



M.KUMARASAMY
COLLEGE OF ENGINEERING

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Thalavapalayam, Karur – 639 113.

**DEPARTMENT OF
ELECTRONICS AND COMMUNICATION ENGINEERING**

**UNDER EMINENCE
ASSOCIATION**

TECHMAGZ-21

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MARCH 2021



2021

MANAGEMENT



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ABOUT THE INSTITUTE

VISION

To emerge as a leader among the top institutions in the field of technical education

MISSION

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

ABOUT THE DEPARTMENT

- The Department has a long tradition of excellence in educating, mentoring, and inspiring future technology leaders and researchers in Electronics and Communication Engineering.
- The department offers undergraduate and post graduate programs and a recognized Research centre under Anna University where the students are involved in Industry collaborative Research, Consultancy, and State of Art Labs which contribute to social betterment.

- Our curriculum provides a strong foundation in both the analytic and technological aspects of Electronics and Communication Engineering and explores internship opportunities in industry and world-class universities.
- The department caters to Outcome-based Education which helps our students to learn, develop, and lead lives of impact.
- Students are provided with ample opportunities to work on projects, skill development apart from regular curriculum, encourage to take part in national/international design contest/tests/quiz, to make them competitive and industry-ready.
- The major goal of the Department is to cater to the holistic development of a student with a participative Learning Environment.

Chief Editor

Mr. S.U.ARIHARAA

Faculty in charges

- 1. Mr. K.KAARTHIK Assistant Professor**
- 2. Mrs. S.SIVARANJANI Assistant Professor**

Student in charges

1. Mr. RAGULAN R, Fourth year
2. Mr. SANJAY G, Fourth year
3. Mr. SANTHOSH S, Third year
4. Mr. RAJESH KUMAR A, Third year
5. Ms. SUSMITHA S, Second year
6. Ms. NIKITHA K, Second year

ECE DEPARTMENT

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism. innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1: Graduates will have a successful career in academia or industry associated with electronics and communication engineering.

PEO2: Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of electronics and communication engineering.

PEO3: Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality.

PROGRAM OUTCOMES (PO)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research- based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfill the industrial expectations.

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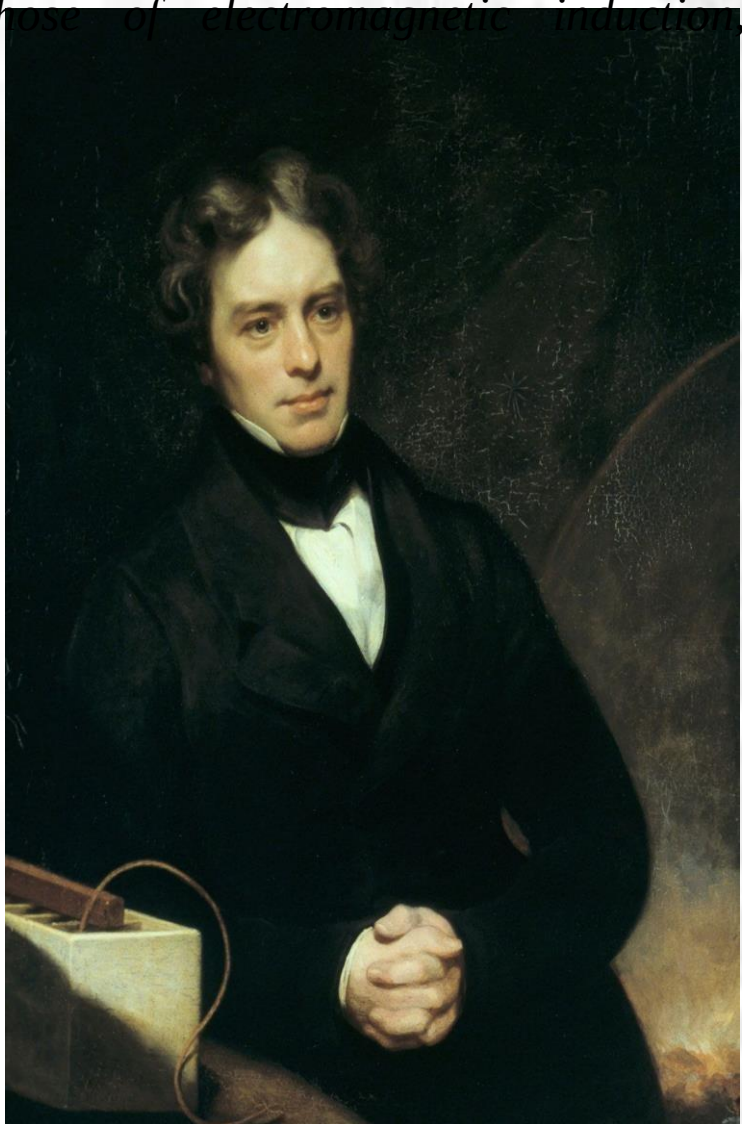
We glad to thank all the Faculty Members of Department of Electronics and Communication Engineering for extending a warm helping hand and valuable suggestions throughout the Magazine Words are boundless to thank our Parents and Friends for their motivation to complete this Magazine successfully.

Michael Faraday

Michael Faraday, FRS (22 September 1791 — 25 August 1867) was an scientist who contributed to the fields of electromagnetism and electrochemistry. His main discoveries include those of electromagnetic induction, diamagnetism and electrolysis.

Although Faraday received little formal education he was one of the most influential scientists in history. It was by his research on the magnetic field around a conductor carrying a direct current that Faraday established the basis for the concept of the electromagnetic field in physics. Faraday also established that magnetism could affect rays of light and that was an underlying relationship between the two phenomena.

He similarly discovered the principle of electromagnetic induction, diamagnetism, and the laws of electrolysis. His inventions of electromagnetic rotary devices formed the foundation of electric motor technology, and it was largely due to his efforts that electricity became practical for use in technology.



As a chemist, Faraday discovered benzene, investigated the clathrate hydrate of chlorine, invented an early form of the Bunsen burner and the system of oxidation numbers, and popularized terminology such as anode, cathode, electrode, and ion. Faraday ultimately became the first and foremost Fullerian Professor of Chemistry at the Royal Institution of Great Britain, a lifetime position.

Faraday was an excellent experimentalist who conveyed his ideas in clear and simple language; his mathematical abilities, however, did not extend as far as trigonometry or any but the simplest algebra. James Clerk Maxwell took the work of Faraday and others, and summarized it in a set of equations that is accepted as the basis of all modern theories of electromagnetic phenomena. On Faradays uses of the lines of force, Maxwell wrote that they show Faraday "to have been in reality a mathematician of a very high order — one from whom the mathematicians of the future may derive valuable and fertile methods." The SI unit of capacitance, the farad, is named in his honour.

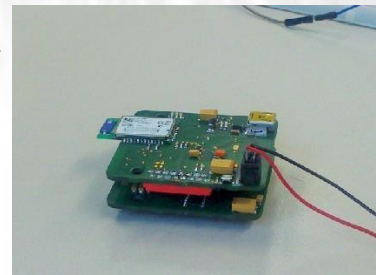
Albert Einstein kept a picture of Faraday on his study wall, alongside pictures of Isaac Newton and James Clerk Maxwell. Physicist Ernest Rutherford stated; "When we consider the magnitude and extent of his discoveries and their influence on the progress of science and of industry, there is no honour too great to pay to the memory of Faraday, one of the greatest scientific discoverers of all time".

