 0.4226$$

$$E(TC) = 4(250+(0.4226)(300))$$

$$= 4(250+126.78)$$

$$= 4(376.78)$$

$$E(TC) = 1507.12$$

Proposed model:

There are 4 checkout counters but only one queue and there is a machine which gives indication to the next customer that which queue should be chosen. As soon as one counter gets vacant, it shows on the machine and the next customer joins that queue. The calculations are made using the performance measures of M/M/s queuing model having s=4 checkout counters. In Table-2 we find out the values of L_q, L_S, W_s, W_q.

Table 2: Details of the customers whose arrival and service rates in Supermarket and Finding the Values of L_S , L_q ,W_S , W_q

Time Slot	Arrival Rate (λ)	Service Rate (μ)	L_s	L_q	W_s	W_q
10 am to 2 pm	26	25	1.04816	0.00816	2.418 min	0.0188 min
2 pm to 6 pm	24	15	1.6603	0.0603	4.1502 min	0.1509 min
6 pm to 10 pm	40	50	0.80239	0.00239	1.203 min	0.003585 min

To find the Expected Total Cost assuming that Service Cost (C_s) is Rs. 250 and Waiting Cost (C_w) is Rs.300. In this s = 4 checkout counters.

Expected total cost in the case single queue – multi server model (i.e. M/M/s model)

$$E(TC) = E(SC) + E(WC)$$

$$E(TC) = sC_s + L_s C_w$$

$$L_s = \frac{1.04816 + 1.6603 + 0.80239}{3}$$

$$= \frac{3.51085}{3}$$

$$= 1.17028$$

$$E(TC) = 4(250) + (1.17028)(300)$$

$$= 1000 + 351.084$$

$$E(TC) = 1351.084$$

Conclusion:

Queueing theory plays an important role in our society. Understanding the concepts of queueing theory helps to compensate the waiting time of customers in the queue and service. In our analysis, which is carried out in the SNA Supermarket, Malumichampatti, Coimbatore there are four checkout counters in this supermarket. Two different models are used to estimate a queue length,

Single Queue Multi Server Model

Multiple Queue Multi Server Model

In this Paper, we conclude that Single Queue Multi Server Model is better than Multi Queue Multi Server Model. The waiting time of customers waiting in the queue in the Single Queue Multi Server Model is almost better than waiting time of customers waiting in the queue in the Multi Queue Multi Server Model. We also proved that Expected Total Cost of Single Queue Multi Server Model is less when compared to Expected Total Cost of Multi Queue Multi Server Model.

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DIAGNOSIS OF SOCIAL ENTREPRENEURSHIP IN RURAL COMMUNITIES OF THE MUNICIPALITY OF ESCÁRCEGA

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Abstract:

It has been shown that social enterprises act as detonators of sustainable development and improve the quality of life, therefore, the objective of this project is to develop a proposal for social entrepreneurship congruent with the Mayan Train project, which takes advantage of the resources of the region. and collaborate in progressively reducing existing poverty levels. This project is approached from the qualitative approach and proposes to carry out a descriptive analysis on the cases of social entrepreneurship existing in the municipality of Escárcega, Campeche and end with specific proposals for integration strategies to the Mayan Train project, or with the adaptation of a model of social entrepreneurship congruent to the Mayan Train project. It is expected to demonstrate that social entrepreneurship can integrate its activities into the Mayan Train project, with the implementation of which it is possible to contribute to improving the level of development of the population and their quality of life.

Keywords: Social entrepreneurship, quality of life, Mayan Train

Introduction:

The place of interest for the present investigation is the town of Escárcega located in the homonymous municipality of the state of Campeche. Currently Escárcega is a town whose main source of development is to be an important communications node, since federal highway 186

from Villahermosa, Tabasco joins it, which continues east to Chetumal, Quintana Roo; and Federal Highway 261 that continues north, connecting it with Champotón, Campeche and Mérida in the state of Yucatán.

According to the poverty and evaluation report published by CONEVAL in (2020) Escárcega, despite being an important communications node, is one of the 5 municipalities with the most people living in poverty in the state of Campeche with a percentage of 59.1 % and 11.3% in extreme poverty.

The government of Mexico seeks to reactivate the economy by maximizing tourism, therefore, the population of Escárcega must be prepared to face the changes and take advantage of the business opportunities that will arise with the implementation of the Mayan Train project. About,

Islas (2020) in an article for Forbes Mexico magazine states: “the project will trigger a high social utility, by virtue of the fact that urban and commercial growth around the stations will be managed through sustainable communities, renovation projects and territorial reorganization that will promote the growth of the region for the main benefit of its inhabitants ”.

In this way, it is clear that Escárcega will undergo a great economic transformation when such a public investment project is generated. The proposed research project includes the social component because Escárcega is located in an area of high marginalization and it is expected to produce benefits for social entrepreneurs, but also due to the influence of the sustainable dimension, it is desirable that the business proposals that are generated in Escárcega are friendly to the environment, which is one of the premises of social entrepreneurship.

History of the problem:

Much has been said about the term social entrepreneurship, however, it should be noted that this is not a term of our century and, contrary to what one might think, it has its origins in the nineteenth century with the emergence of the social economy. In an article published on the Fundación Wiese website (2018) it is mentioned that “Bill Drayton is known as the father of social entrepreneurship, since it was he who coined the term social entrepreneurship, to refer to people who, in an innovative way, they solve important problems in society ”. Similarly, various investigations have shown that "social entrepreneurship is presented as a form of employment that in practice becomes one of the strategies to attack poverty and marginalization in developing and emerging economies" (Valdés, 2015) and that "the social enterprise contributes to the sustainable rural development of its community and improves the quality of life of its inhabitants" (Vázquez-Maguirre& Portales, 2014)

In the state of Campeche there are 5 municipalities with the highest poverty values. The town of Escárcega is one of them, in which, the poverty levels are 59.1% and 11.3% of extreme poverty, according to data from CONEVAL (2020), the specific problem is that in the state of Campeche, "the population It has remained in economic and social stagnation, a situation that has not allowed taking advantage of the opportunities for development that public or private entities offer to start a business and / or to make it grow effectively (Santos, Barroso, & Ávila, 2014), This means that there is a broader and deeper problem, the consequence of which is manifested in the ravages of poverty, from which migration and other serious social effects for the population are derived. Another interesting fact about the problem of poverty in Campeche is that, in most households, the income obtained is spent on consumer goods (daily expenses to satisfy basic needs), not allowing income or investment.

Faced with this situation, the government has promoted strategies to combat poverty, although efforts have been insufficient to present encouraging results, such is the case of programs aimed at eradicating poverty in a comprehensive manner, meeting the most urgent needs of the population. A clear example is represented in the "basic food basket program" implemented in the state of Campeche as a precedent to the "progress" program, which was later replaced by the "prospera" strategy (Levy & Rodríguez, 2005)

The government of Mexico seeks to reactivate the economy by maximizing tourism, for which the population of Escárcega must be prepared to face the changes and take advantage of the business opportunities that will arise with the implementation of the Mayan Train project.

Justification of the problem:

In a population with high rates of poverty, the low income of families does not allow income or investment. This is the case of Escárcega, a municipality in which poverty reaches values of 59.1% and 11.3% according to data from the 2020 Poverty Report published by CONEVAL (2020), and in which the population has remained in economic and social stagnation (Santos, Barroso, & Ávila, 2014). The foregoing explains that the very diverse forms of economic activities that occur in the town of Escárcega have not been sufficient or adequate to generate development at the family and business level.

One way to achieve the development of both families and at the company and society level is through social entrepreneurship, however, apparently it is not identified that in Escárcega there is evidence of this form of entrepreneurship, which represents an opportunity for the development of this research.

In this context, it is necessary to find cases of social entrepreneurship or existing social enterprises in the region and produce a "model" form or general procedure with recommendations and strategies to carry out social entrepreneurship according to the Mayan Train project in the municipality of Escárcega.

Literature review:

Theories and entrepreneurship

Entrepreneurship is a term that has become popular in the 80s and 90s. According to Hernán&Gálvez, (2008) when looking for the relationship of entrepreneurship from the methodological point of view with the different sciences, it is possible to find a relationship between some basic and applied sciences and entrepreneurship. For example: there is a direct relationship with the Economy and Management; and an indirect relationship with Mathematics, Psychology, Sociology and Biology.

There are different theories or approaches to studying entrepreneurship. According to Gómez (2012), the most common are: Inverted Triangle Theory, Schumpeter Theory, Austrian School Theory, Howard Stevenson Theory and Allan Gibb Theory.

Osorio & Pereira (2011) affirm that the Cognitive Social Theory (Bandura, 1986) is useful in the analysis of education for entrepreneurship because it includes a greater diversity of elements and typology of entrepreneurship.

Entrepreneurship

Analyzing the concept of entrepreneurship involves various economic and social aspects, since by nature this term has its origin in those areas. In the opinion of Rodríguez (2009) “understanding the phenomenon of entrepreneurship requires, first of all, to analyze it from its evolution as an economic and social aspect, to then study it from different perspectives, and ultimately propose its analysis from the point of view cultural and psychoanalytic ”. For this reason, for the complete analysis of the concept of entrepreneurship it is necessary to emphasize the social and economic dimensions.

Regarding the concept of entrepreneurship, this is a term that has been widely used as a global research object. This word can have different interpretations depending on the field in which it is applied, and its origin dates back to the meaning of terms used to refer to people capable of taking the initiative and discovering new horizons. In this regard, Rodríguez (2009) points out that the word "entrepreneurship" is derived from the French term entrepreneur, which means being ready to make decisions or to start something.

There are several ways to start a business, one of them is social entrepreneurship. "The distinction between social and commercial enterprises is not dichotomous, but rather more

accurately conceptualized as a continuum that varies from the purely social to the purely economic" (GuzmánVásquez& Trujillo Dávila, 2008).

Finally, from a broader approach, Formichella (2002), affirms that entrepreneurship can be understood “as the development of a project that pursues a certain economic, political or social purpose, among others, and that has certain characteristics, mainly that it has a share of uncertainty and innovation "

Entrepreneur

According to Castillo (1999), the word entrepreneur comes from the French entrepreneur (pioneer), initially being used to refer to these adventurers like Columbus who came to the New World without knowing with certainty what to expect.

There is some confusion between the words entrepreneur and businessman, when in fact they are terms that express a different meaning. Both terms are generally taken as synonyms, when in fact the differences between one and the other concept are duly marked. (Searched, Saavedra, and Camarena, 2015)

Social entrepreneurship

Various investigations have shown that "social entrepreneurship is presented as a form of employment that in practice becomes one of the strategies to attack poverty and marginalization in developing and emerging economies" (Valdés, 2015) and that "the social enterprise contributes to the sustainable rural development of its community and improves the quality of life of its inhabitants" (Vázquez-Maguirre& Portales, 2014)

Social entrepreneurship is a type of entrepreneurship which is characterized by the generation of social projects "a common element in different definitions of social entrepreneurship is the search for solutions to social problems"

Guzmán and Trujillo (2008) present a very complete definition of social entrepreneurship “refers to a specific type of entrepreneurship that seeks solutions to social problems through the construction, evaluation and pursuit of opportunities that allow the generation of sustainable social value, reaching new and stable balances in relation to social conditions, through direct action carried out by non-profit organizations, companies or government agencies”.

Strategies to combatpoverty

The government has promoted strategies to combat poverty, although efforts have been insufficient to present encouraging results, such is the case of programs aimed at eradicating poverty in a comprehensive manner, meeting the most urgent needs of the population. A clear example is represented in the "basic food basket program" implemented in the state of Campeche

as a precedent to the "progress" program, which was later replaced by the "prospera" strategy. (Levy & Rodríguez, 2005)

The government of Mexico seeks to reactivate the economy by maximizing tourism, for which reason the population of Escárcega must be prepared to face the changes and take advantage of the business opportunities that will arise with the implementation of the Mayan Train project. However, in Campeche there are only 13 social tourism companies that group a total of 581 workers. "These social enterprises offer various activities, among which are boat tours through estuaries and islets, sport fishing, tours of interpretive trails, swimming in cenotes, sighting of flora and fauna and a great variety of artisan workshops" .(González, 2018)

Material and Methods:

The methodology used in the project consisted of surveying the cases of social entrepreneurship existing in the municipality of Escárcega, with the aim of knowing them and evaluating which ones are the most appropriate; Subsequently, 6 of the best enterprises will be selected to work on the project, the entrepreneurs will be interviewed to learn more about the enterprise, the impact and the benefit to create new forms of social entrepreneurship appropriate to the Mayan Train project.

Research approach and type

This project is approached from a qualitative paradigm. "It does not correspond to a quantitative study since it is not intended to carry out a causal or correlational analysis" (GuzmánVásquez& Trujillo Dávila, 2008), on the contrary, in this research it is proposed to carry out a descriptive and interpretive analysis on the evidence of social enterprises in the local context and end with specific proposals for integration strategies for the Mayan Train project. The research to be carried out will be of the exploratory, descriptive, analytical and field type.

Population and sample

The study was carried out in the municipality of Escárcega, in the state of Campeche, Mexico and its unit of analysis is economically active men and women who are developing one of the forms of social entrepreneurship.

By consulting the official INAES database, the directory of social enterprises that have received funding from the federal government of the Mexican Republic was located. Data from 46 social entrepreneurship projects were observed for the period of years between 2015 and 2019 financed in the municipality of Escárcega.

By reviewing the specific data of each project, it was found that the projects correspond to 27 organizations or forms of entrepreneurship that for the purposes of this research are

considered "social enterprises" themselves that meet the definition of "social entrepreneurship" established by Guzmán and Trujillo (2008) who define it as a "specific type of entrepreneurship that seeks solutions for social problems through the construction, evaluation and pursuit of opportunities that allow the generation of sustainable social value, reaching new and stable balances in relation to social conditions. , through direct action carried out by non-profit organizations, companies or government agencies "(Hernández, Fernández, &Baptista, 2010)

In conclusion, the finite population is 27 social enterprises distributed in rural communities of the Escárcega municipality.

Data collection instrument

In the first stage of the project, the instrument used was surveys, these were applied in order to know the cases of social entrepreneurship existing in the Escárcega region. The second stage consists of selecting 6 of the best social enterprises and interviewing those responsible, with the intention of knowing more about the entrepreneurial cases and being able to develop their own proposal congruent with the Mayan Train project.

Data analysis procedure

The survey was applied to 27 social enterprises, located in the Escárcega municipality, Campeche. The application was carried out in person, in printed surveys, however, the responses were captured on a digital platform (google form), where the responses received were concentrated. Using Excel software, the basic descriptive statistics (mean, median, mode, standard deviation, variance and range) were calculated.

Results:

Social entrepreneurship

Social entrepreneurship can be considered as a strategy to attack the marginality of peoples; Because of this, it is important to know how well employers know the term.

A total of 27 entrepreneurs in the Escárcega region were surveyed, seeking to know how present the term social entrepreneurship is and how many of them know its meaning. It was found that 70% of the respondents do know the meaning of social entrepreneurship, however, of the total of respondents, only 19% of them have or have had social entrepreneurship projects.

They were questioned about the general benefit of their entrepreneurship, regardless of whether they have or have had social entrepreneurship projects and it was found that, of the total number of respondents, 67% of them contribute to solving some social problem. Of the 67% of those who answered that they do contribute to the improvement of social problems, 30%

contribute by granting jobs, 11% by providing training, another 11% by providing low-cost work materials, and a final 11% by providing digital and advertising services. while 4% contribute helping other companies.

Of the total respondents, 63% provide work or employment to society, 22% provide care for the environment, 7% provide products at low prices, 4% provide training and finally 4% do not provide any type profit, which means that 89% have a commitment to the social environment while 7% have a commitment to the natural environment.

Corporate social responsibility is the result of the commitment by companies to respect the environment and promote sustainable development practices, hence the importance of knowing the contribution to the environment that Escárcega ventures have. It was found that, of the total number of respondents, only 10% contribute to the improvement or preservation of the environment. Of the 10% of the companies that contribute to the improvement or preservation of the environment, 37% do so by not generating pollution and making proper use of waste, while the other 63% did not specify how they contribute.

Quality of life

Quality of life represents a multidimensional term of social policies that means having good "objective" living conditions and a high degree of "subjective" well-being, and also includes the collective satisfaction of needs through social policies in addition to satisfaction. individual needs.

