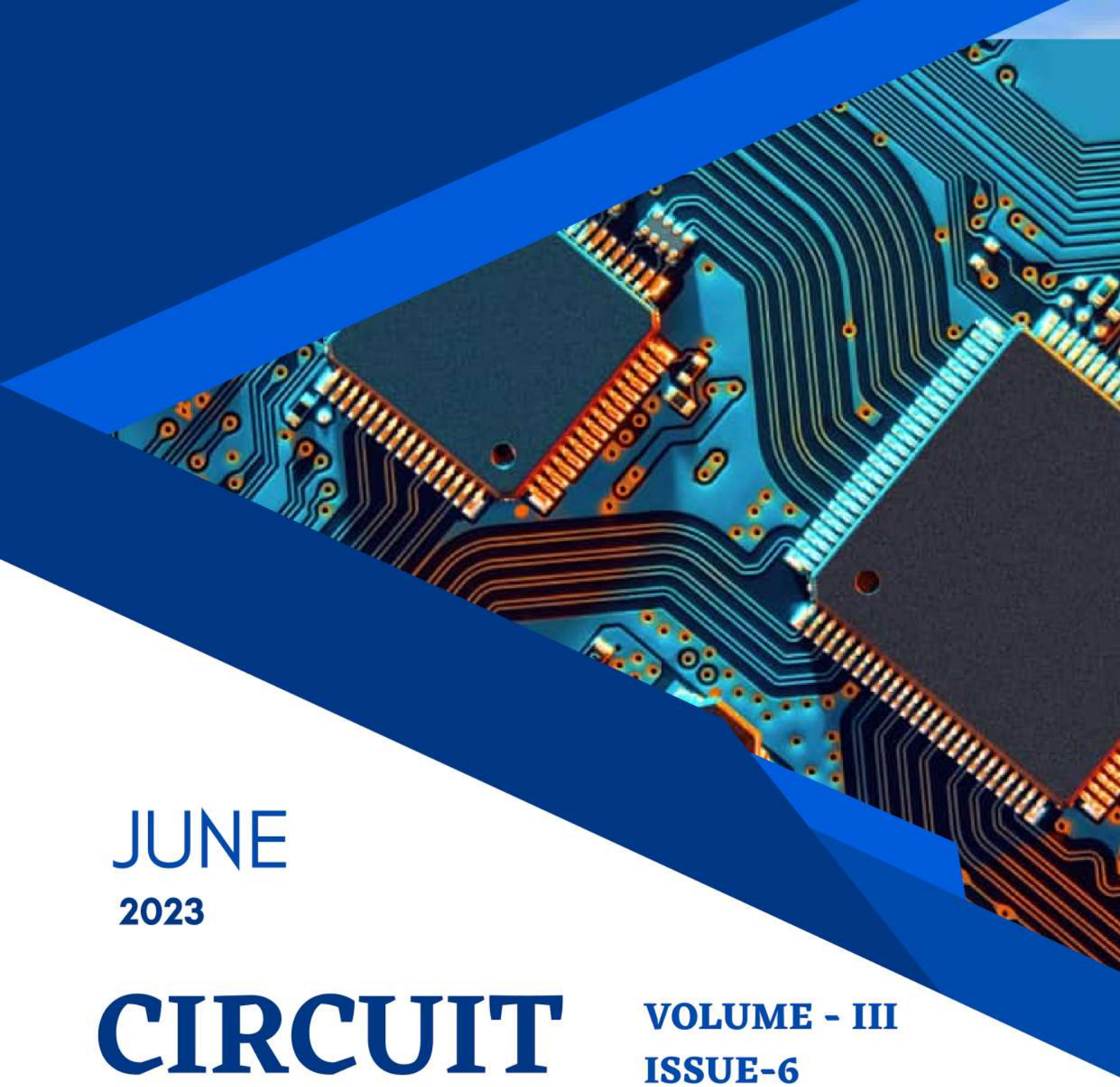

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SVCE | SRI VENKATESWARA COLLEGE OF ENGINEERING

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.

FACULTY ARTICLE

EXPLORATION OF GREEN ICT IN 5G

Dr.M.Bindhu, Associate Professor, Department of ECE, SVCE

Introduction

ICT development is propelling us into a period of a digital world and limitless opportunity. ICT technology does, however, have a negative side that adds to the growth of carbon footprint. According to the IBEA organization, global energy-related CO2 emissions increased in 2022 by 0.9%, or 321 million tonnes, hit a record high of more than 36.8 billion tonnes. As these will overwhelm the fundamental ICT pillars, namely Data Centers (DCs) and Mobile Networks (NT), Next Generation Networks (NGN) and the Internet of Things (IoT) will significantly increase this number. ICT power usage will increase as a result, increasing carbon emissions. As a result, businesses and researchers are always working to turn ICT into Green ICT.