**M.ABINAYA
(PRE-FINAL YEAR)**

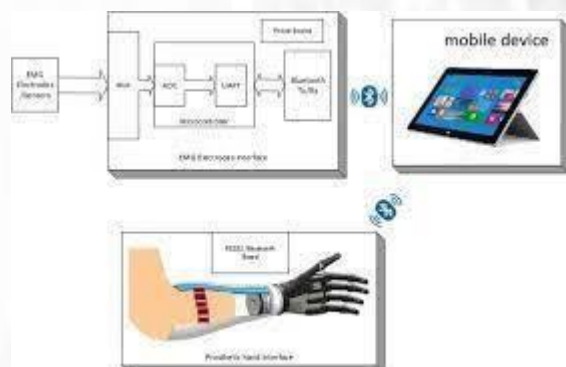
A Low-Cost Wireless Multichannel Surface EMG Acquisition System:

Electromyogram (EMG) signals have attracted much attention and have been applied widely. EMG signals have been used to evaluate the functional status of skeletal muscles. The commercial EMG acquisition systems are costly; so many researchers have provided low-cost solutions.

Although the wireless acquisition systems are realized, the transmission speed is not sufficient for high-sampling and multichannel measurement. The purpose of this article is to implement a low-cost and wireless surface EMG acquisition system supporting high-sampling and multichannel measurement.



Using wearable EMG sensors combined with a microcontroller unit and a Wi-Fi module, the measured surface EMG signal samples can be forwarded immediately to the host for further processing and additional applications. Besides, the proposed system is validated by applying the commercial EMG detection system. The results show that all the correlation coefficients are over 0.8, which represent moderate-to-high relative agreement between the commercial and the proposed system.



**K.K.ABISHEK
(FINAL YEAR)**

Handling controls remotely:

Electronic circuitry is improving day by day. New materials are under research to overcome attenuation and loss issues in electronic devices. Specs are getting better, resulting in handing over more and more control to the user. KM2200 from Kusam-Meco allows connection through local area network for remote control and measurement. Remote connections also have a safety angle.

Better safe than sorry:

Safety with electrical equipment has always been an issue. Equipment often blow up, either due to shorting or overload, causing personal injury and equipment damage. The good news, however, is that these misfortunes are avoidable. Some features are built in the system, like CAT rating requirements. Others are basic guidelines for safety. Tripathi says, "Connection of cable and antenna need special attention." These should not be too loose or tightly connected. He adds, "After use, all cables and connectors must be kept safely, and caps should be used to cover connectors. This helps to save connectors and improve their life usage." KM2100 from Kusam-Meco features CAT III 1000V/CAT IV 600V for safety in addition to a protection shield in the multifunction harmonic and power analyser.



K.BUMIJA
(FINAL YEAR)

Test & Measurements:

Diverse application areas Digital power analysers are used to measure voltage, current, wattage, apparent power, frequency and power factor of any electrical and electronic appliance, compact fluorescent lamps, light emitting diode bulbs, transformers, fans, air-conditioners, motors, auto parts and so on. High-accuracy, true-RMS, digital-readout and light-duty meters are used in general industrial maintenance, production, quality control and laboratories. Anuj Rohilla, deputy general manager - products, SPI Engineers Pvt Ltd, points out “production and diagnostics in load industry as well as actuators and contractors” as another area of application of power analysers. He adds, “These serve as very efficient tools for increasing productivity and life expectancy of load devices and machine analysis with load impact.” With increasing focus on electric vehicles, energy consumption efficiency of quick chargers is an important measurement and evaluation criteria that is being sorted out by power analysers.

3390 from Hioki displays voltage, current, active power, apparent power, power factor, frequency, loss, efficiency,



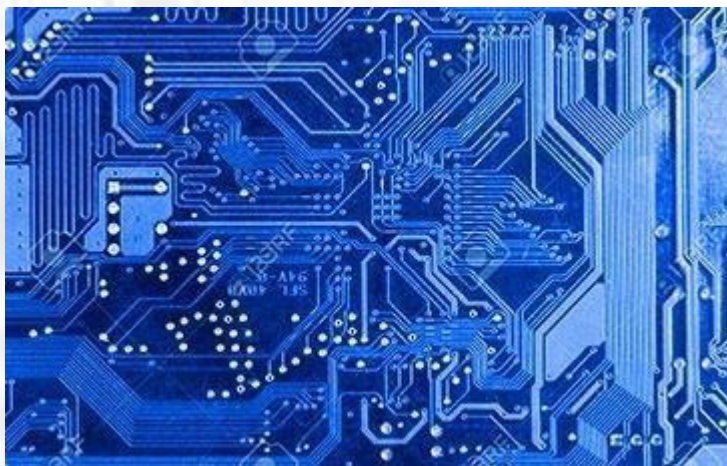
distortion factor and voltage imbalance rate (when measuring three voltages and three currents), all at the same time. Energy is one of the most precious resources. Design engineers are under constant pressure to increase efficiency and reduce power consumption down to the last milliwatt. Challenging programmes like light-emitting diode and high-intensity



discharge lighting, solar panel energy output, efficiency testing on inverters and pulse-width modulation motor drive systems on electric vehicles, all require fast, precise and reliable power measurement. GPA62 from PCE allows energy measurement in symmetrically-loaded three-phase systems. Power analysers PCE-PA 8000, PCE-360 and PCE-830 support professional power and energy measurements in single- and three-phase systems.

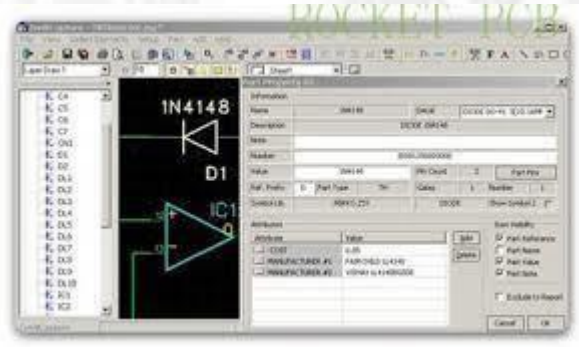
G.DHARENIDHARAN
(PRE-FINAL YEAR)

Osmond: A Feature-Rich PCB Designing Tool



The most important part of embedded system design is the development of printed circuit boards (PCBs). PCB designing has always faced constraints in the development of an efficient design. A lot of design software is available in the market but there are just a handful with engineering excellence and the freedom to customize. This article focuses on Osmond, which banishes all restrictions and artificial limits, and paves new ways to design a PCB. Osmond Cocoa is a simple Macintosh app that helps design PCBs before starting to build the actual circuit board. It is designed

using the latest Cocoa application framework. Algorithms and methodologies are enriched with design research from over a decade, whereas the user interface is maintained as modern and



sophisticated. It is compatible with Intel and Power PC machines running MacOS X 10.5 or later.