One of the important aspects that help to measure the level of quality of life in the population is health, which is why it was questioned about the access of workers to health services and it was found that 78% of workers did not have insurance, 15% have IMSS and 7% have private insurance.

Another quality of life indicator is access to education. Surprisingly, it was found that all respondents do not contribute to education by awarding scholarships to workers or their children to continue with their studies. Regarding housing, it was found that no undertaking grants or facilitates housing loans for workers.

Regarding employment, it was found that 30% of the enterprises do not address the problem of unemployment in the population in any way, 26% do so with the opening of new establishments, 22% with an increase in production and finally 22% do so through training programs.

Discussion and Conclusions:

Campeche is one of the states of the Mexican Republic with alarming poverty rates, it is currently awaiting a project that will positively impact the state and specifically the municipality of Escárcega, which is why it is intended to take advantage of this project to propose new forms of economic development through social entrepreneurship. Said proposals will seek a way to develop productive projects for rural communities in the municipality of Escárcega. To develop it, it is necessary to identify and know the cases of social entrepreneurship existing in the region, know the social impact they represent and in which areas they manage to improve the quality of life of society that is why the study groups were the 27 cases of entrepreneurship in the Escárcega region.

From the results obtained in the research, two exceptions of great importance within the quality of life variable stand out. The first of them is related to education, since all the respondents affirmed that they do not provide any type of support to the workers or their children as extra help for them to continue with their studies; Another alarming result is access to housing, since, in the same way as in the previous case, the total of those surveyed affirmed that they did not grant any housing credit to their workers. Finally, of the total of those surveyed, 78% of them do not provide any type of insurance to their workers. These events have a negative impact on the quality of life of the workers since, in order to enjoy a satisfactory quality of life, one must have access to the 5 factors. These data confirm the poverty statistics presented by CONEVAL in 2020.

Mballa (2015) carried out an investigation where he concluded that “social entrepreneurship is a concept that designates a phenomenon whose goal is to solve a social need directly related to the productive sector”, in the same way he mentions that “social entrepreneurship has become a factor of change for disadvantaged actors due to the following characteristics:

- Generates employment and development for the vulnerable population.
- Improves the quality of social services.
- Promotes ethical practices in the markets (fair trade)
- Sensitizes new entrepreneurs who want to enter the productive sector "

We can clearly observe that the characteristics mentioned by the author are relevant and applied in the Escárcega community since when questioning how social enterprises impact the environment, 63% of them seek to generate jobs, and 7% promote ethical practices in markets, however, despite the fact that 70% of those surveyed know the term, only 19% of them carry out

or have carried out social enterprises. Similarly, it was obtained that 67% of those surveyed contribute to solving a social problem, of which 30% generate jobs, the11% provide training to society, another 11% promote ethical practices in the markets and only 4% contribute by supporting other companies. For his part, Ramírez (2008) mentions that "social entrepreneurship tends to occur successfully, in sectors of the economy where the market has failed and State action is non-existent or ineffective." Therefore, “the concept of social entrepreneurship […] must always be located within a precise sociocultural and institutional context, taking into account its space-time dimension” (Mballa, 2015). Another important point and according to Kazami, Hashim, & Hung (2016) is that "social entrepreneurship is vital to unlock economic inclusion and the growth of developing economies" that is why the importance of implementing social entrepreneurship projects in the Escárcega region before the imminent arrival of the Mayan Train project. Very closely linked to these terms and, above all, to the thesis proposed by Mballa, the quality of life enters the concept of which must be recognized as “multidimensional since said concept is influenced by factors such as: lifestyle, housing, satisfaction in school and in employment, as well as economic situation ”(Velarde Jurado& Ávila Figueroa, 2002) related to these factors, it was obtained that in the enterprises of the Escárcega region, 78% of the workers do not have access to basic health services 15% have IMSS and 7% private insurance; On the other hand, in terms of education, no enterprise grants educational support to its workers or their children, in the same way, no enterprise grants housing loans. In terms of unemployment, 30% said they did not address the issue of unemployment in any way, 26% did so by opening establishments, 22% through training programs for young people and a last 22% increasing their production to generate more opportunities labor.

Due to this, it will be opportune to investigate in more depth the reason why the enterprises and companies in the town of Escárcega do not provide support to society in terms of quality of life. It is necessary to delve into what are the causes that cause such a low level of quality of life in the locality, in order to design strategies that help to detonate the economic development of companies, causing an improvement in quality of life factors.

Social entrepreneurship as a detonator of quality of life and sustainable development is a subject very little studied, it could even be said that it is a pioneering research, due to this, the existing information is very limited; Although the variables studied are of common interest and have a direct relationship with each other, they have never been related in the same project before. Due to this, doing it was a bit of a blind eye, making our own conclusions and developing theories on how both practices can be beneficial for each other and can positively impact the town of Escárcega before the arrival of the Tren Maya project.

The Mayan Train project is a great platform that will benefit the population of Escargot, it intends to be an economic trigger for the population, but in addition to that, it is a latent opportunity to develop social entrepreneurship projects to increase the quality of life of the population and to get Escárcega out of the lag.

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NLP ASSISTANT WITH AI FOR AUTOMATIC CORONAVIRUS DISEASE DETECTION (COVID-19) A TECHNICAL SURVEY OF THE USE OF CHEST CT AND X-RAY RADIOLOGY REPORTS

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Abstract:

The rapid spread of the novel COVID-19 disease is on the horizon. The coronavirus pandemic, according to the World Health Organization (WHO), is placing even the strongest healthcare systems around the world under immense strain. It's critical to identify affected people as soon as possible so that quarantine and treatment can begin. By delivering a clinical diagnosis ahead of the pathogenic test, an Artificial Intelligence technique has the ability to control COVID-19 community spread. We may conclude from this study that the NLP technique gives machine learning algorithms for automatic recognition of chest CT and X-ray imaging patterns. As a result, the CAD system meets the requirements of COVID-19 in terms of cost, time, mistakes, and human involvement.

Keywords: CADe, CADx, NLP, ML, AI, Clinical note, Radiology, COVID-19

Introduction:

The SARS-CoV-2 virus created the novel coronavirus 2019 (COVID-2019), which first surfaced in Wuhan, China, in December 2019. The Severe Acute Respiratory Syndrome coronavirus, also known as COVID-19, has produced a pandemic all across the world, causing person-to-person transmissible pneumonia. The COVID-19 has been proven in millions of people all around the world. Computer science's Artificial Intelligence (AI) is a potentially powerful technology. It's a race among scientists and researchers to employ artificial intelligence as a weapon in the fight against corona.

There are six ways in which AI can help in the fight against COVID-19.

Table 1: AI-based COVID-19 applications and tools

Sr. No.	Application area	AI Tool
1.	To give early warnings and alerts about Positive cases	Blue Dottool
2.	To tracking and prediction of positive cases	GLEAM viz model
3.	To provide data dashboards	Microsoft Bing's COVID-19 Tracker
4.	To diagnosis and prognosis the patient	CAD4COVID system
5.	To treat and cure of patient	Deep Mind
6.	To control community spread	Aarogya Setu App

NLP is an artificial intelligence subfield that allows computer programmes to handle and evaluate unstructured data such as free-text physician/clinical notes, radiology reports, and pathology reports, among other things. Using NLP techniques, clinical notes and parts of speech can be processed remotely, without coming into contact with the suspected patient, and therefore social distance can be maintained. As doctors, nurses, and hospital staff, they are all concerned about the corona virus and work at a high risk of becoming infected when investigating the patient. As a result, early detection of this form of community-spread coronavirus will aid in reducing the strain on healthcare systems.

X-rays of the chest are critical in the accurate and automatic diagnosis of illnesses. COVID-19 is a form of influenza; hence this imaging can be used to diagnose it.Learning can lead to the development of intelligent systems that can differentiate between COVID-19 positive and negative patients. Various studies have been published on it, some of which are included here.

Literature review:

The author employed 48 chest radiography images, which are high resolution DICOM X-ray images, in this study, A Computer-Aided Detection System for Digital Chest Radiographs. The histogram of local binary patterns (LBP) was utilized to determine the normality/pathology of the x-ray. In the preprocessing stage of image processing, pictures were initially scaled using supersampling interpolation. The template matching algorithm was then used to segment the data.

The author collected 1,065 CT scans [2] of pathogen-confirmed COVID-19 cases for the publication "A deep learning system employing CT images to test for Corona Virus Disease

(COVID- 19)." To create the method, the author updated the Inception transfer-learning model. Early stages of COVID-19 are characterized by bilateral distribution of patchy shadows and ground glass opacity. Multiple ground glass and infiltrates in both lungs will occur as the disease advances.

The authors utilized two publicly available datasets in their study "Accurate Prediction of COVID-19 utilizing Chest X-Ray Images using Deep Feature Learning model with SMOTE and Machine Learning Classifiers": Chest X-Ray Images (Pneumonia)1 and COVID-19 public dataset from Italy 2. A total of 5840 pictures were used in the training of the ResNet152 model architecture [3]. The 2748 pictures were used in the final classification of COVID-19 patients by machine learning classifiers.

Image preprocessing is done in order to conduct classification jobs effectively. In both the developed and undeveloped models, all input photos are first transformed to a standard size of 224x224 for a comparable course of action.

The author of the study "Artificial Intelligence versus COVID-19: An Early Review" has identified six possible application areas where artificial intelligence [4] can aid in pandemic response. The author came to the conclusion that AI plays a critical role in preventing the spread of covid -19 in the community and aids in the administration of the healthcare system.

The author of the study "Automated detection of COVID-19 cases using deep neural networks with X-ray images" suggested a CNN-based model with 17 layers of convolutional neural networks [5] to classify COVID-19 cases using x-ray images.

The author also claimed that such AI-based models will undoubtedly address the potential lack of radiologists during pandemics when the demand on the healthcare profession is raised.

The authors looked at 292 chest x-ray reports for their work, Automatic Detection of Acute Bacterial Pneumonia from Chest X-ray Reports. He created a Bayesian network-based NLP system called SymText [6]. The author of this study also concluded that the NLP system performs better when extracting pneumonia-related concepts from chest x-ray results.

The author of this paper employed image processing techniques to detect COVID-19 positive patients using chest X-ray pictures from the GitHub dataset.

The author of this study created a CNN-based ResNet50 [7] deep learning model. Python was used to create the model. The proposed methodology, according to the author, will aid in the early detection of covid -19 patients and thereby avoid community spread.

The author of this paper conducted a survey of numerous open source datasets [8] available for X-ray radiography images of the chest. Various AI-based methodologies utilized in computer-aided detection and diagnosis systems were discovered during this examination. Preprocessing, ROI identification, feature extraction, classification, SVM, and CNN are just a few of the methods covered by the author. He also came to the conclusion that deep learning is useful in automatic disease diagnosis from chest radiography.

The author of this paper looked at CT scans of the chest. The 150 CT chest images [9] in the dataset were divided into four categories. The discrete wavelet transform (DWT) algorithm was utilized for feature extraction, while the SVM algorithm was used for classification. The proposed approach, according to the author, could possibly be employed as an aid system to identify COVID-19 disease.

The author of this research conducted a literature review on the features detected in CT imaging as well as information on the new corona virus. The author looked at publications from PubMed, Elsevier, Google Scholar, and the World Health Organization. The author concluded that COVID-19 has numerous characteristics, such as the emergence of ground-glass pacification (GGO) [10] in lungs CT scans. Septal thickening, bronchiectasis, pleural thickening, posterior distribution, presentation of consolidative opacities Pleural effusion, pericardial effusion, lymphadenopathy, and other conditions can occur.

The authors of this article looked at chest x-ray images [11] to see if they could automatically determine cases of corona infection. Convolutional Neural Network topologies, as well as a transfer learning mechanism, have been proposed by the author. With the proposed CNN architecture, the author concluded that the spreading time of the pandemic will be managed, and diagnosis of the covid -19 will be achievable at a low-cost, rapid, and automatic level.

The author of this paper employed chest X-ray scans to screen for COVID-19.

Backbone network, classification head, and anomaly detection head are the three components of the proposed deep-learning model.

The 18-layer residual convolutional neural network was employed in the system.

The training dataset was created using the stochastic gradient descent (SGD) algorithm.

The author also determined that the suggested X-ray-based screening model outperforms the CT-based screening model. As a result, the suggested model was theeffective computer-aided diagnosis (CAD) tool which could be widely accepted due to its faster imaging time and low-cost.

COVID-Net, a deep convolutional neural network model, was proposed in this paper. It was a specially designed technique for detecting COVID-19 instances in chest X-ray images [13]. It was an open source paradigm that could be used by anyone. The design pattern for the architecture was projection-expansion-projection. It was calculated utilizing a Tensor Flow backend and the Keras deep learning toolkit. The suggested COVID-Net architecture was created with the use of generative synthesis.

The author of this research presented the CVOIDX-Net technology, which would let radiologists discover covid-19 instances from 2D traditional CXR pictures automatically. The model consists of three main components: pre-processing with scaling, training with the Stochastic Gradient Descent (SGD)[14][12] algorithm, validation with evaluation metrics, and deep learning classifiers developed with Python and the Keras package with TensorFlow2[13]. The confusion matrix was used to analyse the model's performance. The author also suggested that of the seven deep learning classifiers (VGG19, DenseNet201, ResNetV2, InceptionV3, InceptionResNetV2, Xception, and MobileNetV2), the VGG19 and DenseNet201 classifiers, when used in a CAD system, would provide a high performance score.

The author reviewed several uses of machine learning in the field of radiology in this essay. Recently, CNN-based CAD systems have become a popular, widely used machine learning application in radiology [15]. The author also suggested that AI techniques might significantly increase radiologists' productivity, reduce their workload, and so improve patient care and satisfaction.

In this study, transverse-section lung CT images were used to detect corona virus automatically. Images were initially segmented using a 3-D deep learning model, then a location-attention classification model was employed in the second stage, and finally a Noisy-or Bayesian function was utilized to determine overall infection probability in the suggested model. For feature extraction, the traditional ResNet [16] was employed. The author came to the conclusion that COVID-19 CT imaging and other pneumonias' appearances were unbiased. As a result, human eyes were unable to identify COVID-19 from other pneumonia strains. As a result, screening models based on deep learning systems would be more dependable, rapid, and accurate. It would undoubtedly aid clinicians in making a clinical decision automatically and swiftly, allowing them to address suspected corona cases earlier and therefore save time and money.

The author of this paper presented the DeCoVNet architecture, which is based on PyTorch.Framework [17].CT scans of the lungs were used. It was a 3D deep convolutional

neural network designed to automatically detect COVID-19 situations. COVID-19 was identified using a mix of epidemiologic factors such as travel or contact history, clinical signs and symptoms, chest CT, laboratory findings, and real-time RT-PCR nucleic acid testing. If the CT results revealed COVID positivity, the author stated that the label flag should be one for positive and zero for negative. The deep learning technique, according to the author, would give a quick and accurate approach for identifying COVID-19 patients, which would help prevent the spread of the corona virus.

The author of this paper employed X-ray scans to discover patients with corona infections. Support vector machine classifier [18] was utilized in the proposed ResNet50 model. The author of this work employed the CXR [28] database, which is a chest X-ray database from GitHub, Kaggle, and Open-I repositories. The suggested model has the highest accuracy for detecting COVID -19 from chest X-ray pictures, according to the author, who compared 11 CNN models.

The author of this paper used the operation notes dataset to extract information.

Both rule-based and supervised machine learning NLP methods were used in the proposed model [19]. The rule-based strategy performs well in medical language processing. Conditional Random Fields (CRFs) are also commonly utilized in medical natural language processing to overcome sequence tagging problems. Annotation from unstructured clinical notes, according to the author, might be a useful tool.

The author of this article identified assumptions using computerized admission notes and discharge summaries. Bag of characters, bag of words, character embedding, and word embedding were used in the proposed system for feature extraction from Chinese clinical text [21]. Conditional Random Fields is a type of conditional random field.

Information from clinical notes is extracted using this programme. The identification of conjecture from Chinese clinical literature was a difficult NLP effort, according to the author.
The author of this work developed a tool capable of annotating a corpus of Chinese clinical writing.

