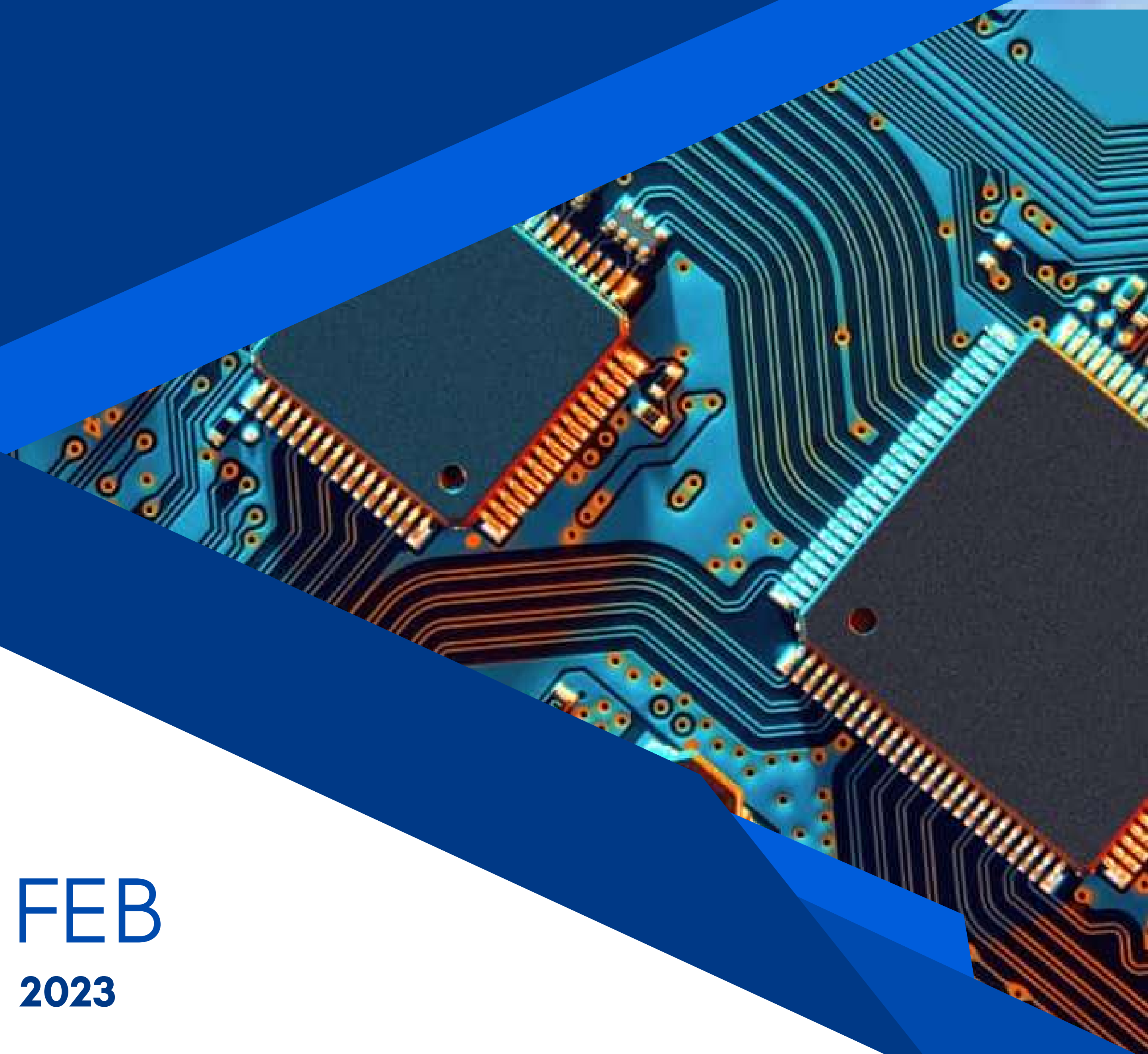

FEB

2023

CIRCUIT TIMES

VOLUME - II
ISSUE-2

SVCE
SRI VENKATESWARA COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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VISION OF THE DEPARTMENT

To excel in offering value based quality education in the field of Electronics and Communication Engineering, keeping in pace with the latest developments in technology through exemplary research, to raise the intellectual competence to match global standards and to make significant contributions to the society.