B.J.DINESH BABU

(II YEAR)

5G: The Next-Generation Network

With time, generations change, whether it is mankind or technological. But the biggest and fastest changes have only been noticed in the communication network generations in the last few years. We have noticed a great electronic change in wireless communication network generations ranging from 1G to 2G, 3G and 4G in a very short span. Fourth generation, or 4G, the next generation of mobile telecommunications technology, succeeding 3G and preceding 5G, was introduced in 2008. A 4G system, in addition to the usual voice and other services of 3G, provides mobile broadband Internet access, for example, to laptops with wireless modems, smartphones and other mobile devices.



The major difference from a user point of view between 4G and 5G techniques must be something else than increased peak bit rate. It could be higher number of simultaneously-connected devices, higher system-spectral efficiency (data volume per area unit), lower battery consumption, lower outage probability (better coverage), high bit rates in larger portions of coverage area, lower latencies, higher number of supported devices, lower infrastructure deployment costs, higher versatility and scalability or higher reliability of communications.

R.RAGULAN
(PRE-FINAL YEAR)

Now Wirelessly Charge Without Any Disruption While In Motion:

The power transfer technology allows devices to get charged regardless of their position or orientation and even on the go. The concept of wireless power transfer has been around since the 1800s, yet work on it intensified after 2010. With the introduction of the Qi wireless charging standard, several phone makers got a head start in incorporating it into their devices. The technology proved to be a much more convenient alternative to wired charging.



Except for a major disadvantage: the digital device with respect to the charger should be precisely aligned for the charging to occur. This meant that in a large charging area, the digital device must be in a relatively known stationary position. Any movement will lead to the misalignment of the transmitter and receiver, and thus no charging.



“The beauty of our method is that it’s very simple yet quite

sophisticated,’ says Prasad Jayathurathnage, postdoctoral researcher at Aalto University. “We don’t need a high-end processor or lots of computations to make the transmitters intelligent.

**G. SANJAY
(PRE-FINAL YEAR)**

Flexible Display:

HP Labs is developing a prototype for a flexible screen that could be used in products from computers to smart phones to e-books. The company says the technology should be available for military use in about two years and for private use shortly thereafter.



The screen is made using a technology HP calls self-aligned imprint lithography, or SAIL. Traditionally, the circuits behind a screen are produced using a batch process, where a group

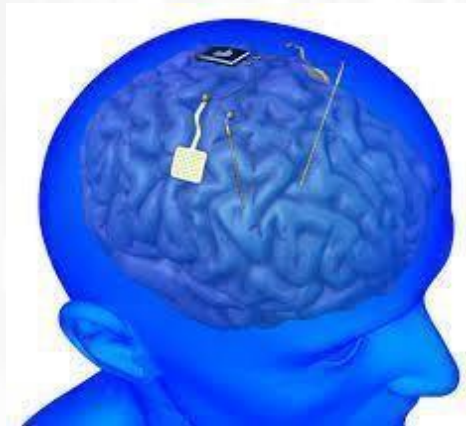
of displays-in-the-making move together from machine to machine. Instead, SAIL uses a faster roll-to-roll process, where a continuous sheet of flexible material is fed into one end of the machinery and a processed product rolls out the other end, like in a newspaper press.

**A.RAJESHKUMAR
(PRE-FINAL YEAR)**

Nano-structure technology that replicates human brain:

A unique nano-structure is being created using a thin film of oxide material by a team of researchers led by Dr Sriram from RMIT University. The material that they are using to develop this nano-structure is 10,000 times thinner than human hair. Researchers are further working on the

development of hard drive technology using this nanostructure. This could be the new leap in the field of memory storage devices. New devices made using this nano-structure can be faster as well as reliable.



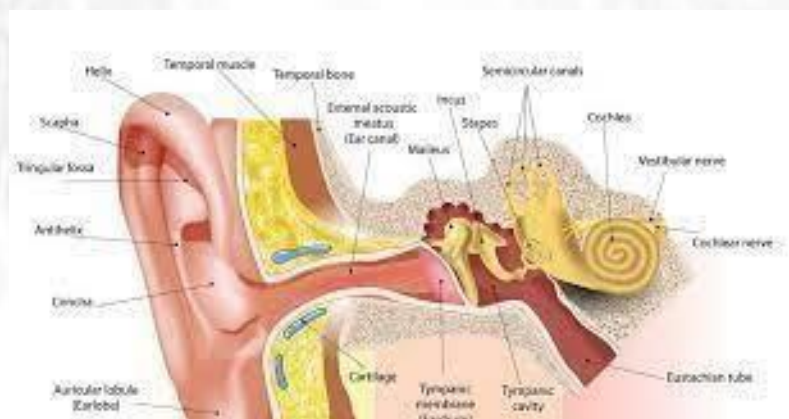
The thin film is capable of creating a memristive effect. The device can log the history of events using the memristive effect. This effect can be used to train the computer to behave like human brain. It is very similar to synaptic interfaces in the human brain. Researchers are testing the structure with various electronic devices. The current structure has a data storage size of 60 nanometers. They are also experimenting with implementation response time of the human neural network.

P.RITHIKA
(FINAL YEAR)

Innovative bionic ear that can switch on or off :

AT&S, a leader in advanced packaging solutions, Sound chip SA, a Swiss-based innovator in wearable sound technology and STMicroelectronics, a global semiconductor

leader serving customers across the spectrum of electronics applications, have collaborated for crafting a bionic hearing module that, when installed into a personal audio device, delivers an amazing wearable sound experience controlled at the ear by the wearer and software intelligence. Personal audio devices, like an MP3 player or smartphone, equipped with the bionic hearing module, provide wearers with the ability to electronically 'open' and 'close' their ears to ambient sound conditions, or even to augment ambient sound with programmed audio from a connected smart device. This capability can fully protect wearers from noise in situations where the ambient sound is too loud, or to open the ear for natural conversation with others, without having to remove the audio device, suffer from the discomfort of occlusion, or worse, the pain of loud noise. The bionic hearing module integrates a broad spectrum of advanced electronics to further enhance the on-the-go audio experience, including head-tracking and other sensing, to enable exciting new features, including augmented-audio guidance and biometric monitoring. The multi-mode audio capabilities of the bionic hearing module are enabled through the use of HD-PA technology developed by Sound chip.



Their implementation in a compact form factor is made possible through the use of patented Sound state technology, which enables the efficient combination of electronic, acoustic and transmission means within a single, compact mechanical structure. The semiconductor components in the bionic hearing module comprise the latest motion and audio MEMS (micro electro mechanical system) components from STMicroelectronics, an HD-PA compliant audio engine for zero-latency sound processing, and an ultra-low-power STM32 MCU from ST's industry-leading portfolio of more than 500 32bit ARM Cortex-M-core microcontrollers. The bionic hearing module's packaging employs the latest in embedded component packaging and 2.5D PCB technology from AT&S, which is capable of integrating acoustic, electro-acoustic, passive and active electronic components with unmatched efficiency, providing module dimensions ideally suited to the comfort and size constraints of in-ear operation, and is compatible with most existing linear-type personal audio devices.