The author of this work developed a tool capable of annotating a corpus of Chinese clinical writing. The sequence-labeling method was used to train statistical models for named entity identification, as well as word segmentation, POS tagging, shallow parsing, and word segmentation. To extract clinical data, the conditional random fields approach was applied. The suggested model was trained using the SVM method on a syntactic and semantic annotated corpus of Chinese clinical texts [20][22]. The author concluded that it was the first widely annotated corpus of Chinese clinical writing, laying the groundwork for future clinical text study.

The author of this study proposed the Medis.NET [23] medical information system, which was a data summary tool. SQL was used to create it. It utilized records from visits, documents, or prescriptions related to a chronic illness. The author created an enhanced data structure that was utilized to summarize data. The tool could operate in two modes: automated and on-demand. The tool would perform better if the patient-diagnosis relationship was not one-to-one but many-to-many, according to the author. The tool was only tested on one sort of medical data extraction, but it might be modified.

The author of this paper looked at chest x-rays (CXR)[27] radiography for automated computer-aided interpretation of Tuberculosis cases (TB). [24]The developed system CAD4TB was based on a machine learning method, and a cumulative abnormality score was computed using k-NN. The proposed approach, according to the author, has the potential to be employed as a computerized tool for screening symptomatic TB patients.

In this study, the author presented an automated surveillance system for screening pneumonia in newborn newborns using natural language processing (NLP) [26]. Knowledge acquisition, knowledge representation, knowledge optimization, and testing were all phases of the proposed system. The dataset for this investigation was derived from radiology reports from two different neonatal intensive care units (NICUs), and the monitoring system included MedLEE NLP and rules-based NLP components.

Multiple CNN models [29] were proposed in this research to categories Covid-19 positive patients based on chest X-ray scans. Chest x-ray pictures from the Kaggle dataset were used. In comparison to chest CT, the author found that chest x-ray had a significantly cheaper cost method. For the diagnosis of covid -19, deep learning is the most successful machine learning technique. The author also compared the performance of the Inception V3, Xception, and ResNeXt models, as well as the correctness of the system.

The author of this work reviewed how NLP benefits the radiology area [26]. For this review, the author looked at pertinent NLP publications in the radiology field. During the survey, the author came to the conclusion that the Quality Assessment of Radiologic Practice [30] category encompassed applications that met regulatory standards. For big databases, automatic content analysis of radiology reports can provide insight into the day-to-day operations and inner workings of the radiology department. For big datasets of radiology reports, such as the present pandemic emergency, NLP has been utilized to generate emotive statistics.

The author of this work mentioned an AI tool for assessing chest x-rays as well as MIMIC-CXR, an online repository for studying COVID-19-affected chest x-ray pictures. The

author concluded that AI algorithms could help doctors recognize COVID-19 from other disorders, giving them an advantage.

The author discussed RADLogics, an AI-powered solution to enable chest CT imaging for COVID-19 patients [32] in this study. It offers image analysis tools based on machine learning to help radiologists work more efficiently. The author also concluded that RADLogics is a pioneer in AI and machine learning image analysis, as well as radical big data analytics, for searching and analyzing CTs, MRIs, PET scans, and X-rays images, reducing diagnostic turnaround time to minutes by automating detection and report generation tasks. It had a patented AI medical image analysis platform that allowed for rapid AI algorithm development and uniform absorption into current radiology workflows.

The author of this paper created U-Net, a deep learning algorithm for automatic segmentation of multiple COVID-19 infection areas based on chest CT data. It was a sort of artificial neural network (ANN) [33]that performed biomedical picture segmentation using a collection of convolutional and DE convolutional layers.

The authors of this article used large-scale observer tests to see how CAD systems can aid radiologists. The author looked at chest x-ray systems for five distinct types of results and used ROC curves to compare the performance of radiologist work flow with and without the use of a CAD system [34]. The author examined the chest x-ray for five different types of results.

Table 2: NLP Method Based on X-ray Findings for COVID-19

Sr. No.	X-ray Findings	NLP Method
1.	Detection of pulmonary nodules	Rule-based analysis
2.	Temporal subtraction	Iterative image-warping technique
3.	Detection of interstitial lung disease	Fourier transformation
4.	Differential diagnosis of interstitial lung disease	Artificial Neural Network
5.	Distinction between Pulmonary nodules	benign

According to the author, CAD has the potential to improve radiologists' decision-making abilities while interpreting chest radiography screening.

Conclusion:

The corona virus behaves in a way that is similar to that of other viral pneumonias. As a result, the identification of the novel coronavirus is ambiguous, making it difficult to keep the situation under control. Some clinical findings in lung screening, such as bronchiectasis, lesion swelling symptoms, and distinct shadowiness in CT and x-ray images, help to identify COVID-19 quickly and easily. As a result, clinical professionals require lung CT images to identify COVID-19 at an early stage. We concluded in this study that while machine learning and artificial intelligence are unlikely to replace radiologists, these techniques have the potential to improve radiology workflow, increase radiologist productivity, improve detection and interpretation of findings, lower the risk of error, improve patient care, and aid in pandemic control.

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STUDY OF DIGITAL TECHNOLOGY AND ITS IMPACT ON INDIAN EDUCATION

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Abstract:

Today is techno savvy era. In techno savvy era people use different digital techniques to simplify education. In past traditional education, the learners reached the information source by enrolling with colleges, teachers, and libraries. Information Communication Technology (ICT) play significant role in education such handling, exchanging information, teaching methods, learning approaches, scientific research and in accessing information. Now day's vast development of digital technology all developed countries .Similarly India, follows their footsteps in digital technique like developed countries. Today's several apps and educational tools are available to develop effective teaching and learning ability among Indian teachers and learner. This papers deals with impact of ICT on education, different educational tools, and different learning apps may use in Indian education. This type of education is shown to have a time lagged positive effects on the attitudes of students as well. This is necessary at present scenario.

Keywords: Digital technology, Education, Impact.

Introduction:

Latter of 21st century Indian formal education was traditional. It was centred on school, college. The teachers, students, and common people accesses information through libraries, newspapers, magazines, and books. Teachers delivered the formal education either following a textbook or notes prepared using books and their experiences. The students admitted colleges, schools that where offered formal education. The libraries were additional resources for learner. The era of 21st century is techno savvy era. In techno savvy era people used digital technique to simply education. Developed countries already used digital technique in education. Now day India follows their footsteps. By studying economy of developed countries it is confirmed that, growth of economy depends upon use digital techniques. An economy which is poor in

technology can never grow in today's scenario. In Indian education now day's different educational tools and learning apps are available but effective implementation of technology methods in the classroom is achieves on the bases of teachers confidence. Positive teacher attitudes toward computers are widely recognized as a necessary condition for effective use of information technology in the classroom (Woodrow, 1992).Today's technology play significant role in day to day life. This is because technology makes our work much easier and less time consuming.

Modern technological tools in education:

There are number of technological tools and Apps available today. Today's modern young generation are utilizing different type of tools easily. This type of technique is not only used in higher education but also in many primary education systems. Students, teachers, and parents are happy and joyful by using such tools and technique. Among the students develops learning and interactive ability. Use of technology can help students understand and retain concepts better .The transfer of knowledge becomes very easy and convenient. By using such tools people develop ability to get faster knowledge. Life make easy. Some common technological tools are used such as:

Use of internet: Today the use of internet is common. The village people to citizen and even rural women to educated girls all use internets. The purpose of use of internet is different for example some women look understand recipe by internet, some for agricultural purposes etc. The internet is now part of our life. The roll of internet in the education world can now never be undermined. Today, the internet is something that is present in almost everything we use. The use of the internet allows students to find previous question papers, tutorials, and other kind of assisting material which could be used to academically improve and increase learning.

Use of projectors: A projector or image projector is an optical device that projects an image. Pictorial view is easy to memorise than words. The use of projector is one of aid in learning. There are number of well-known institute during power point presentation are use projectors in order to keep the learning interactive and interesting. Use of this technology helps to motivate students to learn.

Use of digital footprint: In digital education digital media play important role. Their enrolment in education sector helps to increase digital power. Students accesses more application that helps to learning.

Online course with the use of technology: Online course now have become a very common phenomenon. There are number of online courses run through swayam by CEC, AICET, UGC,

NPTEL, NCERT, IGNOUIIMB, and NITTTR. People wish to take up online courses for their learning and certifications. Online course or degree scenario is more famous among the students and faculty.

Impact of ICT in education

In education factors, ICT benefit for improves relevance and quality of education. Tinio (2002) clam that ICT has a tremendous impact on education in terms of acquisition and absorption of knowledge to both teachers and students through the promotion of: ICT tools help for the calculation and analysis of information obtained for examination. Students' performance report are all being computerized and made easily available for inquiry. ICT promotes learner engagement as learners choose what to learn at their own pace and work on real life situations' problems. ICT encourages interaction and cooperation among students, teachers regardless of distance which is between them. It also provides students the chance to work with people from different cultures and working together in groups, hence help students to enhance their communicative skills as well as their global awareness. ICT promotes the manipulation of existing information and to create one's own knowledge to produce a tangible product or a given instructional purpose. ICT promotes an integrative approach to teaching and learning, by eliminating the synthetic separation between theory and practice unlike in the traditional classroom where emphasis encloses just a particular aspect. Use of ICT for learning is student-centred and provides useful feedback through various interactive features.

E-learning: It is a learning program that makes use of an information network- such as the internet, an intranet (LAN) or extranet (WAN) whether wholly or in part, for course delivery, interaction, and/or facilitation. Tinio (2002) stated that web-based learning is a subset of e learning and refers to learning using an internet browser such as the model, blackboard, or internet explorer.

Blended Learning: It refers to learning models that combines the face-to-face classroom practice with e-learning solutions.

www: The www stands for world wide web which is one of the most important and widely accepted services (like IRC, E-mail etc.) of the Internet. According to Dennis P. Curtin (2002): - “Web is a series of interconnected documents stored on computer sites or websites.”

Constructivism: is a paradigm of learning that assumes learning as a process individuals ‘’construct’’ meaning or new knowledge based on their prior knowledge and experience (Johassen, 1991).

Group discussion: Internet Relay Chat (IRC) is among the popular Internet service people mostly use for live chatting. Group of people with common interest can exchange views / opinions with each other instantly through Internet. Description of the internet technologies required to support education via ICTs (www, video conference, Tele-Conference, Mobile Conference, CD Database, Word-Processor, Intranet, and Internet etc.)

E-modules: Modules written are converted and stored into digital version into a computer using word processor accessible by the user through internet.

Power point presentation, different software, 3D visualization tools, What apps, Telegram, digital camera are sources for teachers. These sources are useful to student to grasp critical concepts very easily.

Decision Support System (DSS): DSS are software products that transform operational data into useful information such as statistical models and trend analysis for used by the management for decision-making.

Graphics: Text and graphics are the basic components of multimedia systems. Text without graphics will fail to retain person’s attention as well as long-term retention.

Tele-conferencing:

Audio – Conferencing: It involves the live (real -time) exchange of voice messages over a telephone network when low – band width text and still images such as graphs, diagrams or picture can also be exchanged along with voice messages, then this type of conferencing is called audio-graphic. Non-moving visuals are added using a computer keyboard or by drawing / writing on graphics tablet or whiteboard.

Video – Conferencing: Video Conferencing allows the exchange not just of voice and graphics but also of moving images. Video-Conferencing technology does not use telephone lines but either a satellite link or television network (broadcast / cable).

Zoom: It is video telephony and online chat service through a cloud-based peer-to-peer software platform and is used for teleconferencing, telecommuting distance education, and social relations.

Google meet: It is a video conferencing app. It supports far more participants.

Go To Meeting: It is an online meeting, desktop sharing, and video conferencing software. It supports more than hundred participants.

Edmodo: It gives teachers the tools to share engaging lesson, keep parent update, and build a vibrant classroom community. This type of tools dominantly used in school education.

Google Classroom: It is a free web service designed for students assignments. Google Classroom helps the learning process becomes extremely easy and is streamlined by way of sharing files between teachers and students. Here the students can post their queries on the lessons taught in the classroom and receive answers from teacher. Teacher can also post study materials for students to review at home.

Seesaw: It is creative tools. Students increase their creativity by using such tools.

Epathshala: It is initiated by the Ministry of Human Resource Development and National Council of Educational Research and Training was launched in November 2015. Epathshala is a gigantic educational reserve that hosts resources for teacher, students, parents, researchers and educators which is available on multiple platform such as Web, Android, IOS and windos platforms.

Web – Based Conferencing: Web-based conferencing as the name implies, involves the transmission of text and graphic, audio, and visual media via the internet; it requires the use of a computer with a browser and communication can be both synchronous and asynchronous.

Open and Distance Learning: All these services availed through ICT plays a great role in teacher education. It allows higher participation and greater interaction. It also improves the quality of education by facilitating learning by doing, directed instruction, self-learning, problem solving, information seeking, and analysis and critical thinking as well as the ability to communicate, collaborate and learn.

By using modern technology there are some advantages such as: It make more thrilled to learn, use this technology in any time in anywhere during busy schedules, develop technological skill by using such technology but some disadvantages are reduce thinking ability, reduce writing skills, time consuming, lack of internet facility, poor connection of internet in rural area, costly to install such technology, trained people must be necessary and finally develop health issues.

Conclusion:

It concludes that the quality of teaching-learning will be enhanced. A well-designed teacher training program is essential to meet the demand of today's teachers who want to learn how to use ICT effectively for their teaching. It is essential that the police maker think about its cost and its impact. It is also provided firm and stable internet facility.

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EFFECT OF MOBILE ELECTROMAGNETIC RADIATION ON HUMAN HEALTH

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Abstract:

Impact of mobile electromagnetic (EM) radiation on human health study was conducted in the different locations of Palus, Palus colony, Palus College campus and surrounding towns like, Kundal village, Savlaj and Shivaji University Kolhapur campus in the year 2017 – 2018. We used questionnaire method for data collection along with electromagnetic radiation detector machine for measuring handset EM radiation. Electromagnetic radiations emitted from mobile phones always accompanied by the issues of health for human. Earlier research studies show no evidence of the impacts of mobile phones to human health. However new research shows that biological effects are possible with warming of tissues which impose of the current radiation exposure levels. The mean value of EM radiation emitted from different locations is as follows, Palus 13.26 µ, Palus colony is 6.97 µ, Palus College campus 11.007 µ, Kundal 8.59 µ, Savlaj 11.33 µ and Kolhapur University campus is 5.72 µ respectively. Present survey report shows that varied EM radiation emitted from mobile causes many health problems. Out of 383 observations 81 persons suffering from headache, 91 fellows eye irritation, 30 persons hearing problems and 6 persons feeling hand set heat sensations. Present studiy suggest that mobile radiation might be risk for developing various health hazards for instance hearing problems, eye irritations, headache and heat sensations around the ear. Reducing the numbers of calls and messages, decreasing the duration of calls, using earphones, keeping the phone away from the head and body and similar precautions might decrease the frequencies or prevalence of the symptoms. Present study report suggests that practicing some of the safe mobile phone use habits and with moderate use can lead to minimize the health hazards from the radiations of mobile phones.