MISSION OF THE DEPARTMENT

- To provide the best pedagogical atmosphere of highest quality through modern infrastructure, latest knowledge and cutting edge skills.
- To fulfill the research interests of faculty and students by promoting and sustaining in house research facilities so as to obtain the reputed publications and patents.
- To educate our students, the ethical and moral values, integrity, leadership and other quality aspects to cater to the growing need for values in the society.

Program Educational Objectives (PEOs)

PEO1: Create value to organizations as an EMPLOYEE at various levels, by improving the systems and processes using appropriate methods and tools learnt from the programme.

PEO2:Run an organization successfully with good social responsibility as an ENTREPRENEUR, making use of the knowledge and skills acquired from the programme.

PEO3:Contribute to the future by fostering research in the chosen area as an ERUDITE SCHOLAR, based on the motivation derived from the programme.

Program Specific Outcomes (PSOs)

PSO-1: An ability to apply the concepts of Electronics, Communications, Signal processing, VLSI, Control systems etc., in the design and implementation of application oriented engineering systems.

PSO-2: An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical and managerial skills to arrive appropriate solutions, either independently or in team.

ARTICLE

Recent Trends in Machine Learning for Clinical & Healthcare Sector

Dr.R.Gayathri, Professor, ECE, Sri Venkateswara College of Engineering.

Abstract:
In order to create new medical algorithms for image processing, deep learning has attracted a lot of research attention. Nowadays, deep learning-based models have proven to be extremely effective in a range of medical imaging tasks that enable illness identification and diagnosis. Despite their effectiveness, the absence of substantial and thoroughly annotated datasets severely restricts the advancement of deep learning models in medical image analysis. Many studies have been done in the last five years with the goal of solving this problem. Here, we have evaluated and synthesized these latest works in order to present a thorough overview of the use of deep learning techniques in diverse medical image analysis. We focus in particular on the most recent developments and contributions of cutting-edge unsupervised and semi-supervised deep learning in medical image analysis, which are compiled based different application scenarios, including classification, segmentation, detection, and image registration.

Deep Learning Methods - an Overview

Deep learning can be generally categorized as supervised, unsupervised, or semi-supervised learning depending on whether labels from the training dataset are available. After all training images have been labeled, the model is optimized using image-label pairs in supervised learning. The improved model will produce a likelihood score to forecast the class label for each test image. In unsupervised learning, the model will search for and recognize underlying patterns or hidden datatypes without labels. If only a tiny percentage of the training data is labelled, the model will be enhanced by learning semantic and fine-grained features from the unlabeled data. This model learns input-output relationships from the labelled data. Semi-supervised learning is the term used to describe this kind of learning strategy

Supervised Learning

Convolutional neural networks (CNNs) are a widely used deep learning architecture in healthcare image analysis (Anwar et al., 2018). CNNs are mainly composed of convolutional layers and Layers are being merged. Fig. 1 depicts a simple CNN in a medical context and it explains the image classification task. The CNN directly takes an image as input and transforms it using convolutional layers, pooling layers, and other techniques fully connected layers, and finally outputs a class-based likelihood of that image.

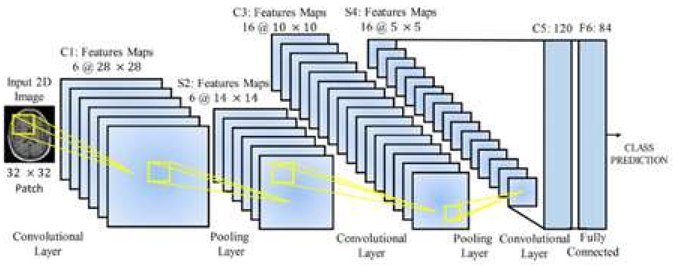


Fig.1 A simple CNN architecture for MRI images disease classification

At each convolutional layer l, a bunch of kernels K ={K1, . . . , Kk} are used to extract features from the input image and biases B = {B1, . . . , Bk} are added, generating new feature maps as follows