S.SUSMITHA
(II YEAR)

Wireless Communication:

Evolving to Meet Ever-Changing Needs

Wireless communication is a constantly-evolving space. Thus, it is important for the designers to be aware of the changes to the existing and new/upcoming standards so that they can incorporate the best-suited technology in the best

possible way Evolution is the key to success.' This saying is also true in terms of wireless communication. There is a lot of competition between the different technologies associated with communication but the technology that is continuously evolving, providing a high rate of data exchange on a more secure network, is the one that can be considered to be the best. From old standards to new, wireless communication has improved a lot over time, making communication more flexible with added reliability and a high rate of data transfer. Almost every year we see at least one new standard coming up to enhance the features associated with the older one or a new technology based on the same standard with added functionality. Networking at 1.3Gbps Networking technologies have been improving since the introduction of Wi-Fi standards. However, there has been a major breakthrough with the introduction of IEEE 802.11ac standard. This is an upgrade to the IEEE 802.11n standard that delivered data at 600 megabits per second (Mbps). 802.11ac incorporates wide bands, multiple antennae, beam-forming and runs at 5GHz, delivering data at the rate of 1.3Gbps. The standard also supports better penetration through walls along with longer ranges, which makes it popular amongst chip-set companies.



From application point of view, the technology would allow consumers to synchronise data instantly or transfer files quickly from one device to the other. The 802.11ac provides a more reliable network as

compared to the networks with previous standards.

This makes 802.11ac ideal for media streaming. When it comes to wireless communication, apart from this, security is the major concern with the upcoming standards. The 802.11ac solves this issue by enabling high-encoding density per packet. It also works on multi-user, multiple input multiple output (MIMO), decreasing interference with an efficient spectrum usage and a great AP/client capacity.

K.ABDULRAHIMAN
(FINAL YEAR)

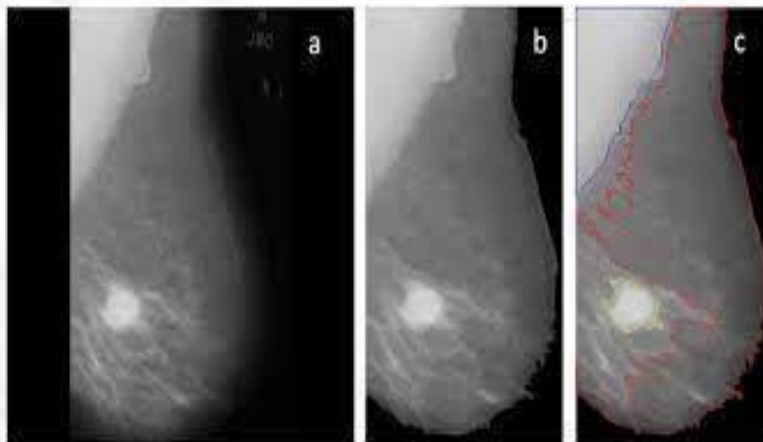
MAMMOGRAPHY IMAGE DATABASES AND SEGMENTATION METHODS:

Databases of mammographic data are important when developing CAD algorithms that aim helping in providing diagnosis of breast diseases. A standardized database gives possibility to compare the performance of similar methods on the same data allowing reproducibility. In the domain of mammographic image processing, two databases are being used in most cases, the MIAS data- base⁵ and the DDSM database.⁶ The MIAS database contains 322 MLO view mammograms from 161 patients and was developed in 1994. Lately, many authors report the usage of the mini-MIAS database, which contains images resized to 1024 1024 pixels. A much larger database is the DDSM, containing 2620 cases resulting in total 10 480 images, 5240 in MLO view, and 5240 in cranio-caudal view.

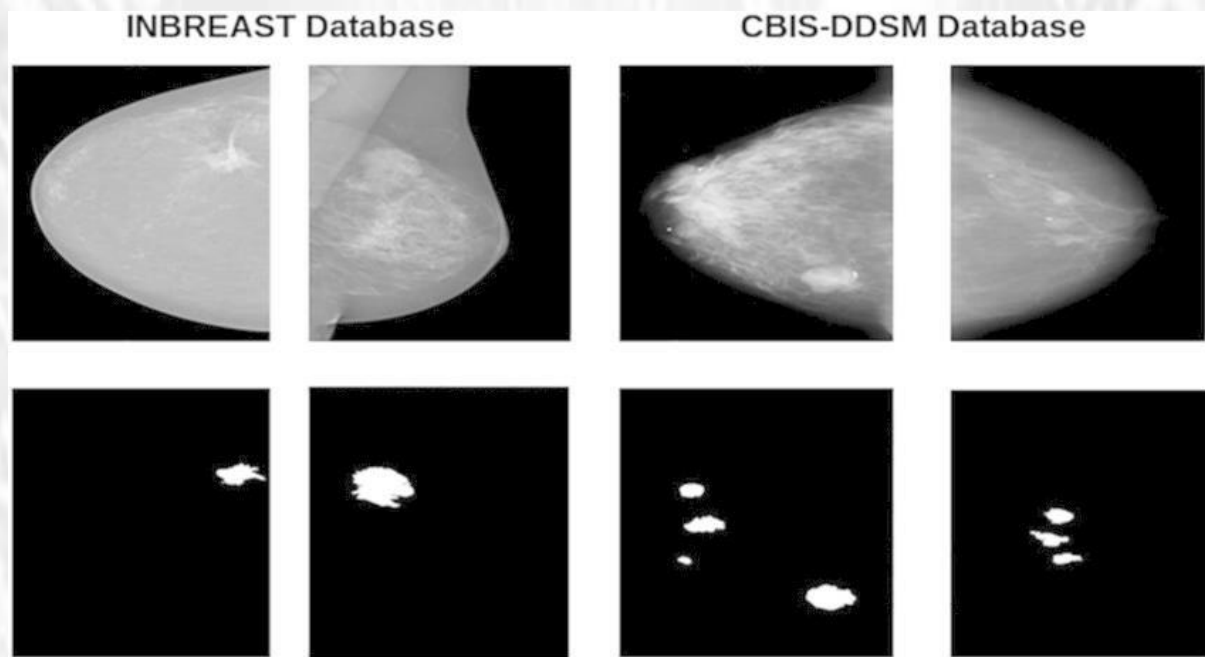
Another, today often used database is the Nijmegen database, describe among several other databases.⁸ This, publicly available, database consists of 40 mammograms

from 21 patients. Some newer digital mammography databases are the BancoWeb LAPIMO data- base⁹ and the In Breast database.⁸ Many of recently proposed breast tissue and pectoral muscle segmentation methods use approaches from contrast based on region- and line detection,¹⁰ while newer approaches use deep learning and neural networks,¹¹ as it is the case in most of novel papers related to image processing. However, there is still a lot work published that uses non deep learning approach.¹² One common thing to these methods is usage of the mini-MIAS database and a common problem is verification of segmentation results, usually achieved by visual inspection rather than by measuring the exact number of accurately and falsely segmented pixels.