Keywords: Mobile Phones, EM Radiation, Health Problems

Introduction:

Today mobile phones have become very much a part of our way of life. Around the world mobile phones were introduced for the convenient communication. The number of mobile users is increasing as the time passes and the technology keeps on evolving to meet the

requirement of higher data rates than the previous generation. Mobile phones to communicate with one another at work, at home or for convenience from just about anywhere we are. Mobile phone subscriptions have grown at very fast pace in the last 20 years. It has penetrated over 70% of the population across the globe. India has also witnessed of this growth and has approximately 1,049.74 million wireless connections today. Millions of people around the world use mobile phones as a communication tool every day. Due to that, base stations or telecommunication towers are continuously being erected. Because of this, scientists worldwide are concerned about the potential health risks associated with the use of this device. Even small adverse effects on health could have major public health implications. The term 'radiation' often conjures fear and scare. A tremendous amount of publicity generated in the mass media has also caused great concern among members of the public. Most of the people are not aware of Mobile Phone and Cell Tower Radiations which are very harmful due to electromagnetic radiation (EMR) exposure. The microwave mobile communication systems include the TV, FM and AM broadcasting station which use large amount of power to transmit the signals at a greater amount of distance. The radiations from BTS as well as mobile handsets moves invisibly through human body and plays havoc on its biochemistry. A large number of studies have been done related to exposure to EM radiations which suggests increased risk of many diseases like Alzheimer, heart diseases, miscarriage, brain tumors, leukemia, stress, fatigue, depression, memory loss, sleep disorders, DNA damage, hormonal imbalance, etc. There are several reports or studies on impact of mobile radiation on human body/health for instance, Mitra *et al.* (2014) have reported that electromagnetic radiation emitted from mobile phone increase blood pressure, heart rate, respiration rate, and body temperature in all age group peoples at North east Kolkata, west Bengal, India. Fatma *et al.* (2011) have documented number of negative health effects in the form of influencing on the heart and circulatory system at Madhya Pradesh. Keykhosravi *et al.* (2018) have been proven effect of mobile phone radiation on DNA and animals, but a few studies were carried-out about skin diseases in mobile phone and tablet uses. According to the vision council more than a third of U.S. adults eyes reported spending 4-6 hrs a day with digital media symptoms of digital eye strain include eye redness, irritation, dry eyes, blurred vision, back pain, neck pain and headaches. Naeem (2014) observed an increased risk of traffic accidents about 3-4 times greater chances of an accident, while mobile phones are used while driving due to distraction. Children have the potential to be at greater risk than adults for developing brain cancer from cell phones. The main aim of this project work is to know whether mobile phone and base station towers emitted EM radiation effects on human health or not in

Palus and around the Palus localities. Before going to start the survey we should known the few basic information regarding radiation, frequency, effect of radiation, dependency of radiation and Specific Absorption Rate (SAR).

Radiation:

Radiation is a form of energy on the move. Radiation is electromagnetic in nature, *i.e.* it consists of waves of electric and magnetic energy moving together through space at the speed of light. We live in a radiation world and are exposed to both natural and man-made radiation. Every second of our life, we are exposed to all forms of radiation such as ultraviolet light from the sun and radio waves from radio and television broadcasts. When we go for a chest x-ray examination, we are exposed to x-rays.

There are two types of radiation:

Ionizing Radiation (IR): It contains enough energy to cause ionization. Ionization is a process by which electrons are stripped from atoms and molecules. Its interaction with matter can change chemical reactions in the body that leads to damage in biological tissues including effects on DNA **(**deoxyribonucleic acid**)** – the genetic material Gamma rays and x-rays are two forms of ionizing radiation.

Non-ionizing Radiation (NIR): It does not have sufficient energy to cause ionization in living matter. It causes some heating effect, but usually not enough to cause any kind of long-term damage to tissues. Radiofrequency energy, visible light and microwave radiation are considered non-ionizing.

Radiations from mobile phone handsets:

EM radiations from mobile handsets are within limits and are about 1W. It operates within prescribed Specific Absorption Rate (SAR) which gives the amount of radio waves absorbed by body tissues while using mobile phones. SAR is defined as the rate at which energy is absorbed by human body when exposed to electromagnetic frequency (EMF). It expresses the power absorbed per mass of tissue and their unit is Watts per Kilogram (W/Kg). In areas of low coverage and low field strength, the prescribed values of SAR can be reached. Exposure from other antennas located in the area. However, it does not consider the specific transmission properties of each mobile handset. It shows only the maximum value and does not indicate the actual or average value. Although SAR is an important value to compare the maximum exposure to EM radiation but does not have sufficient information about practical EM exposure for reliable comparison of individual mobile phone handset models. The radiations from BTS as well as mobile handsets moves invisibly through human body and plays havoc on its biochemistry.

Radiation Behaves: Radiation behaves in the same manner as light. It travels in a straight line and when it collides with an object, it can do three things it can pass right through (transmission), it can bounce off (reflection), and it can be absorbed. It readily reduces its energy as it moves away from its source where radiation is produced. This means that a person will receive less exposure if he / she stays indoors compared to staying outside or keep a distance compared to standing close to the source.

Electro Magnetic (EM) radiation depends on the following:

There are several factors influencing the mobile and base station radiations. Few of them are highlighted here, Frequency / wavelength of RF signal being transmitted, radio frequency power radiated from the antenna, duration of exposure of RF signal at a given distance from the antenna, exposure from other antennas located in the area, duration/ frequency of recurrent exposure, local temperature and humidity.

Frequency:

Frequency is measured in Hertz (Hz)

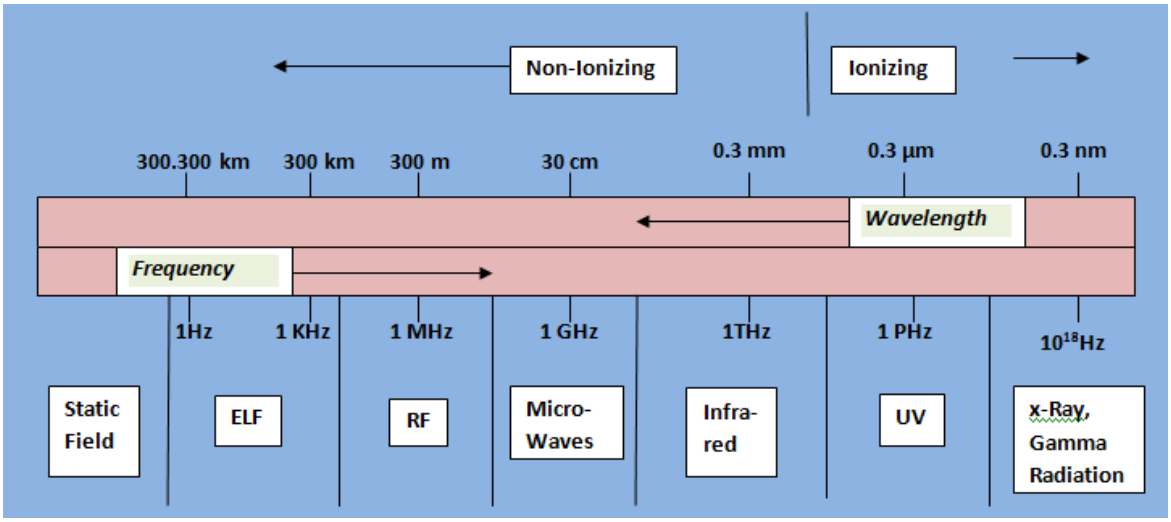
1 Hz = 1 cycle per second

kHz = kilohertz = 1000 Hz

MHz = megahertz = 1000 000 Hz

GHz = gigahertz = 1000 000 000 Hz

Example: **Source: Frequency:** Power line 50 Hz and Mobile phone 900 MHz



Electromagnetic Frequency spectrum

Radiofrequency (RF) radiation: RF radiation can cause the heating of tissues that leads to an increase in the body temperature. This is known as the thermal effect. Although the body has its

effective ways of regulating its temperature, nevertheless, if the RF exposures are too high, the body may no longer be able to cope. There is some discussion about other effects caused by RF radiation other than by thermal effect. At the moment, there are insufficient and inconclusive scientific findings to prove any adverse health effects caused by RF radiation.

Materials and Methods:

A mixed methods approach was employed to explore the research problem. Prepared standard questioner for collecting relevant and appropriate data including name of mobile user, type of hand set, age of user, purpose of use, microwave emission of hand set, location of data collection and any health problems arises from mobile radiation. In this study all age group persons were considered. Quantitative and qualitative data was collected through questionnaires and also by personal interview method. The electromagnetic radiation tester AEOSS 488 Dosimeter Detector was use for measuring EM radiation emitted by mobile phones. Different locations were selected for to know the variation in radiation frequencies of mobiles, range problems, their effect on health. Most of the people are using mobile phones while driving the two wheelers, four wheelers and heavy vehicles and it has been leading to the major and minor accidents on roads. Present day maximum usage of mobile phones by children for video games, Youtube, online classes and cartoons. The quality of EM radiation released from the mobile towers from different localities was also recorded.

Results:

Mobile phones have been in extensive use for a relatively short period of time, and their technology has progressively changed, from analogue to digital systems. Mobile phones and base stations emit radio frequency or microwave radiation. Exposure to such a radiation could affect health directly. The use of mobile phones also results in indirect effects, such as car accidents and interference with health equipment. Electromagnetic radiation emission of mobile phones was recorded by using electromagnetic radiation detector machine. The mean value of EM radiation emitted from mobile phones in different locations is as follows, Palus 13.26 µt, Palus colony is 6.97 µt, Palus College campus 11.007 µt, Kundal 8.59 µt, Savlaj 11.33 µt and Kolhapur University campus is 5.72 µt respectively (Table 1; Fig. 1). Different health problems noticed from mobile users at different location are recorded (Fig. 2). In Palus 2 persons feeling headache and 6 persons suffering from eye irritations out of 27 mobile users (Table 1 & 2; Fig. 4). Similarly in Palus colony 6 mobile users noticed headache and 7 people feeling eye irritation out of 21 mobile users (Table 1 & 2; Fig. 5). Out of 143 mobile users at Palus College campus 19

students noticed headache, 27 people feeling eye irritation and 2 student's heat sensations from handsets (Table 1 & 2; Fig. 6). We have interviewed more than 47 mobile users from Kundal village. It is 5 km away from Palus College regarding electromagnetic radiation effect on human health among them 9 users feeling headache, 27 persons noticed eye irritations and 2 students sensed about handset heat sensations (Table 1 & 2; Fig. 7). We have collected the information from 20 students of Savlaj College. It is 45 km away from Palus towards east among 5 students noticed headache, 11 students feeling eye irritations and one student have an ear pain feeling (Table 1 & 2; Fig. 8). Similarly, our team went to Shivaji University Kolhapur campus and met more than 105 students and collected the relevant data from them. Out of 105 student's 40 students feeling headache, 27 students sensed eye irritations and 29 students noticed hearing problems (Table 1 & 2; Fig. 9). Present survey report shows that out of 383 mobile users are feeling following health problems such as, 81 persons suffering from headache, 91 from eye irritation, 30 persons hearing problems and 6 persons feeling hand set heat sensations (Table 2; Fig. 2 & 3).

Table 1: Data of electromagnetic radiation emitted by cell phone in different locations and their effect on human health

Sr. No.	Location	Frequency mean µT	Health Problems	No. of Observations
1.	Palus	13.26	Headache – 2 Eye irritation – 6	27
2.	Palus colony	6.94	Headache – 6 Eye irritation – 7	21
3.	Palus college campus	11.007	Headache – 19 Eye irritation – 27 Heat sensation – 2	143
4.	Kundal	8.59	Headache – 9 Eye irritation – 12 Heat sensation – 4	47
5.	Savlaj	11.328	Headache – 5 Eye irritation – 11 Ear pain - 1	20
6.	Kolhapur	5.72	Headache – 40 Eye irritation – 27 Hearing problem - 29	105
				383

Table 2: Mobile Electromagnetic radiation effect on human health

Headache	Eye Irritation	Hearing problems	Heat sensation
81	90	30	6

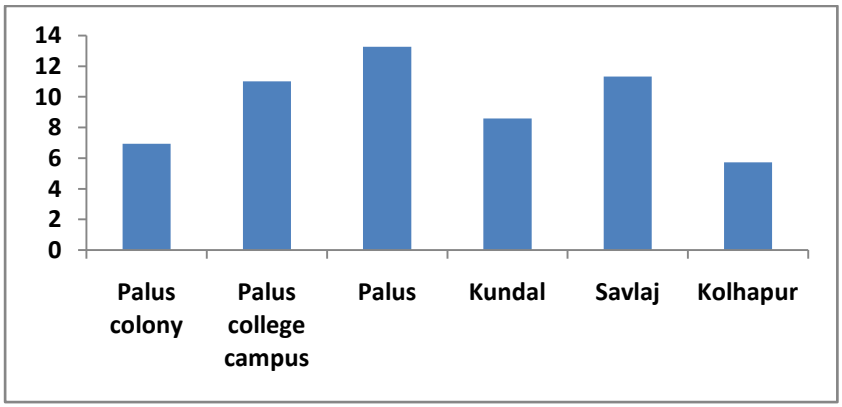


Figure 1: Mobile electromagnetic radiation emitted at different locations

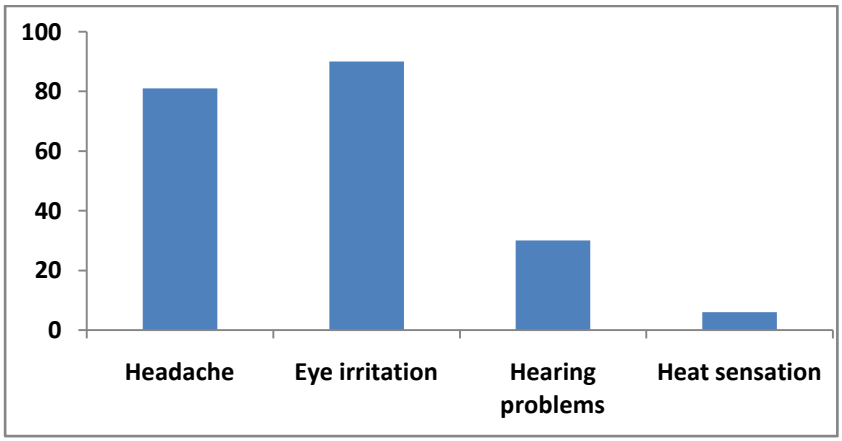


Figure 2: Mobile electromagnetic radiation effect on human health at different locations

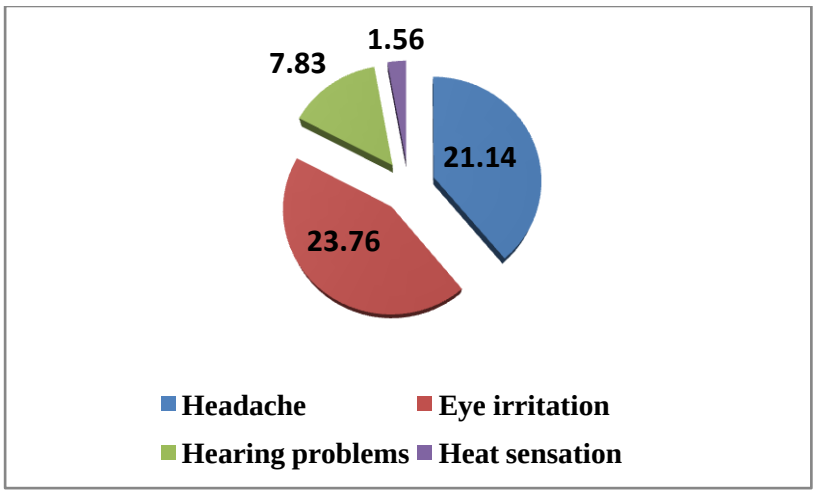


Figure 3: Percentage of mobile phone users feeling following health problems

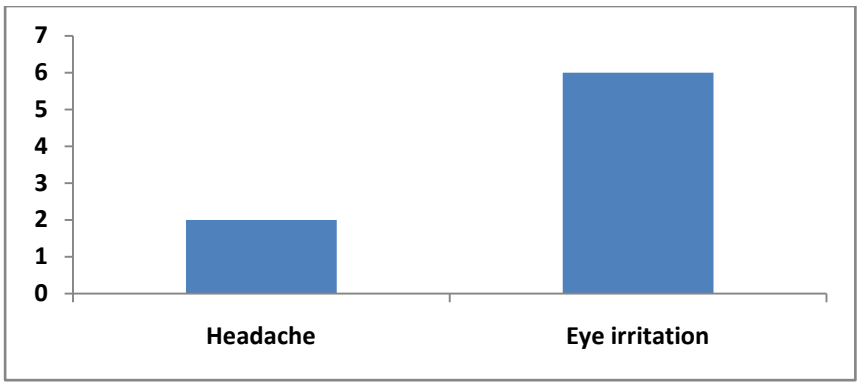


Figure 4: Mobile electromagnetic radiation Effect on Human Health at Palus

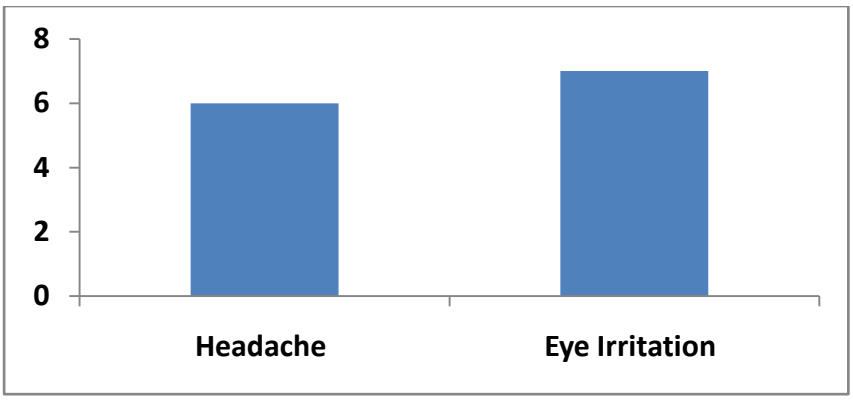


Figure 5: Mobile electromagnetic radiation Effect on Human Health at Palus Colony