MOTIVATION

Increased CO2 emissions pose a serious threat to the planet's ability to sustain itself. ICT may significantly contribute to reducing carbon emissions and enhancing environmental sustainability. The ICT sector's main problem, meanwhile, is that in helping other industries perform better environmentally, it imposes a heavy load on itself. As millions of devices join a network, massive amounts of data (Zeta-Bytes) will be produced and handled by data centers and access networks.

CONTRIBUTION

a. Data centers

Consideration is given to the most recent methods that could help data centers become greener by consuming less power. Dynamic provisioning, workload management, Power capping and shaving, Virtualization, AI-based, Effective cooling, and Effective data center design are among the techniques covered. Additionally, the significance of the carbon emission measures established by the International Telecommunication Union (ITU) and other standards, as well as data center Energy Efficiency (EE), are explored.

b.Mobile networks

The most recent methods in mobile networks are deployed to lower the power consumption of BS (Base Station) and Core networks to

further reduce the overall energy consumption of mobile networks. Antenna muting, Resource management strategies, Caching policies, Effective deployment, and power optimization of the BS Power-amplifier are methods that are covered to reduce base station energy usage. Additionally, methods to cut back on energy use at the network level are covered. These include scheduling algorithms, procedures for cell breathing and cell switching on and off, and approaches for backhaul power optimization.

c.IoT services

The performance of the gadgets related to IoT services affects QoE as it depends on the battery life. Therefore, many methods to extend battery life are considered. These include low power communication technologies, D2D-based techniques, effective charging procedures, power-saving modes, and Efficient System on Chip design solutions. These energy harvesting technologies are also being considered as a way to lessen the rebound effect caused by rechargeable batteries.

On the storage side, there are two significant developments: One is flash storage, which is been used on phones but now entering in data centers. Replacement of traditional disk drives, which are highly efficient compared to flashes on account of mechanical parts like spinning disk.

But nowadays, redesigned full version of software based flash storage are 50%more efficient than ordinary flash storage and its ten times more storage than traditional ones. Second, development is the design of hardware products to last many years, as traditional junk hardware creates enormous e waste. New hardware developed perfectly fits into the chassis, so any part which needs upgraded can be updated.

GREEN of ICT TECHNIQUES

Data centers, system-level hardware (linking BS), communication networks, and electronic devices (such as PCs, laptops, tablets, and IoT sensing devices) are the four pillars of the ICT sector [1]. Each of the four is a direct or indirect source of greenhouse gas emissions (GHGE).

1. Techniques to turn data centers into green data centers.

Since the last two decades, data centers have been a common piece of infrastructure for delivering IT services. Today's DCS are high-density server farms. The "Big Data Era" refers to the time period we are currently experiencing. Zeta Bytes is the current scaling up of the quantity of data processed, and further scaling up is anticipated in the future.

The handling of this disproportionately large amount of data will exacerbate global warming. Given that computation, data collecting, data transfer, and cooling the DC will all demand greater power.

a.Workload Management

It is a tool that assiduously tracks server performance so that remedial steps can be done to guarantee the least amount of energy use and effective resource allocation. Job resource requirements, time gaps between job arrivals, counts of jobs that need to be planned, job delay profiles, and the amount of time these jobs/tasks need to be completed are necessary properties for effective workload management [3].
In order to maintain service quality, it is important to overestimate peak traffic, which limits the possibilities for efficient resource utilization. ii) In addition, the selection of servers is complicated by the nonlinear relationship between power and cooling requirements, which lengthens the time needed for workload management.

b.Power capping and shaving

Power capping is a technique that effectively prevents circuit breakers from tripping by keeping the server's power usage below a predetermined cap amount. Thus, it might be assumed that it can also handle the cooling demand.

It can be used for data center UPS, CPU, and other equipment. Adjust the power allotment to each server in addition to power capping and power shifting [2] A related technology called "power shaving" uses a sizable transient current to rapidly minimize or "shave" unwanted power spikes, which limits the peak power needs at the data center and limits CAPEX and OPEX.

c.Virtualization

Using the best virtualization machine location and migration selections, data center IT equipment power consumption can be decreased. This unavoidably lowers the need for cooling, which in turn lowers the total amount of energy used and the CAPEX of DC.

d.Dynamic provisioning

Using the fewest number of servers necessary to supply the demand that is currently present and that could arise in the future is an efficient technique [4]. The load is distributed among the few servers that are now active, while the idle servers are put into sleep mode. The power consumption of data centers is thus decreased as a result of this power scaling method.
This technique has some drawbacks, including the need to i) adapt to changing demand while achieving a trade-off between energy proportionality and ramp-up latency for resource availability. ii) A significant demand for the active server