A database of segmentation masks for a dataset of images should give the possibility for quantitative testing of



proposed methods and facilitate the comparison of results among different authors. This does not mean that quantitative results would be the perfect parameter on their own, because errors could be differently spread over the segmented area, but they should be preferred over a plain visual inspection



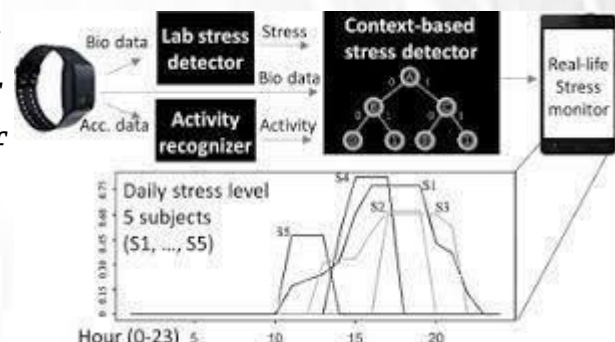
V.MONOJ KUMAR
(II YEAR)

MACHINE LEARNING TECHNIQUES FOR STRESS MONITORING:

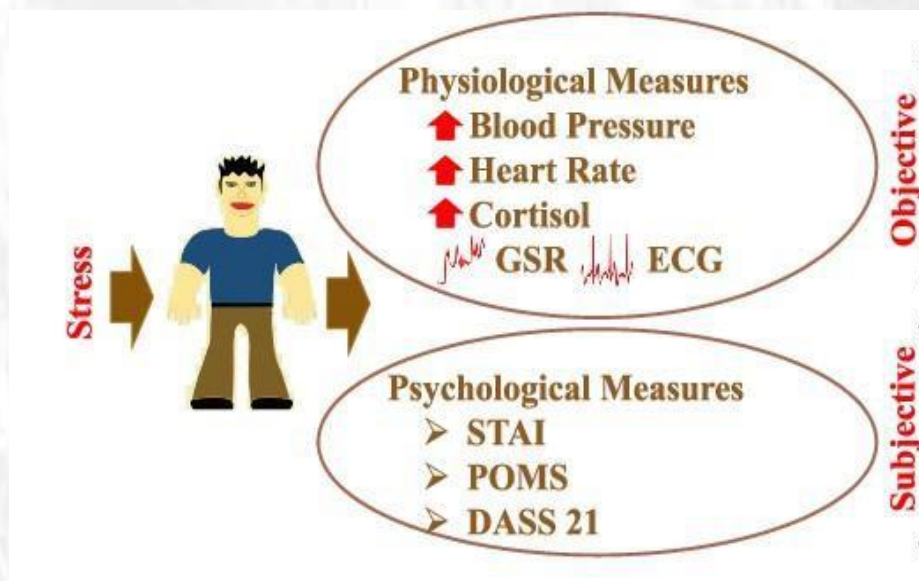
Features from physiological signals represent the relationship between these physiological signals and corresponding stress levels. These features are the backbone of any machine learning model based on which classifications are made. The characteristics of some of the popular machine learning algorithms commonly used for stress classification the common features extracted from ECG, GSR, EEG, and Resp (Respiration) signals.¹⁴ Features from ECG signals typically consist of the mean heart rate, SDNN (standard deviation of the R–R peak interval), RMSD (RMS value of the successive differences between R–R peak intervals), pNN20 and pNN50

(percentage of the successive normal sinus R–R intervals which are more than 20 and 50 ms, respectively), HF and LF (high frequency and low frequency components of R–R interval) in the range (0.15–0.4 Hz) for high frequency and (0.04–0.15 Hz) for low frequency and the LF/HF ratio. Finally, SD1 and SD2 are the crosswise and lengthwise standard deviations of the Poincare plots GSR is characterized by two components: a slow changing tonic component called skin conductance level (SCL); and a fast-changing phasic component named the skin conductance response (SCR). Features like SCL, duration and magnitude of SCR and SCRR (skin conductance response rate), and the time duration during which the influence of stimulus persists also called OPD (ohmic perturbation duration) constitute the set of features commonly studied in the context of stress detection. Mean respiration frequency and the spectral power density of the signal in four different energy bands (0–0.1 Hz), (0.1–0.2 Hz), (0.2–0.3 Hz), and (0.3–0.4 Hz) denoted by EB1, EB2, EB3, and EB4, respectively, are the most commonly examined features of respiration signal.

Similarly for EEG signal, features from four different frequency range of the EEG signal namely: Delta (0.5–3.5 Hz), Theta (4–7.5 Hz), Alpha (8–13 Hz), and Beta (14–32 Hz). Sample Entropy (SEN) is also used as a feature for distinguishing between the two states. Table 3 lists some of the related works in stress detection published during the past eight along with key attributes like number of subjects,



physiological signals used, number of features, length of acquisition window, number of stress classes, and accuracy.

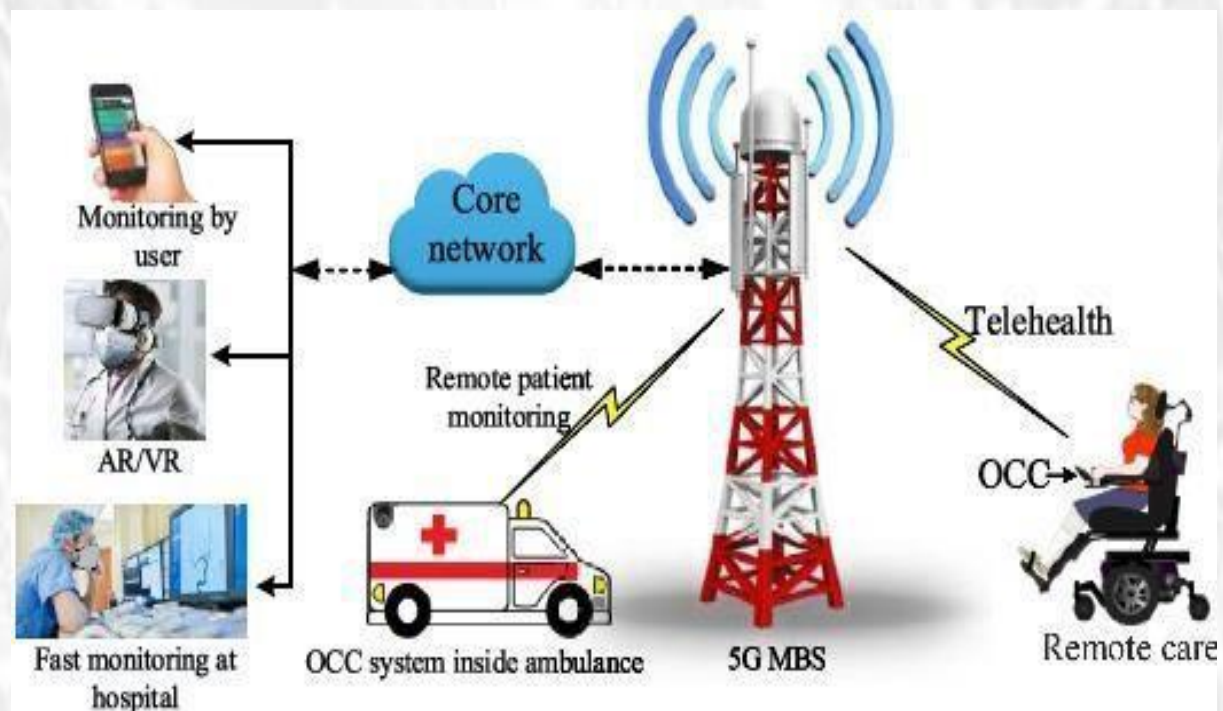


S.MANIVEL
(FINAL YEAR)

A New 5G eHealth Architecture Based on Optical Camera Communication:

Abstract—Currently, various radio frequency (RF) technologies are used to transfer medical data in healthcare applications. The electromagnetic interference caused by RF can critically affect the performance of medical devices. The main goal of this article, thus, is to provide reliable and low-latency fifth-generation (5G) electronic health (eHealth) solutions for monitoring patients at home, hospitals, ambulances, intensive care units, and outdoors. This monitoring is based on optical camera communication (OCC). In our proposal, the OCC system is used to receive the monitored data from wearable sensors/patches. OCC systems

are connected to 5G access networks or wired networks to be linked with the core network.