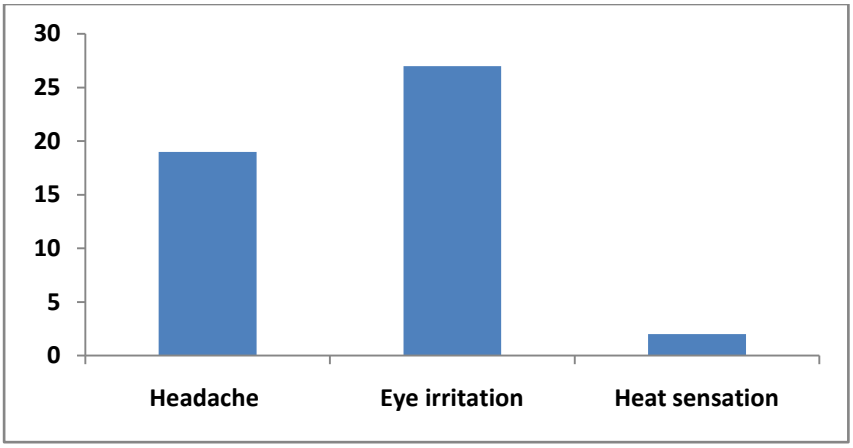


Figure 6: Mobile electromagnetic radiation Effect on Human Health at Palus College Campus

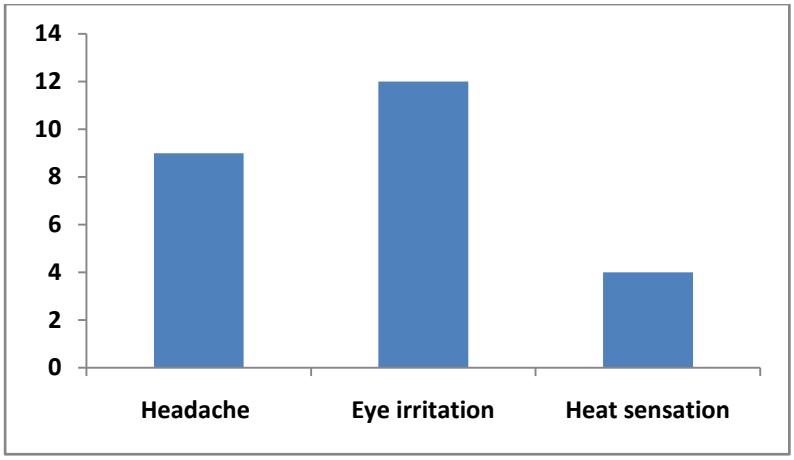


Figure 7: Mobile electromagnetic radiation Effect on Human Health at Kundal

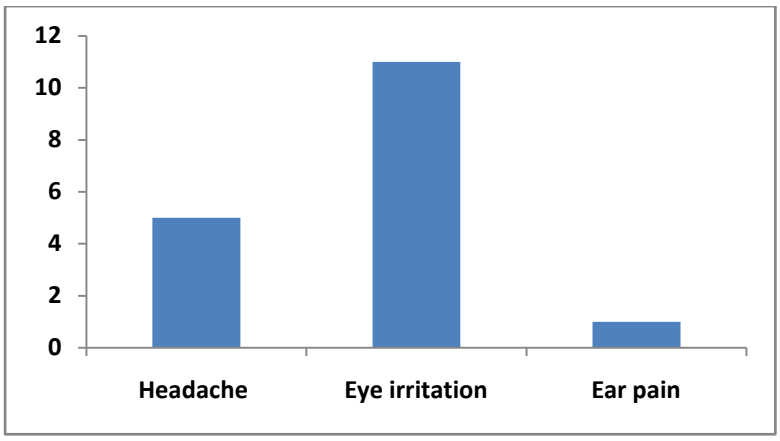


Figure 8: Mobile electromagnetic radiation Effect on Human Health at Savlaj

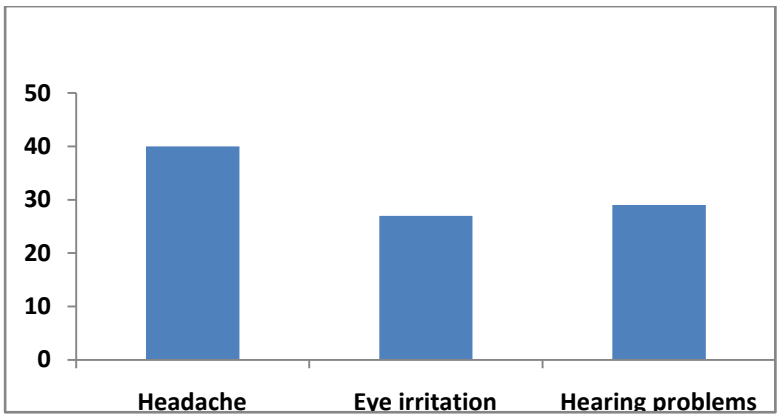


Figure 9: Mobile electromagnetic radiation Effect on Human Health at Kolhapur

Discussion:

The mobile phones, being a very new invention of humanity, became an inherent part of human's life. The smart phone combines different sophisticated features. It allows users to keep

pictures, memories, personal info, correspondence, health and financial data in one place. Smart phones also became an integral part of modern telecommunications facilities.

Figure 10a: Two wheeler rider using mobile while driving

Figure 10b: Children using mobile for playing video games with high brightness screen

In some regions of the world, they are the most reliable or only of available phones. The phones allow people to maintain continuous communication without interruption of their movements and distances. Smart phones and mobile phones combine advanced computing capability, such as internet communication, information retrieval, video, e-commerce and other feature, which make the device, is one of the necessities for many people. “Mass cell phone mobilization” covered humanity probably ten or fifteen years ago. The growing number of mobile phones and phone owners raises a concern about phones’ effect on human health and life. A world-wide popularization of mobile phones and a little knowledge about their side effects triggered us to start research on effects of mobile phones on human health and life. The radiations from BTS as well as mobile handsets moves invisibly through human body and plays havoc on its biochemistry. A large number of studies have been done related to exposure of mobile radiations causes many health risks like, Alzheimer, heart diseases, miscarriage, brain tumors, leukemia, stress, fatigue, depression, memory loss, sleep disorders, DNA damage and hormonal imbalance.

Present results show that different mobile phones emit different Electromagnetic radiation in different locations. The mean value of EM radiation emitted from different mobiles at locations are as follows, Palus 13.26 µt, Palus colony 6.97t µ, Palus College campus 11.007 µt, Kundal 8.59 µt, Savlaj 11.33 µt and Kolhapur University campus 5.72 µt respectively. High radiation is recorded at Palus, college campus and Savlaj village this result may be due to the less number of base stations, poor connectivity, fluctuations in frequency and local weather conditions. These radiations might be much harmful on human body. Meanwhile Palus colony and Kundal village has lesser radiations compared to Palus and Palus college campus. The lowest radiation is recorded in the Shivaji University Kolhapur campus. The campus has

sufficient number of base stations, good range and best connectivity which will not be much harmful on human body. Even though, 40 students feeling headache, 27 students sensed eye irritations and 29 students noticed hearing problems at Shivaji University Kolhapur campus. Present survey report shows that out of 383 mobile users are feeling following health problems such as, 81 (21.14%) persons suffering from headache, 91 (23.76%) from eye irritation, 30 (7.83%) persons hearing problems and 6 (1.56%) mobile users feeling hand set heat sensations. More than 21% and 1.56% of mobile users are feeling various level of headache and hand set heat sensation around the ear problems in the present study. These health problems were associated with the duration of the phone calls used per day and may be related to low signals, low quality handsets. High quality digital mobile phones showed a lower risk for sensations of warmth on the ear and partly for fatigue and headache. Kamiya *et al.* (2012) reported that tissues and cells that compose the human body have different radiation sensitivity and symptoms appear in order from radiosensitive tissues. Youssef *et al.* (2016) study indicated that high frequency of mobile phone use could be a risk factor for ear disease among medical students of Saudi Arabia. Al-Khlaiwi and Mco (2004) have been observed more than 44.4% of participants related common health complaints such as headache, trouble concentrating, memory loss, hearing loss, and fatigue to their mobile use at Saudi Arabia. Durusoy *et al.* (2017) found an association between mobile phone use and especially headache, concentration difficulties, fatigue, sleep disturbances and warming of the ear showing also dose-response. The clinical symptoms of acute disorder begin with a decrease in lymphocytes and then the symptoms appear such as alopecia, skin erythema, hematopoietic damage, gastrointestinal damage and central nervous system damage with increasing radiation dose. Similarly, Saurabh Sharma noted, “A mobile is an e-toy designed for the lonely inner child hidden in each and every one of us.” By conducting this research, the author tried to bring attention to potential risks that cell phones can cause to the users and provide some solutions how to mitigate side-effects of cell phones and mobile devices on the users by limiting cell phones and handheld devices usage or with special physical exercises. The advancements of modern technology, particularly, handheld devices (HHD) are tremendous. However, prolonged use of devices may cause symptoms of the musculoskeletal disorders, thumb, and neck. Given that more studies should be done to create awareness among cell phone users about the seriousness of this matter. World Health Organization (WHO) report reveals that the evidence available does not provide a clear pattern to support an association between exposure to RF and microwave radiation from mobile phones and direct effects on health. At the moment, it is impossible to state that exposure to RF or microwave radiation does not have adverse effects on the health of the general population. The current evidence, however, does suggest that if there is a risk, it is very small. Finally, evidence shows that the use of a mobile phone while driving translates into a significantly increased risk of a traffic accident.

Conclusion:

Steven Spielberg said "Technology can be our best friend, and technology can also be the biggest party pooper of our lives. It interrupts our story, interrupts our ability to have a thought or a daydream, to imagine something wonderful, because we are too busy bridging the walk from the cafeteria back to the office on the cell phone". Mobile devices became an integral part of the most people live. The influence of cell phones and their effects on human health are still being tested and studied. There is no one single opinion if cell phones bring harm to human's health. However, addiction and huge reliance on cell phones carry some risks on human development and health. The risks are emotional, physical, social and psychological. Present day situation giving mobile phones to their kids is a prestigious issue in parents. Many of children using mobile phones for playing video games, seeing cartoon through Youtubes, these activities may cause effect on children health. However, the scientific evidence does not show a danger to mobile phone users, including children and teenagers (Fig. 10a). If you want to take steps to lower the exposure to electromagnetic radiation, the measures described above could also apply to children and teenagers. Reducing the time of mobile phone use and increasing the distance between the user and the RF radiation source will reduce the RF radiation exposure. The United Kingdom government recommended that limiting the use of mobile phones by children as a precautionary measure. To avoid potential risks, some simple steps can be employed to minimize exposure and effects of RF radiation.

Prevention or precautions from mobile use:

Keep always conversations short: the less you talk on your mobile phone, the less exposure to radiation you will have. If long conversations by mobile phone must be conducted on daily basis then distance should be placed between the body and the source of the EM radiations, which will help in minimizing the exposure level. Use speaker phone function of the cell phone: for the same reason you'd use an air-tube headset, suing a speaker phone is another very good option. It keeps the mobile phone away from your body. Wait for call connection: when making a call, wait for the call to connect before placing the phone next to the ear. The phone emits the most intense radiation during the initial connection, and then lowers its power once a connection is established. Avoid using your cell phone in places where you get a poor signal: these scenarios cause mobile phones to increase their transmitting power in an attempt to connect to the nearest cell tower. You get more radiation and your battery drains faster under these conditions. Text, e-mail or use the net more than talking on your phone whenever it's possible. Use a radiation blocking case or defender shield case Devices marketed under Cell / Wave Guard were found to reduce a significant amount of radio frequency emissions could be used to prevent these emissions from entering the body. Turn your cell phone off when you are

not using it and in night. Limit kids cell phone use time: Children should only use cell phones for emergencies or strictly in speaker mode at a safe distance. A child's body is still developing and cell phone radiation penetrates a child's brain more deeply than an adult. Avoid using your cell phone inside spaces that are surrounded by metal like a car, elevator, bus, train or airplane

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DESIGN OF HIGH-SPEED FULL ADDER ARCHITECURE FOR IMAGE COMPRESSION APPLICATIONS

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Abstract:

Static and dynamic logic are used in integrated circuits (ICs) to increase efficiency and scalability. This paper introduces pseudodynamic logic (PDL), a modern circuit design technique design technique that combines the benefits of static and dynamic cells. The proposed full-adder with 14 transistors is used to test the PDL. The complete adder is designed for PDL. The two networks are adjusted into an alternate setup, limiting the quantity of semiconductors and interior hubs, and buoy procedures are joined. Post-format re-enactments and advanced picture expansion were utilized to survey the cell's usefulness in a true environment. A high-speed adder using PDL is designed specifically for image enhancement and retrieval application.

Keywords: Pseudo-dynamic logic (PDL); Full adder; Pixel recognition; Image enhancement; Power delay product.

Introduction:

High power consumption in a chip may lead to malfunctioning and ageing [1].Sorting, comparing, subtracting, multiplying, and dividing data are all performed by the arithmetic logic Unit (ALU) in electronic chips [2, 3]. Since addition is the most fundamental of the four main operators, researchers and designers have created a variety of complete circuits of adder. A adder consists of three inputs A, B, and Cin (convey input touch), and yields 2 qualities: Sum and Cout (Carry yield bit). Carbon nanotube field impact semiconductor (CNTFET) [4] innovation and expected procedure [5] were introduced to limit power utilization in static complete adders. The unique full adders have included quick exchanging, no static force utilization, going full speed ahead yields, and less semiconductors are only a couple of the advantages. [6]. Two separate circuits with

40 semiconductors were utilized to deliver Sum and C_{out} in a unique differential course voltage switch (DDCVS) complete viper executed in [13], yet the huge number of interior hubs

and capacitances made the plan troublesome. Two distinct circuits run simultaneously in multi yield blended dynamic/static (MOMDS) [7, 8] and the DDCVS' six inverters increment the quantity of yields. Zipper corresponding metal-oxide-semiconductor [14] is a two-stage dynamic full snake with the principal stage utilizing NP CMOS to get away from direct ways from the inventory (VDD) to the ground (GND) [9, 12].

To stop charge sharing and improper usefulness, the subsequent stage utilizes scaffold engineering, yet this presents idleness and force utilization. At the point when all data sources are 1, MMODL [10] experiences since an immediate way the VDD to the GND can be shaped, permitting the Sum to undergo metastable state. The standard static CMOS full adder [11, 15] has 28 transistors which has high power consumption.

Regardless of the way that VDD and GND have going all out and stable yields, they similarly eat up a huge load of energy [16]. Six full snake cells reliant upon move semiconductor reasoning (PTL) XOR-XNOR doorways are imparted in [17, 19] to improve the standard CMOS cell. Notwithstanding the way that domino rationale circuits are indistinguishable from pseudo-unique circuits, they utilize a ton of force and were along these lines prohibited from this examination. In this proposed method, PDL full adder, frequency has firmly associated with a fundamental body of the phone. Some draw up or pull-down semiconductors are dispensed with utilizing this technique, bringing about less inward hubs and lower power utilization when contrasted with dynamic and static cells. To fabricate solid, exact, and little measured circuits, researchers utilize an assortment of rationale ideas, including transmission entryway (TG) [10, 19], door dispersion input (GDI) [18], and pseudo-NMOS [21].