$$K_i^l x_i^l + B_i^l \quad (1)$$

when we introduce the activation function σ (.) The non linear transform becomes

$$x_w^{l+1} = \sigma(K_i^l x_i^l + B_i^l) \ (2)$$

A pooling layer is added after the convolutional layer to lower the dimension of feature maps and subsequently the number of parameters. Two typical pooling operations are average pooling and maximal pooling. Repeat the aforementioned procedure for the remaining layers. Fully linked layers are typically used at the network's termination to generate the probability distribution over classes using a sigmoid or softmax function. The projected probability distribution provides a label y for each input instance, allowing for the calculation of a loss function L(y, y), where y is the actual label. The loss function is minimised iteratively to optimise the network's parameters.

Supervised Learning

Auto encoders

The use of autoencoders in dimensionality reduction and feature learning is common. The simplest autoencoder, also referred to as the auto-associator at first (Bourlard and Kamp, 1988), is a neural network with just one hidden layer that learns a latent feature representation of the input data by minimising a reconstruction loss between the input and its reconstruction from the latent representation.

Simple autoencoders have limited representational capability because to their shallow structure, however deeper autoencoders with more hidden layers can enhance representation. Deep auto-encoders, also known as stacked auto-encoders (SAEs), may learn more complex non-linear patterns than shallow ones and, as a result, generalize beyond training data better than shallow ones by stacking several auto-encoders and optimizing them in a greedy layer-wise way.

An encoder network and a decoder network, which are frequently symmetrical to one another, make up SAEs. Regularization terms, such as sparsity constraints in Sparse Autoencoders, can be added to the initial reconstruction loss to further force models to acquire effective latent representations with desirable properties.

Generative adversarial networks (GANs)

A class of deep networks for generative modelling called generative adversarial networks (GANs) was initially put forth by Goodfellow et al (2014). A framework for estimating generative models is created for this architecture to take samples directly from the appropriate underlying data distribution without the requirement to establish a probability distribution in advance.

The generative model G maps z to data space as G(z, g), where G is a neural network with parameters g, and accepts as input a random noise vector z sampled from a prior distribution Pz (z), which is often either a Gaussian or a uniform distribution.

The training process is similar to playing a two-player minimax game. The generative model G is trained to maximise the log-likelihood of D making a mistake, and the discriminative network D is designed to maximise the log-likelihood of correctly labelling false samples and actual samples. G should gradually estimate the underlying data distribution and produce real samples through the adversarial process.

The performance was enhanced based on the vanilla GAN in two ways: 1) various loss (objective) functions, and 2) conditional settings. Wasserstein GAN (WGAN) is a typical example of the first direction. The Jensen-Shannon (JS) divergence in the original Vanilla GAN was proposed to be replaced with the Earth-Mover (EM) distance or Wasserstein-1, often known as the Wasserstein distance, in WGAN to calculate the separation between the real and synthetic data distributions (Arjovsky et al., 2017).

Because JS divergence saturates and results in vanishing gradients, the critique of WGAN has the advantage of providing usable gradients information. Moreover, WGAN may enhance learning stability and resolve issues like mode collapse.

Self-supervised learning

Natural language processing (NLP), where large amounts of unlabeled data are accessible for pre-training models (e.g. BERT, Kenton and Toutanova, 2019) and learning practical feature representations, has seen tremendous success with unsupervised representation learning in recent years. Following that, the feature representations are refined for use in tasks like text summarization, natural language inference, and question answering. Researchers in the field of computer vision have investigated a similar workflow in which models are first trained to learn rich and meaningful feature representations from the raw unlabeled image data in an unsupervised manner, and the feature representations are then fine-tuned in a wide range of downstream tasks with labelled data, such as classification, object detection, instance segmentation, etc. For a considerable amount of time, supervised pre-training has supplanted this method because it was less effective than in NLP. It's interesting to note that during the past two years, a surprising amount of research have reported that self-supervised pre-training performs better than supervised pre-training.