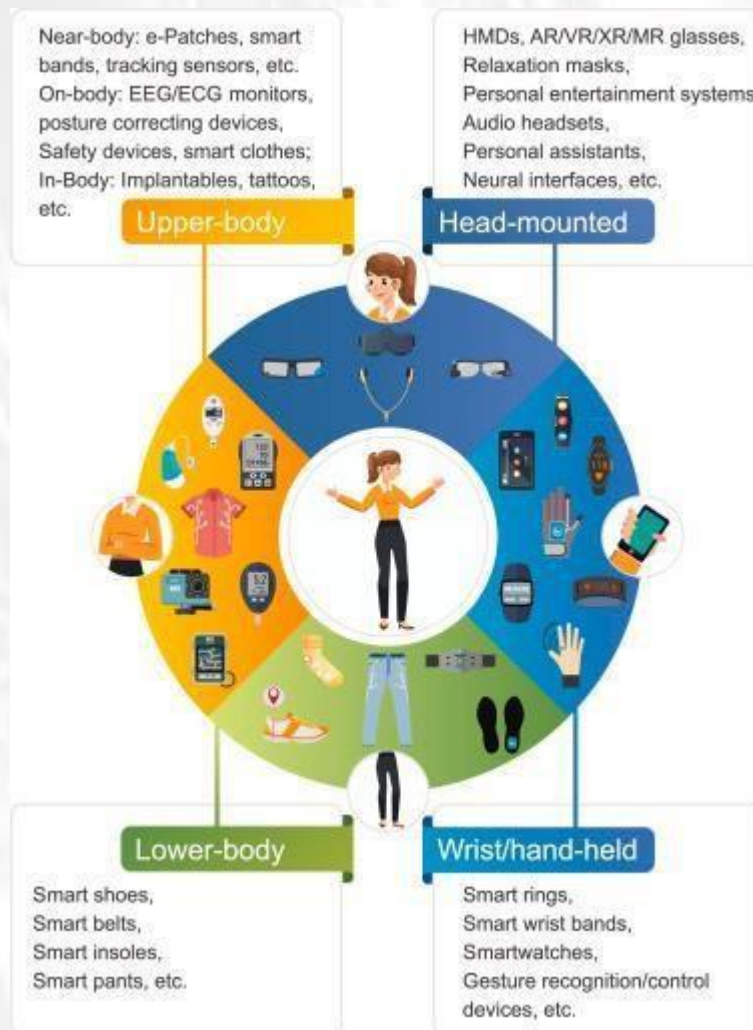


The proposed system is able to provide fast and secure connectivity for simultaneous monitoring of multiple patients. The monitored information is forwarded to hospitals, medical servers, doctors, cloud, and mobile systems for remote monitoring purposes. In this study, we provide a novel technical solution for monitoring patients remotely. A robot system with OCC is also proposed to monitor the health data of multiple patients in hospital. We provide several eHealth solution scenarios for better understanding of the proposed eHealth architecture.

K.NIKITHA
(II YEAR)

UPCOMING FIFTH-GENERATION (5G):

The 5G Public Private Partnership aiming for new 5G-enabled markets in the fields of intelligent transport, smart cities, entertainment, media, electronic health (eHealth), and education. Commercialization of 5G is expected to have a huge impact on the implementation of eHealth systems. According to the World Health Organization (WHO),^{2,3} eHealth is the use of ICT for health. ICT-based devices, apparatus, and facilities are included in eHealth systems, and they enhance the performance of the medical sector by providing excellent monitoring, diagnosis, medication, prevention, and management systems. The use of ICT for healthcare can benefit the whole community by improving the system for access to care and quality of care. An eHealth system includes real-time remote monitoring of patients, exchanging medical records among patients, expert physicians, and health service providers through hub of medical information networks, recording patient health information and storing eHealth records on the cloud, providing remote monitoring and diagnosis facilities, provision of global access of medical data, monitoring patients remotely in and outside hospitals, and robotized patient monitoring and surgery.^{4–6} Various services offered by eHealth systems can improve medical facilities and help in the decision-making process. eHealth solutions can be effectively used in every aspect of our lives. 5G communication is essential for the deployment of the real phase of eHealth systems. The upcoming 5G communication can provide services with ultra-low latency, ultra-high system capacity, ultra-high security, massive device connectivity, ultra-low energy consumption, and extremely high quality of experience.



This article aims to provide a novel framework for future 5G eHealth architecture based on optical camera communication (OCC). The 5G capabilities for eHealth solutions are considered. OCC,7,8 a sub system of optical wireless communication (OWC),9 uses light-emitting diodes (LEDs) or LED arrays as the transmitter and a camera or image sensor (IS) as the receiver. The proposed OCC based 5G eHealth solutions can be applied to different places such as hospital, sports, homes, public places, workplaces, and pharmacies. Hospital solutions include real-time monitoring of patients in hospitals and ambulances as well as assisting in medical data transfer, storage, and sharing, among other tasks.

Sports solutions include remote monitoring of players and remote caring for emergency cases, if any. Home-based eHealth solutions provide remote monitoring of healthy patients and old patients or those with disabilities. eHealth solutions for public and workplaces deal with providing emergency solutions to the public and employers, respectively, using smartphones or other smart devices. Inter connecting pharmacies with hospitals or medical specialists provide for a quick exchange of prescriptions and information about medicines as well as their storage in respective server. On the other hand, the application of OCC for human visual communication is also growing significantly.¹⁰ Besides, OCC-based eHealth system can be effective in providing treatment during spreadable diseases such as COVID-19.