To decrease static force utilization, the two networks in complex circuits are disconnected and advanced utilizing PMOS and NMOS semiconductors, individually. As found in Fig. 1, the recommended PDL is a unique circuit elective that dispenses with two activator semiconductors and associates the clock straightforwardly to the circuit (b). With this game plan, the measure of excess draw up or pull-down semiconductors is altogether diminished, bringing about critical force savings [20]. The proposed PDL cell ought to be a short out on the grounds that NMOS semiconductors are quicker than PMOS semiconductors and there are more NMOS semiconductors in the proposed full viper cell than PMOS semiconductors. The drifting setup significantly diminishes power use in spite of the way that the arranged circuit utilizes both dynamic and static force [22]. The articulation "coast procedure" alludes to a circuit where the VDD and GND are not associated directly [23].

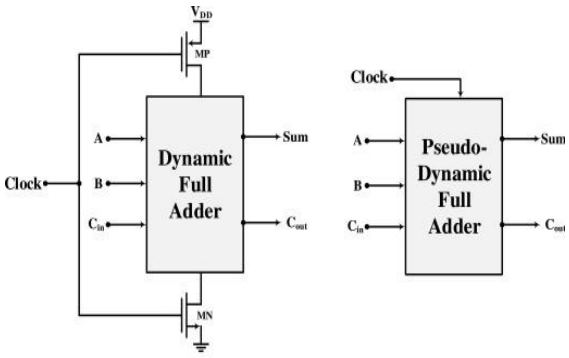


Figure 1: Dynamic full adder circuit

The circuit has two necessary nodes on the inside: A and B, with A serving as the source node. The suggested design is referred to as pseudo-dynamic [25] since the frequency generated to drive M1 and M3 to generate the A signal shown in fig.2. The A signal controls the B node, while the B signal controls the Multiplexer (MUX), which generates the Number. When the frequency is zero, the number of NMOS transistors in the circuit increases.

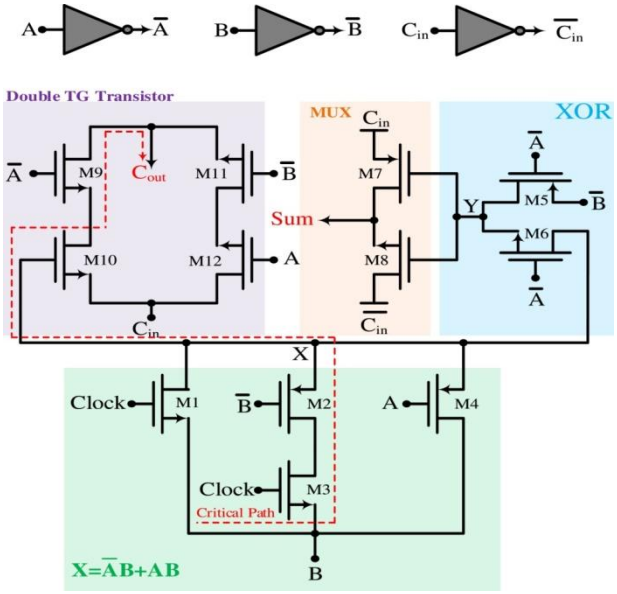


Figure 2: Proposed Full adder circuit

The dynamic power consumption of the proposed circuit is given by,

$P_{dynamic}= \alpha C_L VDD^2 f_{clk}$ (1)

where α is the activity factor and C_L is load capacitance

$C_L=C_{self}+C_{fanout}+C_{wire}$ (2)

Implementation:

The technique is depicted in the diagram below, where we will use an image as input for the procedure to be carried out [20]. The image is then passed to the MATLAB code to obtain the desired results, such as an improved image and quality measurements of the input image, and it is then passed to the HDL, where the input vectors are calculated, and it is then given to the ASIC. The image from the test vectors is sent to the ASIC for analysis, then to MATLAB for output vectors, then back to MATLAB for improved image and quality measurements, and finally to the output vectors [21].

Results and Discussions:

The example data sources and yields of the proposed circuit with yield cushions are appeared in Fig.3. The precision of the proposed pseudo-unique circuit is shown, utilizing these waveforms and Table 1 for the accompanying conditions: VDD=1.5 Volt (V), frequency of 1 GHz and burden capacitance of 1 fF According to (5), the powerful force is influenced by the force source in a quadratic way.

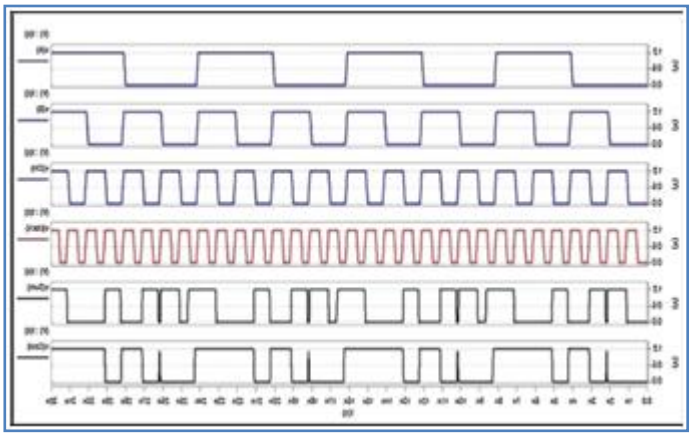


Figure 3: Simulation of proposed full adder

From that point forward, the re-enactment is finished, and the impacts are appeared in Figures (a) and (b). The least outcomes for power utilization against measure contrasts. Besides, NEW-ND-FA, CMOS, and NP-CMOS all burn-through 3 to 5 watts of force, while the proposed cell has the most noteworthy unwavering quality in the previously mentioned scenario[23].

The centre idea of computerized information handling is fundamental, however endeavouring to address it will end up being a critical test. The cycle for unloading computerized information to the PC is as per the following: first, we should import the advanced information, which we will use as info, and afterward the PC will take care of the issue. Since we've

effectively customized the machine to control input information utilizing conditions or arrangement of conditions, at that point save the outcome in the calculation for every pixel of an image[30]. The lone two degrees of versatile difference improvement are low pass separating and upgrade. The utilization of Finite Impulse Response (FIR) or Infinite Impulse Response (IIR) channels to build the difference around edges.

Table 1: Comparison of power and PDP of various styles of full adder design

Designs	Parameters	1	1.2	1.4	1.6
DDCVS	Power	4.28	6.06	8.47	9.42
	PDP	21.13	28.12	42.18	74.1
MOMDS	Power	2.11	2.44	4.71	7.1
	PDP	12.26	24.12	33.21	39.578
NP-CMOS	Power	1.47	2.23	2.25	4.77
	PDP	4.18	4.6	9.44	11.82
MMODL	Power	2.11	3.97	4.44	6.78
	PDP	11.93	19.77	28.51	42.32
NEW-RSD-FA	Power	2.37	4.62	3.43	6.78
	PDP	5.22	6.95	10.72	19.816
NEW-ND-FA	Power	2.1	3.18	4.49	7.324
	PDP	4.36	7.62	10.6	18.72
CMOS	Power	1.83	2.9201	7.65	7.19
	PDP	4.19	6.34	9.346	11.67
Proposed	Power	0.52	0.82	1.23	1.84
	PDP	7.51	4.13	6.95	10.59

The interaction will have a long stack span, which implies it will burn-through more force. Therefore, the proposed innovation's force utilization would be decreased.

The engineering of the PDL-based total snake cell, which depends on TSMC 90 nm innovation, is planned utilizing Cadence Virtuoso programming, as demonstrated in Fig.4. The proposed circuit is 10.64 m wide and 3.24 m tall, with an all out space of 40.05 m^2.

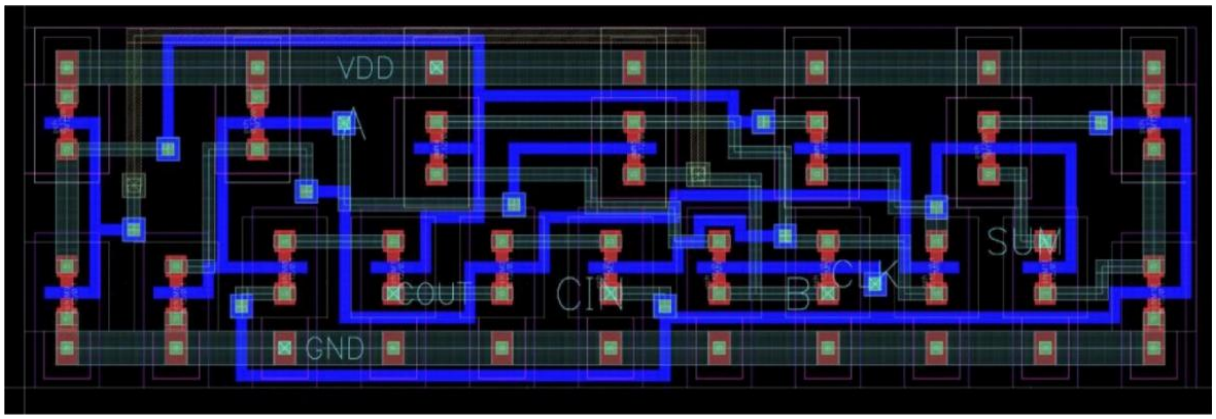


Figure 4: Floorplan view of full adder circuit

The proposed circuit's force utilization and PDP are 3.403 W and 6.13 fJ, separately, in customary mode with a recurrence of 2 GHz and a VDD of 1.4 V shown in fig.4. In the post-format recreation, the cell burns-through 3.48 W of force and has a PDP of 5.67 fJ, showing a 5.64 percent and 5.26 percent distinction in force and PDP between the post-design and ordinary modes, individually.

Table 2: PSNR comparison of existing and proposed logic styles

	PSNR Sum			**Average**			**PSNR C_{out}**	**Average**
Proposed	**31.93**	**32.71**	**32.68**	**30.41**	**33.43**	**36.17**	**34.52**	**35.78**
DDCVS	30.17	31.56	30.42	30.33	29.97	30.53	30.57	30.39
MOMDS	30.14	32.14	30.29	30.29	31.94	29.93	30.43	30.76
NP-CMOS	30.58	31.16	29.58	30.14	30.98	30.15	30.26	30.69
MMODL	30.57	30.23	30.21	29.93	31.04	30.01	30.25	30.66
CMOS	29.49	31.25	30.38	30.21	30.01	30.17	30.29	30.52
PROPOSED	30.33	31.86	30.25	30.14	31.07	30.97	30.30	30.44

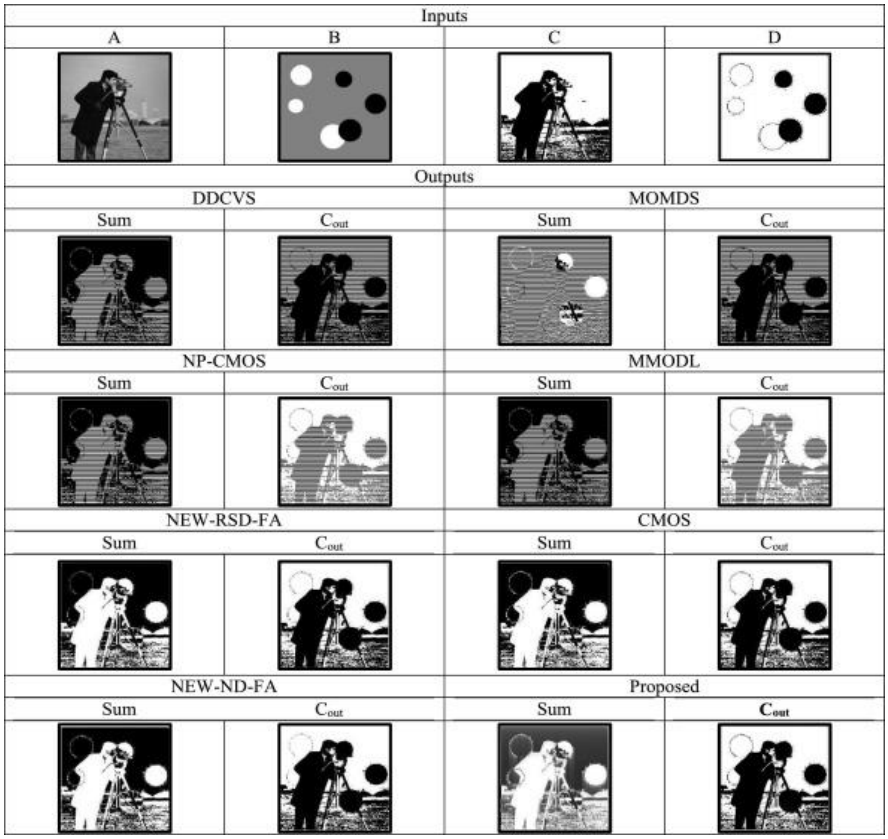
In advanced picture expansion as a utilitarian execution, the entirety of the above plans is differentiated. The circuits are taken care of two dim level pictures as sources of info An and B, which are then changed over into piecewise straight (PWL) advanced signs that can be

deciphered by the circuits utilizing a MATLAB work. From the principal pixel (1 ns) to the last pixel (10 ns), the circuits are re-enacted utilizing HSPICE (62,500 ns).

Some picture handling execution measurements incorporate pinnacle sign to commotion proportion (PSNR), mean square blunder (MSE), and underlying closeness list.

In the arranged circuit, compacted containers are nearest to the Y-hub. Besides, regarding indispensable, the outcomes for the proposed adder are nearer to the A-B tomahawks, implying that the proposed circuit is hearty and decent to PVT varieties.

Table 3: Simulation results of image processing



Conclusion:

Pseudo-powerful rationale is a cutting-edge way to deal with planning incorporated circuits (ICs) that is portrayed in this article (PDL). Another total snake cell with 18 semiconductors is introduced by utilizing the PDL, GDI, TG, and buoy methods. By zeroing in on picture incorporation, the cell is examined in genuine tests utilizing post-design recreation and paired picture preparing applications. An immediate capacity among HSPICE and MATLAB performs consistent review of the cells for both hardware and picture preparing. The outcomes

for picture quality and differentiation are determined utilizing PSNR, MSE, and SSIM, and the incomparability of PSNR, MSE, and SSIM is resolved.

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SECURE FEDERATED LEARNING WITH REAL-WORLD APPLICATIONS IN INDUSTRIES AND TECHNOLOGIES

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Abstract:

Federated learning (FL) brings cooperative intelligence into industries whilst now no longer centralized training facts to boost up the technique of change 4.zero on the edge computing level. Everglade State solves the predicament in the course of which companies need to shape the usage of statistics intelligence with safety concerns. United Learning allows numerous gadgets to discover collaboratively while using a shared version. FL works due to it makes use of the data for your tool. Once accumulated, this fact updates the version. It will totally ship the facts accumulated from that version replace to the cloud. In short, it protects the facts on a non-public tool via way of means of preserving it local. Information regarding Associate in nursing replace to the version is distributed to the cloud. It is useless encrypted conversation to decorate that version's services.

Keywords: Federated learning, Internet of Things, Industry 4.0, deep learning, edge computing

Introduction:

With an increase in technology, there's a serious rise within the information. With this, lots of privacy rules ar presently in impact to safeguard such data. Several organizations have begun utilizing united learning. They train their algorithms on varied knowledgesets whereas not exchanging data.Federated learning aims to secure the information collected through altogether utterly totally different mediums. It additionally keeps important data native.FL is additionally a resolution that permits on-device machine learning whereas not transferring the user's personal data to a central cloud. Hence, united learning will facilitate succeed personalization. Likewise as enhance the performance of devices in IoT applications. Though business four 0 was planned in 2013 and internet of Things (IoT) is being wide applied in mobile services. There ar few reports on applying large-scale data and deep learning (DL) to implement large-scale enterprise

intelligence. One in each of the explanations is lack of machine learning (ML) approaches which may manufacture distributed learning offered whereas not infringing the user's data privacy. Clearly, province trains a model by enabling the individual devices to act as native learners and send native model parameters to a federal server rather than coaching data. This offers a transparent advantage in terms of privacyoriented industrial applications. Another key advantage is that province doesn't would adore massive data-sets to be rapt to a central repository (edge/cloud), it avoids famous issues associated with the sink node congestion/overloading. Another advantage of yank state is to convey little or no and medium-sized enterprise (SMEs) a chance to create full use of intelligence, which will be lack of monumental sets {of data|of data|of knowledge} and lots of desirous to apply province into leveling information intelligence and proprietary for promoting innovation and enhancing fight.