Self-supervised learning is a word that has been used interchangeably with unsupervised learning in recent literature; however, self-supervised learning actually refers to a type of deep unsupervised learning in which inputs and labels are generated independently from external supervision from unlabeled data.

The necessity to create new labelled datasets or gain high-quality annotations in specific sectors, like medicine, makes supervised activities, which are frequently expensive and time-consuming, a major driving force behind this technology. Despite the dearth and high cost of labelled data, many fields typically have access to substantial amounts of inexpensive unlabeled data that are underutilized. Unlabeled data is probably going to have useful information that is either missing or weak in labelled data.

Self-supervised learning can take advantage of the power of unlabeled data to boost productivity and effectiveness in supervised jobs. Features learned through self-supervised learning may potentially generalize more effectively in the actual world than those learned through supervised learning since it involves a larger volume of data.

Pretext task-based methods and contrastive learning-based methods can both be used to produce self-supervision. We will highlight further research in this direction because contrastive learning-based methods have attracted increased interest in recent years.

CONCLUSION

In the field of medical image analysis, widespread applications of recent innovations like MoCo and SimCLR have not yet been developed. Self-supervised contrastive learning is a relatively new concept. We believe studies utilising this new technique to interpret medical photos will quickly take off given the positive outcomes of self-supervised learning described in the literature so far. Self-supervised pre-training also has a lot of promise to be a powerful substitute for supervised pre-training.

References

1. Azizi, B. Mustafa, F. Ryan, Z. Beaver, J. Freyberg, J. Deaton, A. Loh, A. Karthikesalingam, S. Kornblith, T. Chen"Big self-supervised models advance medical image classification" Proceedings of the IEEE/CVF International Conference on Computer Vision (2021), pp. 3478-3488

2. Chen et al., 2019b, L. Chen, P. Bentley, K. Mori, K. Misawa, M. Fujiwara, D. Rueckert, Self-supervised learning for medical image analysis using image context restoration, Med. Image Anal., 58 (2019), Article 101539

STUDENT ARTICLE

EVOLUTION OF BIO-INSPIRED ANTENNAS

Ms.S. Lakshana, 3rd Year ECE

Over a century has passed since antennas were first employed for communication. Any wireless system that transmits information between two points must include them. Classical physics is a domain where designs are based on mathematical models and equations. It has frequently proved to be an inspiration for a myriad of antenna designs. But as scientists have looked to nature more and more for ideas, bio-inspired antenna design has emerged. It has greatly helped in the optimisation of its design.

A new discipline called "bio-inspired antenna design" seeks to create antennas that mimic the form and function of living things. Due to the promise of bio-inspired antennas to overcome the limits of conventional antenna designs, this topic has attracted a lot of attention. We shall examine the evolution of bio-inspired antenna design and technology in this post.

Bio-inspired antenna design is not a brand-new concept. Researchers have long drawn inspiration from nature and used biological ideas in a variety of engineering sectors. Researchers only started looking at the possibility of bio-inspired antenna designs in the last several decades, though.