2. Techniques to convert network to green network

The enormous increase necessitates ongoing wired and wireless cellular network expansion. The rural and urban sectors will surely benefit from this growth's addition of upscale smart services.

a.Massive MIMO

It has been found that a sizable part of multimedia traffic is produced as a result of people downloading popular content repeatedly in duplicate. It is therefore necessary to switch from traditional Tx/Rx communication to content dissemination.
A highly effective 5G technology with the potential to boost EE and SE is massive MIMO. Beam forming and enormous antenna elements (far larger than the density of users) are two concepts that are integrated to create the massive-MIMO [1]. Beam forming controls energy, but MIMO takes advantage of spatial complexity. Additionally, massive-MIMO lowers the power consumption caused by PA by swapping out traditional PAs for inexpensive power amplifiers with milliwatt-level output power. By focusing the energy only on the equipment of the intended user, it reduces the power that is radiated

b. mm Wave cell

A hardware-based solution i.e. a low power phased array receiver to be used to enable low power consumption at mmWave BS.

c.Resource Management

In 5G, the idea of a radio resource has been expanded to cover both soft and hard resources, such as network node software capabilities and antenna T-N-C (Type-Number-Configuration). There are three categories of resource management (RM) techniques: power resource management (PRM), cloud resource management (CRM), and radio resource management (RRM). Algorithms for radio resource management (RRM) maximize spectrum use while preserving QoS. Along with managing variables like the bandwidth, modulation method, and transmission time slot. Its goal is to anatomize the energy and efficiently schedule the user in accordance with their needs.

3. Techniques to convert core network to green-network (Green-NT)

Overprovisioning is done to withstand the high traffic hours, However during lower traffic hours, it only serves to use more energy. Additionally, the conventional network is

designed with redundancy to ensure dependability and fault tolerance. Adding more network equipment also increases energy usage.

a.Efficient routing with cancellation and scheduling algorithms

The quantity of routers needed has increased due to the incredible rise of Internet data. In turn, this has increased overall energy usage. The situation can be predicted using the numerology provided by the Rocket-fuel project [1], which collected data from 45,000 routers that are exclusively owned by ten internet service providers.

A router's power use can be calculated using[1] the baseline power of the data plane, the environmental power, and the control plane is constant and unaffected by traffic. However, traffic has a considerable impact on the processing power/packet and the store-forward energy. Thus, a few approaches that have been suggested in the literature to reduce energy use are addressed here.

The three scheduling factors can aid in lowering energy consumption for cellular networks. A few examples are scheduling with rate, power, and fairness constraints. The fairness constraint solution ensures that resources are distributed fairly among users, the power constraint solution is dependent on channel circumstances, and rate constraint solutions establish transmission rates based on predetermined weights. The scheduling methods for cellular and sensor networks can be roughly divided into four categories: bandwidth scheduling, job scheduling, topology transparent, multi-hop scheduling,

b.Backhaul network power optimization

Traditional macrocells with a dense deployment of low-power, low-cost base stations are undoubtedly an answer to the exponential increase in traffic. The energy-intensive backhaul that combines the traffic from each base station limits the benefits of heterogeneous network installations.

4. CONCLUSION

The deployment of new networks without decommissioning existing ones, along with an increase in the number of users requesting ever-increasing data rates, will undoubtedly make the green problem more difficult and complex. We must therefore acknowledge that if a vigorous green transformation is not started, ICT energy consumption will most likely increase over the course of the next ten years.Research efforts should stop this

exponential growth and provide the framework for creating, running, and maintaining future environmentally friendly networks.

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STUDENT ARTICLE

A Deep Learning Approach for Underwater Fish Species Classification

K. PANNAVE , R. PRITHA , S. NIVETHASREE (IVth Year ECE)

Introduction

There are many technologies available that can be utilised for fish identification and categorization, from conventional techniques like underwater cameras to cutting-edge tools like artificial intelligence and computer vision. Underwater cameras can be fixed to moving objects, buoys, or permanent structures. The detected fish species can subsequently be identified and categorised using the collected photos and videos. Our goal is to use a Convolutional Neural Network (CNN) with a Squeeze-and-Excitation (SE) architecture to classify fish in 2D images. Out of the 15 fish categories present in the FishClef-2015 dataset, we have used seven of them . The accuracy of our model during training and validation was 93.50% and 96.09%, respectively.

Architecture

Pre-Trained Model

Deep learning pre-trained models are neural networks that have already been trained on a huge amount of data and can be utilized as a starting point for a variety of tasks rather than beginning from scratch. They are created to extract significant characteristics from unprocessed input, such as images, sounds, or text. When opposed to developing models from scratch, pre-trained models are advantageous since they conserve time and resources.