Big data and Edge-Computing Trend

Today, associate large form of connected devices like mobile devices, wearables, and autonomous vehicles generate large amounts of information (Big Data). due to the invasive methodology power of those devices, beside privacy issues, there's associate increasing have to be compelled to be compelled to store and technique data domestically – pushing the computation from the cloud to the sting.Artificial Intelligence (AI) is required to leverage the worth of big Data: Deep Learning has been shown to be terribly effective in learning from advanced data. As associate example, deep learning architectures unit ready to trounce humans once recognizing footage from the favored ImageNet dataset.

Edge Computing became the new paradigm, enabling the adoption of computation-intense applications. Edge Intelligence or Edge AI is additionally a combination of AI and Edge Computing; it permits the preparation of machine learning algorithms to the sting device wherever the information is generated. Most ideas of Edge Intelligence typically think about the reasoning 0.5 (running the AI model) and assume that the coaching of the AI model is performed in cloud data centers, primarily due to the high resource consumption of the coaching 0.5. However, the growing methodology capabilities and storage of connected edge devices modify ways for distributed coaching of machine learning models.

Need for Privacy-Preserving Deep Learning

Traditional tool mastering strategies want to be pressured to mix all knowledge at one location, commonly a cloud statistics center, which could violate the felony pointers on client privacy aNd statistics confidentiality. A primary example is that the European Union's General knowledge Protection Regulation (GDPR). united mastering is an developing approach to

preserve privacy as quickly as schooling the Deep Neural Network Model supported statistics originated thru manner of manner of a couple of clients. United tool mastering addresses this disadvantage with solutions combining allotted tool mastering, cryptography and security, and incentive mechanism style based totally mostly on financial thoughts and exercise theory. Therefore, united mastering could probably become the foundation of next-era tool mastering that caters to technological and social desires for accountable AI development and utility.

FL has one in every of a type use cases, with lots of assessment concerning FL's applications, one example being withinside the care sector. Unfortunately, there are nevertheless some crucial obstacles for FL to be in reality covered in possibility settings, especially regarding the statistics. However, even the facts itself can display difficult to deal with due to there may be frequently masses of variety at periods the statistics, admire contents, structure, and file-formats. Additionally, the concept of integrative streams of sensitive statistics over to high school companies has tried to be relatively unpopular with the United States. In step with Massachusetts Institute of Technology engineering professor Ramesh Raskar, the sort amongst statistics privacy and therefore the advantages of mistreatment that statistics on thereforeciety is false. The reasoning is that we're capable of supply home the bacon each utility and privacy, so troubles concerning privacy are frequently lessened.

Interestingly, Blockchain technology gives a risk to deal with the higher than worrying conditions of FL. a number of precisely, through the combinationture of chain structure, tree structure, and graph structure, the Blockchain ensures constant storage and knowledge traceability. Besides, through the accord mechanism of proof-of-work (POW), Blockchain notices the untamperability of statistics. in more detail, manner to the validation method of Blockchain neighborhood schooling results, the planned BCFL framework will avoid the only reason of failure (SPOF) and amplify its federation scope to untrusted clients withinside the public network. In addition, thru manner of manner of offering rewards proportional to the size of the education samples, BCFL can understand effective incentives and so facilitate the union of a number of devices with an outsized type of schooling samples. Therefore, the Blockchain are frequently seen as a certainly ideal complement for FL, offering it with improved interoperability, privacy, security, reliability, and scalability.

Although numerous papers contain completely distinctive factors of the BCFL paradigm, there may be no systematic research in this paradigm. Throughout this article, we generally tend to present a survey on a latest paradigm for integration Blockchain and American country. This survey denotes the sort of synthesis of Blockchain and FL as Blockchain-primarily based totally federate getting to know (BCFL) framework. To gift an entire picture of BCFL-associated

studies, we surveyed the related works focusing on shape design, overall performance sweetening attempts, incentive mechanism design, and commercial programs of BCFL, in a really quantity beginning from 2016 to 2021. Given the preceding work, we goal to (i) provide a summary creation to FL and Blockchain technology, (ii) provide a systematic evaluation of the capacity of incorporating Blockchain into FL, and (iii) speak the right programs of BCFL in depth.

Accurate gadget getting to know fashions are precious to companies and historical centralized gadget getting to know methods have shortcomings like loss of persistent getting to know nervy gadgets and aggregating private facts on imperative servers. These are relieved through federate getting to know.

In conventional gadget getting to know, a imperative cubic centimetre version is made mistreatment all obtainable education facts in a really centralized environment. This works without any troubles as soon as an imperative server will serve the predictions. However, in cellular computing, customers call for brief responses and additionally the communique time among person tool and an imperative server may also be too gradual for an sincere person experience. to overcome this, the version can be positioned inside the person tool on the other hand persistent getting to know turns into a undertaking on the grounds that fashions are educated on an entire facts set and the quit person tool does not have get admission to to the complete Another undertaking with historical gadget getting to know is that person's facts receives combination in a really imperative place for gadget getting to know education which may be towards the privateness guidelines of positive international locations and must make the facts extra susceptible to facts breaches federate getting to know overcomes those demanding situations through sanctioning persistent getting to know on quit-person gadgets while making positive that person facts does not go away quit-person gadgets.

Industrial net federate learning

The everyday call device (DNS) decision carrier faces critical demanding situations in phrases of concern identity, decision methods, protection, and restore quality, and it can't meet the desires of enterprise networks. The maximum motives is summarized as follows: change of concern identity, mass facts and ultralow latency requirements, protection and privateness protection, fairness, and reciprocity. it is mainly due to the blockchain device has the traits of calculation, storage, and scalability, while federate getting to know (FL) has the traits of creating positive facts protection for the duration of huge facts sharing and alternate and defensive the privateness of terminal private facts. This paper makes use of blockchain to keep vital facts

concerning gadgets; the version makes use of the convolutional neural network (CNN) of American country due to the fact the baseline. The technology of blockchain and federated getting to know are carried out to Industrial net identity evaluation, that permits identity evaluation to play a extra crucial and irreplaceable position inside the Industrial net field.

The chain storage structure of the blockchain will comprehensively record the information generated by Industrial web corporations within the production and operation process, that makes the data nontamperable, thereby making certain the legitimacy and credibility of the data. This {can be} conjointly advantageous for Industrial web companies to cut back prices and improve efficiency. The privacy protection of blockchain technology are applied because of the benefits of sure collaboration; it can be deeply integrated with the commercial web in terms of knowledge confirmation, accountability, and transactions, thereby promoting the transformation of commercial production to digital and intelligent introduced four core technologies of blockchain: decentralization, accord mechanism, encoding algorithm, and sensible within the blockchain, users conjointly produce a public ledger for block verification and dealing records. Blockchain technology has set a solid foundation for earning trust and created a reliable cooperation mechanism, and it's a large vary of application prospects.

United learning may be an answer for machine learning and AI (AI) to face a lot of rigorous knowledge management regulations. Within the framework of federated learning, the central server saves international data which will be at first shared, and every consumer saves native data and trains local machine learning and artificial intelligence models based on the native data. Then, in step with a definite communication mechanism, consumer transmits the model parameters and alternative data to the central server. The central server collects the information uploaded by every client and conducts coaching to make a worldwide model; each client has constant role and standing within the entire united learning mechanism. united learning effectively thereforelves the matter of the client sharing data between 2 or a lot of data while not contributory data, so it solves the problem of knowledge islands to an outsized extent.
The sensors and IoT devices deployed in the Industrial web of Things generate large amounts of sensing element knowledge, and also the analysis of sensor data can promote industrial production and manufacturing. For example, within the process of anomaly observeion in the Industrial web of things, the privacy of local data can be guaranteed by victimisation federated learning, and there is no got to interact with local data between devices, which might improve the power to detect abnormal IoT nodes in the process of anomaly detection.

So as to unravel the matter of privacy run in cognitive computing, united learning may be utilized in cognitive computing in the Industrial web of Things to guard data security and

hindrance of privacy leaks. However, if the central server fails or contains a trust issue, then all computing and data security can't be guaranteed, and one purpose of failure can occur. The localized distributed data storage structure of the blockchain will take away the sure central authority, so it will solve the trust drawback of the central server within the united learning, thereby forestalling the only purpose of failure. Therefore, the employment of blockchain technology supported federated learning can prevent single-point failure problems, and also the verification mechanism of the blockchain can make sure the legitimacy of knowledge whereas choosing high-quality and credible edge device.

Potential use cases and samples of federated learning

United learning models can work with completely different machine learning techniques however data sort and context are important. Potential applications could also be learning activities of movable users, autonomous vehicles and foreseeing health risks from wearable devices.

Mobile applications

Federated gaining knowledge of is wont to assemble models on purchaser behavior from understanding pool of realistic phones whilst now not leaky personal statistics, similar to for next-word prediction, face detection, voice recognition, and so on For example, Google uses federated gaining knowledge of to beautify on-device device gaining knowledge of models like "Hey Google" in Google Assistant that permits clients to trouble voice commands.

Hobby

Hobby and insurance change will benefit of federated gaining knowledge of, due to it permits protective sensitive statistics in the actual source. Federate gaining knowledge of models can supply higher statistics range through manner of approach of accumulating statistics from numerous locations (e.g. hospitals, virtual health report databases) to diagnose unusual diseases. A opportunity study, "The way beforehand for digital health with federate gaining knowledge of", claims that federated gaining knowledge of will facilitate to resolve stressful conditions regarding understanding privacy and statistics governance through manner of approach of enabling device gaining knowledge of models from non-co-positioned statistics.

Autonomous Vehicles

Federate gaining knowledge of can supply higher and extra stable self-the use of car information with length statistics and predictions. Autonomous vehicles want the ones to reply to new conditions:

1. Real-time records about the site visitors and roads

2. Real-time higher cognitive process

Federate gaining knowledge of can do all of those goals and permit the models to beautify over time with input from sincerely splendid vehicles. For example, an exploration mission has incontestible that federate gaining knowledge of will lessen back schooling time in wheel steering angle prediction in self-the use of vehicles.

Producing – prognostic protection

Producing businesses can use federated gaining knowledge of models to growth predictive protection models for equipments. prognostic protection can face some barriers similar to customers who do now no longer choice to share their personal understanding or commercialism statistics troubles from splendid countries/sites. federate gaining knowledge of can address the ones stressful conditions through manner of approach of exploitation nearby datasets.

Blessings of federated gaining knowledge

Federate gaining knowledge of is a developing place in device gaining knowledge of place and it already gives important benefits over traditional, centralized device gaining knowledge of approaches. the blessings of federate gaining knowledge of are

1. Understanding safety: Keeping schooling dataset on the devices, therefore an statistics pool isn't wanted for the model.
2. Understanding range: Challenges though statistics safety similar to network inconvenience in aspect devices might probable save you businesses from merging datasets from sincerely splendid reassets. federate gaining knowledge of allows get proper of access to to heterogeneous statistics even in times everywhere statistics reassets will communicate absolutely throughout positive times
3. Real time persistent gaining knowledge of: Models are always improved exploitation consumer statistics without a need to mixture understanding for persistent gaining knowledge of.
4. Hardware efficiency: This technique uses a great deal much less complicated hardware, due to federate gaining knowledge of models do now no longer want one complex critical server to research statistics

Challenges of federate Learning

The implementation of federate Learning is predicated upon on a group of key challenges:

- low in price Communication at some point of the federated network

- Managing heterogeneous systems withinside the same networks
- finished math heterogeneousness of know-how in federated networks
- Privacy troubles and privacy-preserving techniques

1. Communication-efficiency

Communication may be a key bottleneck to do not forget as quickly as developing techniques for federated networks are often} because of federate networks likely encompass a widespread kind of devices (for example, loads of smartphones), and communique withinside the network can be slower than neighborhood computation via many orders of magnitude.

Therefore, federate learning is predicated upon on communique-inexperienced techniques that iteratively deliver little messages or model updates as a part of the allocated schooling technique in desire to causing the complete dataset over the network. There are 2 primary desires to more reduce lower back communique: (1) reducing the complete kind of communique rounds or (2) reducing the dimensions of transmitted messages at every round.

The subsequent are full-size mind that cause to attain communique-inexperienced allocated learning techniques:

i. Neighborhood extrade techniques have sufficient cash a variable huge style of close by updates to be finished on each device in parallel at each communique round. Thus, the goal of neighborhood extrade techniques is to reduce the complete kind of communique rounds.
ii. Model compression schemes like sparsification, subsampling, and quantisation will appreciably reduce the dimensions of messages communicated at every update round.
iii. Localised schooling. Withinside the federate learning settings, a server connect with all a long way flung devices. Localised topologies are each different as quickly as communique to the server will become a bottleneck, particularly even as operational in low records diploma or immoderate latency networks.

2. Systems heterogeneousness

The storage, computational, and communique capabilities of the devices which may be a part of a federated network have to disagree appreciably. Variations generally get up manner to variability in hardware (CPU, memory), network property (3G, 4G, 5G, wifi), and power offer (battery level).

Additionally, absolutely alittle fraction of the devices also can be active at as quickly as. Every device can be unreliable because it is not uncommon for a grip device to drop out due to connectivity or power constraints. Therefore, fault tolerance is essential as taking factor devices may additionally drop out in advance than finishing the given schooling iteration.

Therefore, federate learning techniques need to be superior so they (1) expect a coffee quantity of participation, (2) tolerate heterogeneous hardware, and (3) are robust to born devices withinside the network.

There are some key commands to address systems heterogeneity:

i. Asynchronous communique is employed to area unvaried improvement algorithms. Asynchronous schemes are a pretty approach to mitigate stragglers in heterogeneous environments.

ii. Active device sampling. Typically, absolutely alittle set of devices participate at every spherical of schooling. Therefore, AN approach is to actively select out out taking factor devices at each round with the goal to mixture as severa device updates as manageable among a pre-defined time window.

3. Fault tolerance

A sensible approach is to push aside device failure, which may additionally reason bias into the device sampling challenge count number if the unsuccessful devices have precise records characteristics. Coded computation is an possibility desire to tolerate device failures via introducing algorithmic redundancy.

4. Statistical diversity

Bias constantly induce and collect data in anon-identically distributed manner across the network,e.g., mobile phone druggies have varied use of language in the environment of a coming word vaticinationtask.Also, the number of data points across bias may vary significantly, and there may be an beginning structure present that captures the relationship amongst bias and their associated distributions. This data generation paradigm violates constantly- used independent and identically distributed (I.I.D.) hypotheticals in distributed optimization, increases the liability of plodders, and may add complexity in terms of modeling, analysis, and evaluation.

Challenges arise when training allied models from data that isn't identically distributed across bias, both in terms of modeling the data and in terms of assaying the confluence geste of associated training procedures.

5. Sequestration enterprises

Sequestration enterprises frequently motivate the need to keep raw data on each device original in allied settings. Still, participating other information similar as model updates as part of the training process can also potentially reveal sensitive information, either to a third party or to the central garçon. Lately styles aim to enhance the sequestration of allied literacy using secure multiparty calculation (SMC) or discriminational sequestration. Still, those styles generally give sequestration at the cost of reduced model performance or system effectiveness.

Thus, balancing these trade-offs is a considerable challenge in realizing private allied literacy systems.

Lately, multiple sequestration- conserving styles for machine literacy have been delved. For illustration, the following three main strategies could be used for allied settings Differential sequestration to communicate noisy data sketches, homomorphic encryption to operate on translated data, and secure function evaluation or multiparty calculation.

- Differential Sequestration is a popular sequestration approach due to its strong information-theoretic guarantees, algorithmic simplicity, and comparably small systems above. A randomized medium is differentially private if the change of one input element won't affect in too important difference in the affair distribution. Thus, it isn't possible to draw conclusions about whether or not a specific sample is used in the literacy process. Likewise, there exists an essential trade-off between discriminational sequestration and model delicacy, as adding further noise results in lesser sequestration but may compromise delicacy significantly.
- Homomorphic Encryption can be used to secure the literacy process by calculating on translated data. Still, it has presently been applied in limited settings,e.g., training direct models or involving only a many realities.
- Secure multiparty calculation (SMC) or secure function evaluation (SFE) are other options for performing sequestration- conserving literacy with sensitive datasets distributed across different data possessors. Those protocols enable multiple parties to collaboratively cipher an agreed-upon function without oohing raw input information from any party except for what can be inferred from the affair. SMC is a lossless system and can retain the original delicacy with a veritably high sequestration guarantee. To achieve indeed stronger sequestration guarantees, SMC can be combined with discriminational sequestration.