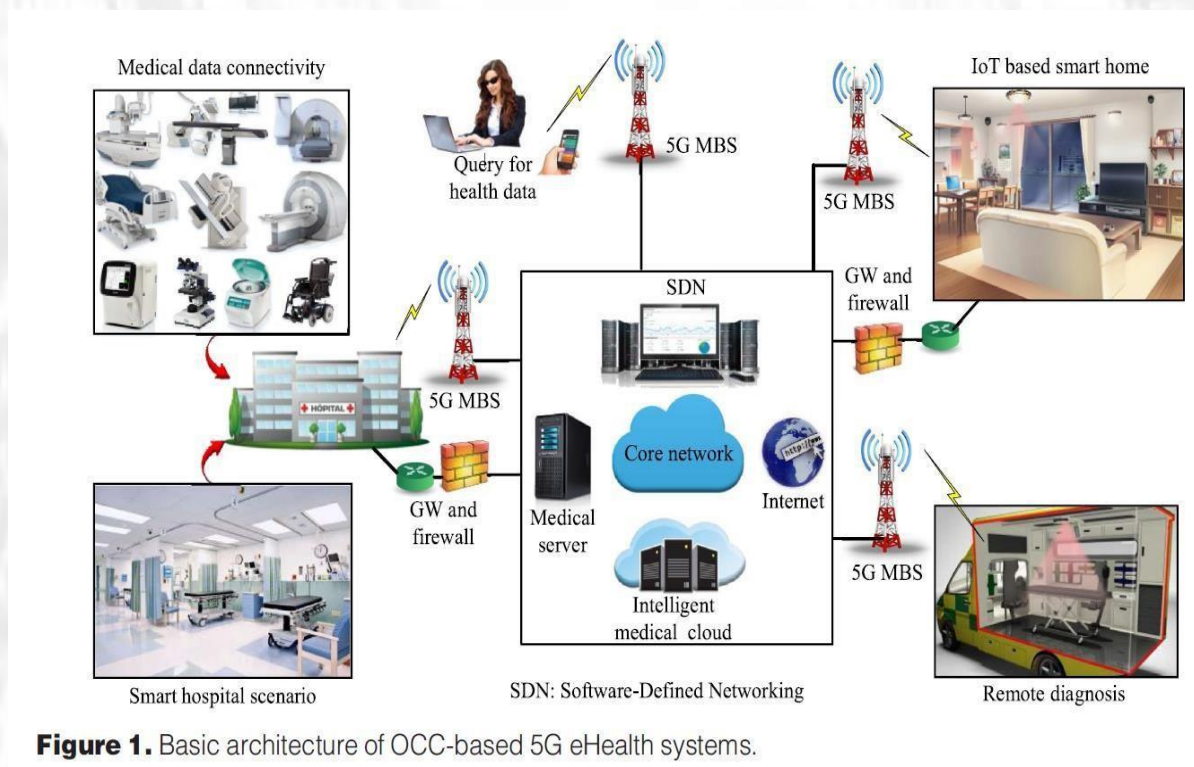
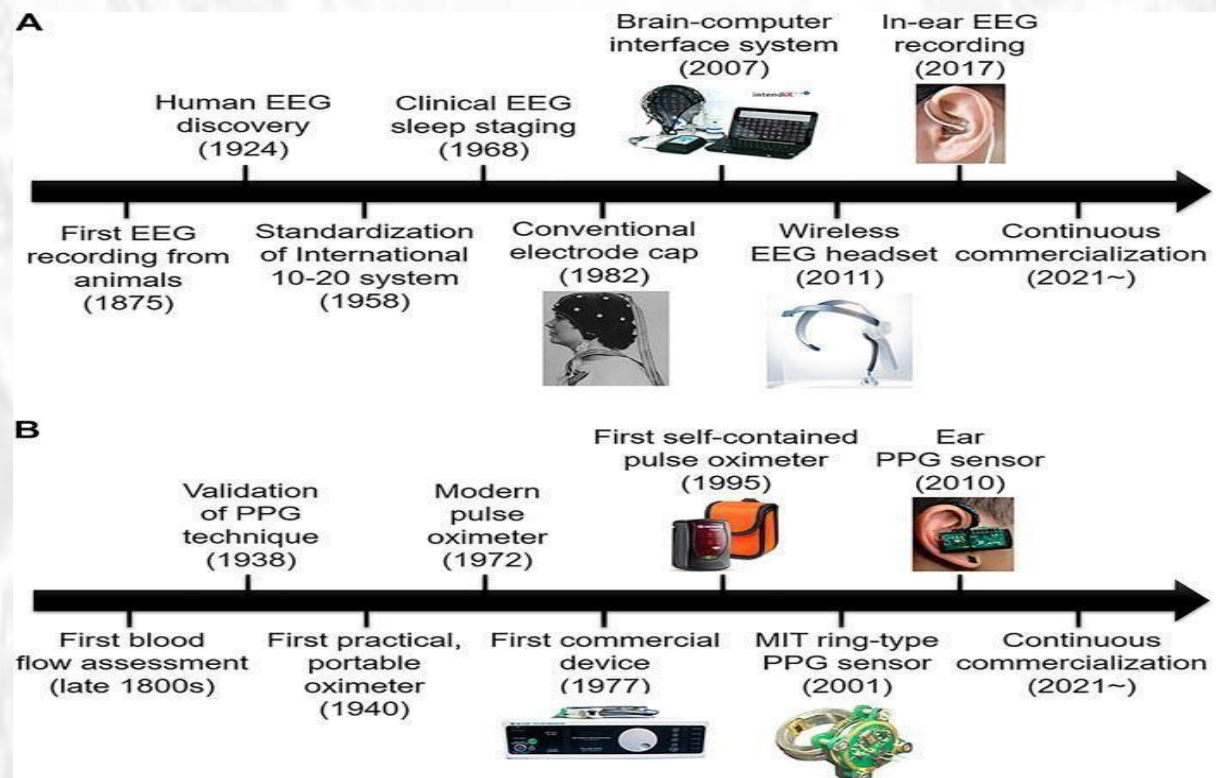


Figure 1. Basic architecture of OCC-based 5G eHealth systems.

This interference can result in mal functioning of the medical devices (e.g., errors in reading, automatic restart/shutdown, and wave form distortion).¹¹ Consequently, it can potentially be harmful to patients. Therefore, the designing of wireless communication systems for eHealth services should be done very carefully, especially for hospitals or other health care centers. Therefore, we propose OCC-based eHealth solutions. OCC-based systems can provide highly reliable communication for access network-to-sensor/patch connectivity. The application of an OCC system to a healthcare system is a novel idea.



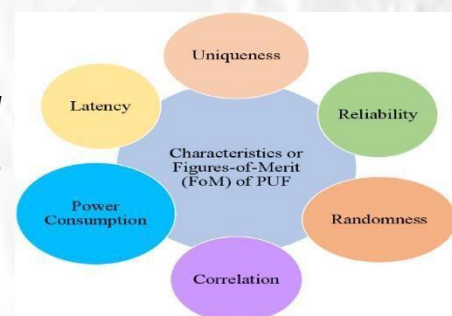
The patients have wearable sensors/patches with LEDs or LED arrays. Sensors/patches measure the health data, e.g., electrocardiography (ECG), electroencephalogram (EEG), photoplethysmogram (PPG), electromyography (EMG), pulse rate, and blood pressure, whereas LEDs or LED

arrays transmit the information. The OCC systems receive the medical information and forward it to the desired destination, e.g., hospitals, doctors, servers, and smartphones. The contribution of this article can be summarized as follows. An overview regarding eHealth is presented. The features of OCC-based eHealth system are discussed. A novel technical solution based on OCC for monitoring patients remotely is proposed. A robot system with OCC to monitor the health data of multiple patients in hospital is proposed. OCC-based several eHealth solution scenarios for better understanding of the proposed eHealth architecture are presented. The challenges for OCC-based eHealth system are discussed.