Leaf shaped Micro strip antenna

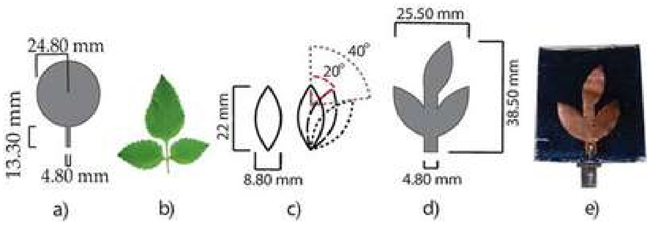


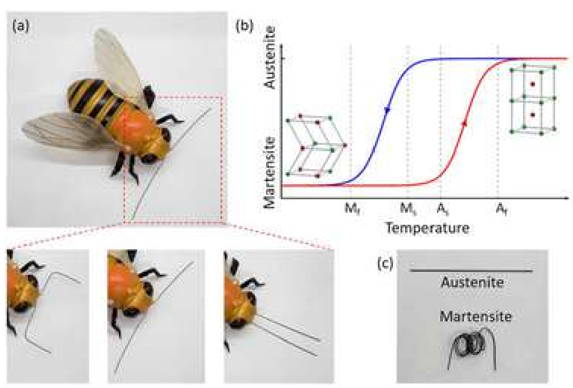
Image Courtesy - Wikipedia

The fractal antenna was one of the first bio-inspired antenna designs. The mathematical idea of a fractal, which is a geometric shape that displays self-similarity at various scales, serves as the foundation for the fractal antenna. A fractal antenna was an idea that was put forth in the 1980s by physicist Nathan Cohen of Boston University. He proposed that the Koch curve, a particular kind of fractal, might be used to guide the antenna's construction. Being multiband, fractal antennas have the advantage of functioning at several frequencies.

Fractal antenna inspired from snow fractals

Image Courtesy - Wikipedia

The insect antenna was yet another early bio-inspired antenna design. Researchers started looking into the prospect of employing the antennae that insects use to detect chemical and electrical signals for communication. A low-cost, high-gain antenna was created in the 1990s by University of California, Berkeley researchers based on the design of an insect antenna. The antenna was created to function at the typical mobile communication frequency of 900 MHz.



Researchers started looking into the possibility of employing biological organisms as antennas in the early 2000s. University of Illinois at Urbana-Champaign scientists created an implanted antenna in 2004 based on a beetle's anatomy. The antenna was made to be utilized for monitoring and other medical procedures.

Therefore today’s widespread usage of bio mimicking antennas proves how much of an inspiration nature can truly be! Many innovations in the 20th & 21st CE heavily used the concepts from nature & ossifies the belief that nature is the greatest element of inspiration.

EVENTS CONDUCTED

The MAZEBOT was an Intercollegiate Technical Event organized by the Department of Electronics and Communication Engineering in Association with The Institution of Electronics and Telecommunication Engineers-Students Forum on 23rd February 2023. A total of 10 teams with 3 participants participated in the event.

Mr.S. Elangovan, Faculty Coordinator gave the welcome speech followed by the presentation of IETE President's address.The Chief Guest Dr.S.Muthukumar, HOD-ECE, gave a special address to the students and encouraged the student's effective participation.

Dr.S.Muthukumar addressing the participants

The event commenced with a combative temperament, the students all participated with great vigor. The competition was lively throughout.The judges of the event Dr.S.R.Malathi Professor and Mr P Arul Assistant Professor, ECE Department were judging the Teams.

The cash price and the certificates were presented by Dr. S Muthukumar, HOD-ECE. The Vote of Thanks was read by Dr.T.J.Jeyaprabha, IETE-SF Coordinator. The event ended with the National Anthem.

Winners of the event

ACHIEVEMENTS

BY FACULTY

●Dr.G.A. Sathish Kumar, Professor served as a reviewer for the IEEE International Conference on Networking and Communications 2023 (ICNWC 2023) conducted by the SRM Institute of Science and Technology in Chennai.

●Dr. G.A. Sathish Kumar, Professor served as a reviewer for the Asian Journal of Mathematical Science.

●Dr. R.Gayathri, Professor served as a reviewer for the IEEE International Conference on Networking and Communication 2023) conducted by the SRM Institute of Science and Technology in Chennai.

●Dr. R.Gayathri, Professorserved as a reviewer for the BMC Medical Informatics and Decision Making, Springer Nature Journal.

● Dr.T.J.Jeyaprabha, ASP, has received Best IETE Student Forum Coordinator Award for the third time for the period 2021- 2022. This award was given by the Institution of Electronics and Telecommunication Engineers, Chennai Centre on 27.02.2023.

● Dr.T.J.Jeyaprabha, ASP, reviewed the book titled Electronic Devices and Circuits (4th edition) published by McGraw Hill Education (India) Pvt.Ltd.

● IETE-SF of SVCE bagged Best ISF Award 2021-22 for the third time. This time the award was received under the category - Maximum Corporate Membership. This award was given by the Institution of Electronics and Telecommunication Engineers, Chennai Centre on 27.02.2023.