Sequestration in Federated Learning poses new challenges to being sequestration-conserving algorithms. Most importantly, sequestration- conserving styles have to offer rigorous sequestration guarantees without exorbitantly compromising delicacy. Thus, similar styles have to be computationally cheap, communication-effective, and tolerant to dropped bias.

Current executions of sequestration- conserving allied literacy generally make around classical cryptographic protocols similar as SMC and discriminational sequestration. Still, SMC ways put significant performance charges, and their operation to sequestration- conserving deep literacy remains an open problem.

Future opportunities

The emergence of FL has introduced numerous possibilities to cubic centimeter for IIoT, but it moreover faces loads of demanding situations. in line with the equipment of simple evaluation in FL for IIoT, we generally tend to emphasise a few destiny works that be any research in the following.

• Privacy preservation. Quantifying know-how privateness publicity has now no longer been definitely studied in present studies. The prevailing studies specialize in getting to know accuracy and do not look at statistics privateness measurement. We generally tend to trust that it is vital to decide a mechanism to judge statistics privateness publicity like version accuracy withinside the destiny. Meanwhile, novices actually have absolutely unique dreams for statistics privateness, but it is currently constrained to privateness safety at an equal degree.

• Model evaluation criteria. The prevailing version critiques are all supported a third celebration and absence a standard and unified assessment standard, similar to consultant know-how units for assessment, load, etcetera Therefore, the group of a benchmark for FL is a critical direction.

• Personalization. The storage, computing, and communique competencies of each purchaser tool in the federal community may want to range due to versions in hardware, community connections, and electricity. Due to belongings or electricity constraints, it's miles moreover not unusualplace for customer gadgets to lose communique for the duration of iteration. These carry demanding situations to dawdler mitigation and fault tolerance. The versions in instrumentation and know-how collection techniques violate the freelance and identically disbursed assumptions, and need to boom the fine of disadvantage modeling and theoretical evaluation.

• Incentive mechanism. There may be currently a lack of powerful incentive mechanisms in FL, similar to contracts for loads of work, extra rewards.

• Know-how distribution. At present, maximum researches concentrate on HFL, but there are instead few properly advanced algorithms for VFL. However, VFL packages are not unusualplace in alternate concerning a couple of organizations.

• Local version transportation. There are already techniques which can significantly reduce lower back communique costs with little or no effect on training accuracy. It is uncertain whether or not or now no longer communique charges are frequently any reduced, and whether or not those strategies can provide the only alternate-off among communique and accuracy in FL.

• Model optimization. As soon as the purchaser updates the federal version in an asynchronous or lock-loose manner, mistakess convergence evaluation is an open and hard problem. Commonplace FL is now and again hosted and operated via way of means of a principal server, this is someway criticized for any such centralized mode

• Platform and tools. A complete platform is needed for overlaying the beneficial wishes from statistics processing, version storage, version schooling, version transportation, aggregation algorithms, statistics privateness preservation, incentive mechanism, personalization, etcetera
• Security. FL remains vulnerable to a few assault fashions similar to reasoning assault and poisoning assault. Adversaries switch malicious updates to the server for aggregation, that can have a main effect at the federal version.Curious or malicious servers will sincerely use the shared computing electricity to make malicious duties in the federal cubic centimeter version. Adversaries can in part screen the training know-how of each participants' unique schooling statistics in line with the local fashions uploaded via way of means of them. Growing demanding situations nevertheless exist as soon as making use of FL to IIoT.

Conclusion:

In this paper, we have a tendency to readdress Florida from the attitude of Assiduity4.0 action its operation in advancing intelligent manufacturing. To grease a typical understanding of the FL paradigm, we unfold and modernize applicable generalities of the places, algorithms, tools employed in FL, similar as learner, organizer, original model, civil model, and so forth With the great check, the state of the art of FL on abecedarian FL exploration is anatomized from eight motifs and farther work and challenges are gifted. Before reviewing the FL operations in advancing any than 13 profitable sectors, we present the paradigm of FLtransformed manufacturing.Meanwhile, we have a tendency to list some artificial areas for IIoT experimenters and interpreters into that FL can be seamlessly and incontinently integrated. Lately, the eye and exploration on FL have magnified exponentially. Still, there isn't important exploration on Assiduity4.0 and good manufacturing.

This deserves any attention from the factitious academe and follow on FL. the factitious web has entered full attention from domestic and multinational experimenters. As a very important structure of the artificial Internet, identification resolution technology may be a link that has got to be overcome. The network affiliation of artificial control systems, the communion of artificial knowledge, and system security are problems that bear nice attention throughout the event of the factitious Internet. Blockchain technology has the characteristics of decentralization, invariability, and low cost, which may break the pain points within the development process. united skill, because the introductory proposition of large-scale collaboration in the returning generation of artificial intelligence, provides effective results to crucial issues similar as little data and sequestration in the current development of artificial intelligence, which can any promote the development of the artificial Internet. The numerical

results justify that the allied literacy and blockchain technology for artificial web identification projected during this paper are sensible and effective, that release a replacement exploration direction for the event of artificial web identification.

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APPLICATIONS OF INFORMATION TECHNOLOGY IN ANIMAL SCIENCES

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The impact of information technology can be seen in every domain of science. It pervades and influences our day-to-day activities. It has been adopted in all those areas where computations and communication are required to be done at a really quick speed In today's click-and-access kind of world, advanced tools of IT is finding applications in each field and animal science is no exemption.

Since the early days of life, human beings started the domestication of animals and always relied on its intuition, collective knowledge, and sensory signals to make effective animal production decisions. This traditionally accumulated knowledge base has significantly empowered livestock farming. In India, livestock farming has progressed significantly and has become an industry. To strengthen this sector, modern information and communication technology can play a vital role. Advancements in computer technologies are facilitating the flow of IT-based delivery services to the farmers.

Nowadays most of the technologies are leveraged with Artificial Intelligence technologies. AI-empowered innovations in livestock farming include the use of modern sensors, enhanced automated data collection, remote monitoring, real-time data analytics using machine learning etc. The AI-enabled integrated solutions can offer great assistance to farming communities to lower the input costs, optimum utilization of available resources, increase the income, improve animal welfare and enhance the per animal productivity. Today, the various AI-enabled information technologies tools are being applied in the domain area of animal science. It includes sensors, cloud computing, machine learning (ML), image processing, IoT, bots, data analytics, intelligent systems, voice recognition, etc. These technologies have the potential to improve animal health and production using modern IT tools and they can help the farmer in efficacious disease forecasting, quick disease diagnosis, modern therapeutic methods, livestock farm management etc.

Artificial Intelligence

Artificial Intelligence (AI) is a science that enables a group of mainstream technologies to work in a smarter way. It aims to provide optimal solutions to many animal farming problems. It has been extensively used to find the optimum solutions at minimal resources, to maximize the production & efficiencies and provide the optimal diet formulations. AI-based solutions are purely data-centric and require a large amount of data to work efficiently. In general, Artificial Intelligence (AI) is focused on creating expert machines that can model the human thought process into a computerized system (Russell *et al.,* 2016). Some of these broad domains of AI are elaborated with their application in animal science and husbandry in subsequent paragraphs.

Artificial Intelligence technologies and its application in animal science

There are various technologies and domainshas successfully adopted Artificial Intelligence and the adoption of this modern technology has paid a good dividend. Now, it is ready to modernise the traditional farm to a smart farm equipped with intelligent sensors, depth cameras, robots, unmanned aerial vehicles (drones), and intelligent monitoring systems. Various AI tools like speech recognition, natural language processing (NLP), pattern matching, expert system, the internet of things (IoT), robotics, machine learning, etc. are being implemented in farm management. These tools in single or in combination can be vital tools for smart livestock farming.

Automatic speech recognition

Automatic speech recognition is an application of AI to acoustics and recognizes phonemes in a voice signal. The voice or speech recognition systems analyse the signal received from a microphone to identify the texts pronounced by the user. This system can be helpful to recognize the particular animals in order to know which animals are calling (Tau and Eng, 2009). The vocal frequency of an animal used to be unique in nature and this technology can be used to identify the individual animal on the basis of its vocal frequency. This type of system can be beneficial to study animal behaviour.

Natural language processing (NLP)

Natural Language Processing (NLP) is an application of AI in the domain of linguistics and aims to get the intent of text or vocal commands given to the computer. It enables the interaction of humans with computers in natural language and analyses the mood to find subjective patterns (Arguello *et al.,* 2019). In short, it is the field that helps communication between machines and humans. The NLP-enabled system is known as a bot and implemented using messaging applications, web applications, portals, mobile apps and embedded systems. If it communicates using text, it is a chatbot and a human interacts with the system using voice, then

it is referred to as an audio bot. Bots are designed to do the thought process, simulate the interaction in the absence of humans and provide accurate and relevant information (Hur *et al.,* 2020). Nowadays some social networking systems like Telegram, WhatsApp, etc. are providing the facility to host the BOT on their platform. Amazon's Alexa and IBM's Watson cognition service platform provide the facility to design the audio or char bot. IBM Watson Assistant is an AI-enabled service that efficiently understands the context and provides quick, steady, and accurate answers. These bots can be of immense use to access to information and expert advice in the absence of a human expert.

Visual recognition or pattern matching

Visual recognition or pattern matching is the most important application of AI and is based on the analysis of an image or video signal, with the aim to identify the shapes, patterns and precisely identify the different features in an image. This technology can be implemented to remotely monitor the heard with the least interface with the help of cameras and an AI-enabled image analysis system. It enables the monitoring of the behaviour of individuals or heard of animals, timely recognition of lameness and accurate recording of feeding behaviours. Detailed observation by AI-powered image analysis facilitates the timely detection of injuries and ailments that can affect the quality and quantity of yield (Niloofar *et al.,* 2021).

Expert systems

An expert system (ES) is an AI-enabled intelligent system that represents the human expertise in a domain or discipline and emulates the decision-making abilities of a domain expert. ES is designed to solve the complex problem by reasoning the stored knowledge of a specialized domain in the absence of a human expert. In animal science, row domain knowledge of disciplines like reproduction, nutrition, medicine, farm management, etc. can be structured and an expert system based on this structured knowledge base can address the specific, on-site needs of farmers (Kishan *et al.,* 2012). Expert systems do the institutive reasoning in the absence of specialists and advise the farmers in making the best decisions for their animal health and production. Expert systems in animal science can be designed to give automated advisory to the livestock farmer. An automated advisory system is a rule-based expert system. It advised the user regarding the situation by reasoning the information using its stored knowledge and heuristics. Such a system can be used to disseminate the automated information to the livestock farmer with regards to the requirements of distinct animal

Big data

Big data is a collection of huge structured and unstructured data that grow exponentially with time and evolved into a new domain, data science. This voluminous data cannot be handled by using traditional database management software. Some special statistical and computational tools and techniques are applied to mine this huge data to generate meaningful and insightful information. Modern data analytics is used in machine learning-based projects for predictive modeling and other cutting-edge analytics The example of big data are social networking site data, climate-related data, nucleic acid sequencing databases. Big data and data analytics can play a key role in applying AI-enabled advanced technologies to animal farming practices and offers a scalable solution to store vast amounts of data on a remote server (Majumdar *et al.,* 2017). Advanced AI and ML algorithms can make use of this extensive data to analyze, predict and notify farmers in case there is something abnormal. Therefore, in regards to livestock farming, integration of AI and IT tools like smart sensors, big data, and advanced ML algorithms can provide a complete solution.

Machine Learning (ML)

Machine Learning is one of the core sub-disciplines of Artificial Intelligence and has the capabilities to train a machine to emulate human behavior. It is machine learning that gives life to a chatbot, does the language translation, powers to autonomous, mines a huge dataset, and diagnoses the medical condition on the basis of images. The pervasiveness of machine learning is growing in every sphere of life and the application of ML can be encountered in almost every discipline. ML enables a machine to learn the patterns in the requisite data and perform the prediction (Mahesh, 2020). The machine-learning algorithm has the aptitude to improve performance over time and learn from its experience to achieve significant accuracy. It is the power of a machine learning algorithm that extracts the facial features of a friend in a social networking site and predicates the name of a friend in the image. Advanced AI technologies interpret the various types of data in the form of text, audio, videos, and images, perform the clustering and classification of this dataset and perform the predictive analysis.

In animal science and allied discipline, pattern matching algorithms can be applied to detect animal disease and to remotely monitor the livestock herd. There has been a lot of advancement in sensor technologies. Nowadays a variety of advanced sensors like 3-axis accelerometers and magnetometers, optical sensors, etc. are available and they can be used to record animal movement and behaviors like feeding, resting, walking, etc. The sensors first record these data and transmit it to data storage. ML algorithm equipped system to process this data in real-time and if any deviation in the pattern is found, it highlights and an alert is raised.

Deep Learning

Deep Learning is the advancement of Machine Learning. It is a learning system that is inspired by the neural networks based thought processing capabilities of the human brain and uses highly complicated mathematical computations. It trains the system to perform the task as naturally as a human does. It has been implemented in driverless vehicles and has enabled them to recognize the road signs and navigate the vehicle as a human does. Deep learning models provide state-of-art accuracy and can perform better than humans. Deep learning models are based on neural network architecture and are trained using a large labelled data set.

Internet of Things (IoT)

The Internet of Things (IoT) is a network of embedded physical objects that is equipped with sensors and software to connect and exchange information with another device via the internet. Smart Livestock management, also known as smart livestock monitoring or precision livestock farming, uses IoT-enabled devices to track and monitor the health of livestock (Neethirajan, 2020). Digital devices like wearables are picking up pace in animal science to monitor and record real-time data collection of individual animals.

Wearable sensors like battery-powered neck or collar tags can be used in animals to wirelessly record the various parameters on location, temperature, heart rate, blood pressure, etc, and send the data to a data recording device. This enables the farmers to have insight into individual animal health from anywhere and facilitates them to receive alerts in case of deviation from the usual pattern (Niloofar *et al.,* 2021). In livestock farming, the IoT model is an important tool to monitor the available resources by connecting multiple and diverse objects like cattle with wearable sensors, milking robots, automated washing, automated feeder, GPS tracking system, depth cameras, etc.

Robotics

Robotics deals with the design of intelligent robots. Livestock Robotics is the newest development in the area of livestock production and its most prominent application is milking robots and washing robots (Halachmi and Guarino, 2016). Combined with extensive knowledge and experience in design, sensing, automation, robotics makes the life of animals is easy and compatible.

The robotic milking system automates the milking process by integrating the manual and mechanic processes to milk and manage the individual cow irrespective of the farmer’s presence. It also performs the visual checks of udder health during milking by automated monitoring. It

supplies highly accurate animal-related data in real-time which was unobtainable in a traditional milking process and enables the farmer to individually monitor the animal on regular basis.

Information system

Information System is a web application designed using web technologies such as HTML, CSS, PHP, JavaScript, ASP.Net, etc., and hosted on a webserver. It is a delivery-based system to deliver information to the masses. The information need of animal research data are growing day-by-day and information system is helping the research and academician in expanding the knowledge base, distributing it as widely as possible, and preserving it for meeting the future demand. This information system works as a repository of technologies developed for various species to increase animal production and also serves as reference material for future research programs. These systems are used to disseminate the information in a structured way. With the help of this system, users can retrieve the relevant information in quick time in a single window.

Conclusion:

In recent years, with a growing population, there has been a higher demand for animal production. The livestock sector has also witnessed the innovations of advancement in information and communication technologies and various IT tools have been significantly adopted by the farming communities across the world. Modern AI-enabled IT tools have empowered livestock farmers to monitor, forecast, and optimize farm animal growth and monitor farm management in a better way. These tools have significantly assisted in the identification of parasites and diseases, monitoring the animal movement and feeding behaviors perfuming the milking and cleaning, etc. Although AI-enabled technologies can be useful for farmers but are quite expensive there's still a lot of work to be done by technology providers on its cost-effectiveness and make it more farmer-oriented. It has the prospective to change the way of livestock farming and enable the farmers to achieve more results with less effort while bringing many other benefits.

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