D.KANIMOZHI
(FINAL YEAR)

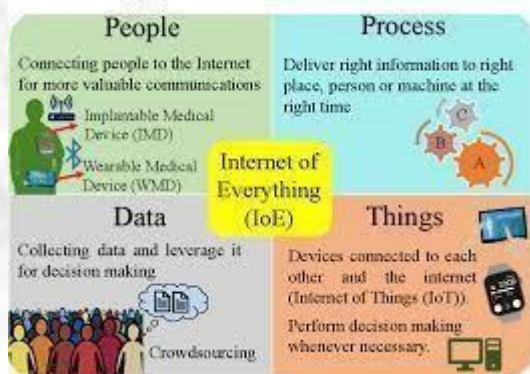
PUFchain: A Hardware Assisted Blockchain for Sustainable Simultaneous Device and Data Security in the Internet of Everything (IoE)

This article presents the first-ever blockchain that can simultaneously handle device and data security, which is important for the emerging Internet-of-Everything (IoE). It presents a unique concept of blockchain that integrates hardware security primitives called physical unclonable functions (PUFs) to solve scalability, latency, and energy requirement challenges and is called PUFchain.



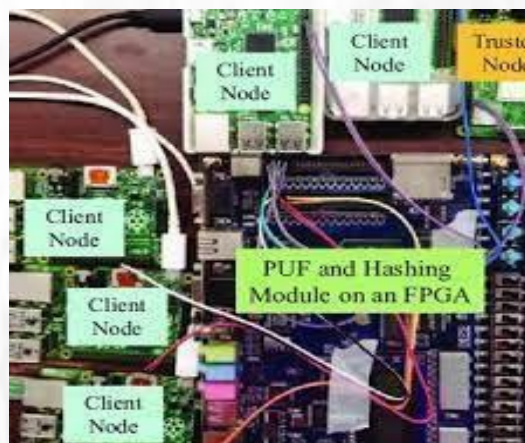
This article also introduces a new consensus algorithm called “Proof of PUF-Enabled Authentication” (PoP) for deployment in PUFchain. PoP is 1000 times faster than the well-established proof-of-work (PoW) and 5 times faster than proof-of-authentication (PoAh).

ELECTRONIC FINANCIAL TRANSACTIONS helped grow E-commerce in leaps and bounds.¹ But in presence.¹ Blockchain provides an answer to many issues. Every participant having a copy of the entire or partial ledger of transactions, makes the entire process transparent. Since its introduction in 2008, it has been explored for a variety of applications.



The Internet of Things (IoT), a possible application of blockchain, is part of a bigger environment, the Internet-of-Everything (IoE). With the increased number of devices in

IoE environments, the number of vulnerabilities increase at the same rate.^{5–7} Every new device can potentially act as a different entry point for attackers. The blockchain uses cryptographic hash functions for maintaining consistency and security in the ledgers.⁸ Various IoT devices are prone to



attacks and data safeguarding has become a major issue. The blockchain can be a potential solution with an integration into IoT architectures.

V.YOGESHWARAN

(FINAL YEAR)

Blockchain Technology:

In a nutshell, a blockchain is a sequence of blocks and provides a decentralized book keeping mechanism. Blocks are linked together using hash values, and any type of records can be embedded into the block.

Depending on the way the blockchain is constructed, a proof field is used to store different information to demonstrate the validity of this block. Each participant of the system maintains

his/her own local copy of the blockchain, and they follow a predefined consensus protocol to determine the next block to be added. Blockchain technology has found many applications,5,6,11,13 and is used to build cryptocurrency systems without relying on a centralized party. The basic idea is to embed transactions into blocks and store the complete transaction history on the blockchain. Because of the public accessibility and the immutability feature, every participant can detect double-spending himself/ herself, and the consensus mechanism



guarantees that as long as the majority of participants are honest, every double-spending transaction will be rejected. More specifically, a blockchain based cryptocurrency system has two basic functions: currency creation and currency transfer. We only consider public blockchain-based cryptocurrency system in this article as it is harder to be taken over by a small group of malicious participants.

G.VIVEAK
(PRE-FINAL YEAR)

Jelly Fish - A Source of Electricity

Jellyfish are found in every ocean, from the surface to the deep sea. A few jellyfish inhabit freshwater. Large, often colorful, jellyfish are common in coastal zones worldwide. Jellyfish have roamed the seas for at least 500 million years, and possibly 700 million years or more, making them the oldest multi-organ animal. Jellyfish bloom formation is a complex process that depends on ocean currents, nutrients, sunshine, temperature, season, prey availability, reduced predation and oxygen concentrations. Ocean currents tend to congregate jellyfish into large swarms or "blooms", consisting of hundreds or thousands of individuals. Blooms can also result from unusually high populations in some years. Jellyfish are better able to survive in nutrient-rich, oxygen-poor water than competitors, and thus can feast on plankton without competition. Jellyfish may also benefit from



saltier waters, as saltier waters contain more iodine, which is necessary for polyps to turn into jellyfish. Rising sea temperatures caused by climate change may also contribute to jellyfish blooms, because many species of jellyfish are relatively better able to survive in warmer waters. Here the jelly fish has a vitamin called Green fluorescent protein Aequorea Victoria jelly fish harbors a specific protein called Green Fluorescent Protein (GFP) that fluoresces after absorbing UV radiation. This fluorescence reveals to us that this protein does transform energy and re-emits it after absorbing energy from UV radiation. If an efficient design is created, more colors of fluorescing proteins will be able to be incorporated, and thus further increase the efficiency of the dye-sensitized solar cell by expanding the range of spectra that can be absorbed by the cell and transformed into electricity. Already, there are designs of dye-sensitized solar cells that include many color of dyes together in one array.

N.KAVINESH
(FINAL YEAR)

New Technology for Grid Level Electrical Energy Storage

Nowadays, many industrialized nations are shifting to plan towards a sustainable future with efficient use of renewable energy resources. But electrical energy storage is the obstacle preventing more widespread use of renewable energy sources such as wind and solar power due to their unpredictable nature. Batteries store a large amount of energy, but are relatively slow in discharging it and they have a limited

lifespan, or cycle-life. whereas on other hand conventional super capacitors, similar to lithium-ion batteries, can provide a high power output with minimal degradation in performance and can rapidly store and discharge energy, but only in small amounts compared to the battery.

The Drexel's team of researchers is putting forward a plan to integrate into the grid an electrochemical storage system that combines principles behind the flow batteries and super capacitors. The "electrochemical flow capacitor"

(EFC) consists of an electrochemical cell connected to two external electrolyte reservoirs - a design similar to existing redox flow batteries which are used in electrical vehicles. This technology is unique because it uses small carbon particles suspended in the electrolyte liquid to create slurry of particles that can carry an electric charge. Uncharged slurry is pumped from its tanks through a flow cell, where energy stored in the cell is then transferred to the carbon particles.



K.POOJA
(FINAL YEAR)



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