BY UG STUDENTS

- Mr.G.Hariharan, III Year ECE and Mr.R.Harshavardhan, III Year ECE have presented their project in the LAB to MARKET CONCLAVE at IITM Research Park and won the Best Project award with a cash prize of Rs.10,000 on 18th February 2023.

- The Badminton (Men teams) secured the Winners position in the CM Trophy 2023. It was organized by the Sports Development Authority of Tamil Nadu held at Kanchipuram District stadium on 18 Feb 2023. In Badminton Men Singles Mr Sasidhar of III year ECE secured winning postion and recived cash prize.

- Mr. Sarveshwar. V, III Year ECE participated and won 3rd place in vignyan bhiksha - scientific quest (technical event) at prayatna'23 organised by AME of PSG College of Technology, coimbatore on 18/2/2023.

FACULTY PARTICIPATION

- Mr.L.K.Balaji Vignesh, Assistant Professor/ECE attended webinar on 06.02.2023 titled "Electromagnetic Simulation Using TaraNG" at QIS College of Engineering and Technology, Ongole.

- Mr.L.K.Balaji Vignesh, Assistant Professor/ECE attended FDP from 13.02.2023 to 17.02.2023 titled "Challenges and New Trends in Power Electronics" at JCT College of Engineering and Technology, Coimbatore.

- Dr.M.Bindhu, Mr.P.Arul, Mr. S.Elangovan, Mr. L.K.Balaji Vignesh, Assistant Professor ECE attended FDP on 21.02.2023 titled "Shift Innovation Resilient Strategies for Academics" at Sri Venkateswara College of Engineering (Autonomous), Sriperumbudur.

- Mr.K.Ragupathi, Assistant Professor/ECE has attended the National Level Workshop on “Simulation and Emulation of Self Organized Networks (SEASON-2023)” from 17-02-2023 to 18-02-2023 at Kongu Engineering College ,Erode.

- Mr.L.K.Balaji Vignesh, Assistant Professor/ECE attended International Conference on Artificial Intelligence and Smart Energy (ICAIS 2023) from 02.02.2023 to 04.02.2023 titled “Rectangular Microstrip Patch Array Antenna for Short Wave Radio Band Applications” at JCT College of Engineering and Technology, Coimbatore.

RESEARCH

PATENTS

- Dr.P.Jothilakshmi, Mr.V.Poonchezhian, Mrs.C.Gomatheeswari Preethika, Mr. R. Mohana Sundaram filed a design patent titled ANTENNA SIGNAL MONITORING SYSTEM (Application No : 375996-001, Cbr Number : 210184). The same was granted on 13/02/2023.

- Dr. A. Prasanth have published an International Patent (Application number: 2022/10003) titled A HYBRID DEEP NEURAL NETWORK-BASED INTRUSION DETECTION SYSTEM The South African Patent Office also grants it on 04/02/2023.

FACULTY PUBLICATION

The following research papers were published in journals by faculty and students during February 2023.

- Dr.A.Prasanth, "Self-diagnosis platform via IOT-based privacy preserving medical data" Measurement: Sensors, Volume 25, February 2023, pp.1-20.

- Dr.Kavitha Munishamaiaha, Hyperspectral Image Classification with a Deep Convolutional Neural Network Based on Enhanced Elephant Herding Optimization, MDPI -Electronics, 12, February 2023.

INTRAMURAL FUNDING

- Mr. T.Kishore Kumar, Mr. A.Kenwin Patrick and Mr. Mukesh Kumar of final year ECE mentored by Dr.P.Jothilakshmi, Professor received intramural funding of Rs.10,000/- for the project titled Miniaturized Microstrip Patch Antenna for Biomedical Applications.

- Mr.V.Aanant, Mr. S.Guhaneswar, Mr. G.K.Harish Kumar of final year ECE mentored by Mr.S.Elangovan, Assistant Professor received intramural funding of Rs.9000/- for the project titled LoRa Based Conveying Unit for Armed Force Trooper Monitoring System.

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