Transfer Learning

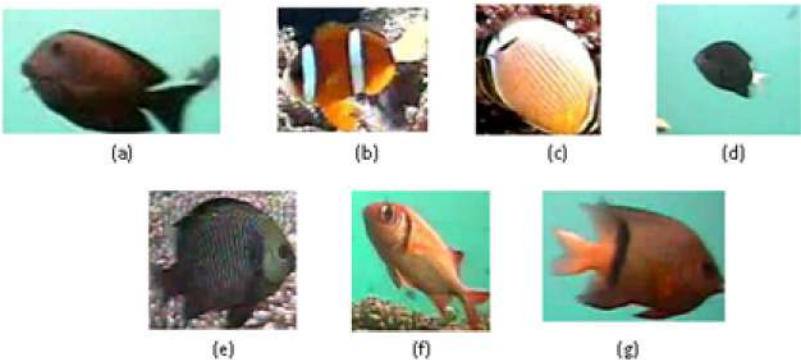
One of the key challenges in DL-based fish classification isthe high degree of intra-class variation, or the differences in appearance and behavior within the same fish species. Using a pre-trained neural network model that has been taught on one task or domain as a starting point for training a new model on a different but related task or domain is known as transfer learning, which is a potent deep learning technique. This strategy enables the pre-trained model's knowledge and characteristics to be used by the newly created model, hastening convergence and improving performance, especially when the newly created task contains little data.

Train-test-validation split

The data should be divided into three groups: a test set, a validation set, and a training set. The largest data collection, called the training set, is what the model is trained on. The model is fitted to this set of data, and minimising errors on this set is the objective. A smaller data set called the validation set is used to fine-tune the model's parameters. We can change these settings to enhance the model's performance by assessing the model's performance on the validation set. After the model has been trained and validated, it is utilised with a test set of data to assess its ultimate performance. Training, validation, and testing set percentages are 80%, 10%, and 10%, respectively.

Squeeze-and-Excitation Network (SENet) - Feature Extraction and Fine Tuning

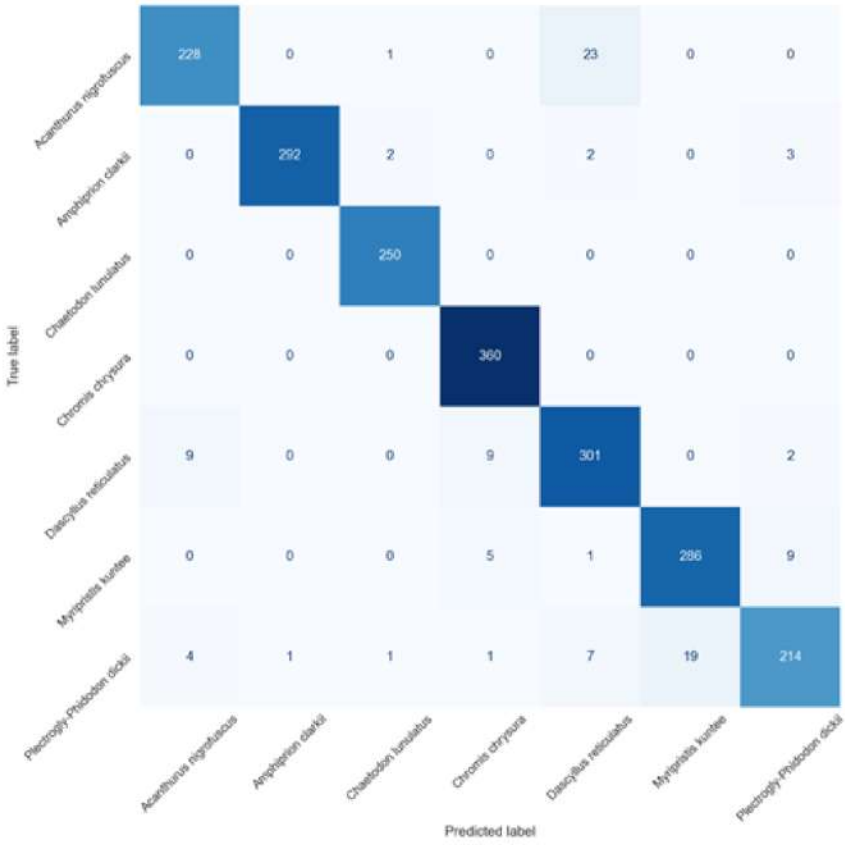
Inception v3 receives an input of an RGB image with dimensions of 299x299x3. Convolution, pooling, and auxiliary layers of Inception v3 are used to process the image. The final layer of softmax classification is eliminated. As a result, we extracted the learnt features using the pre-trained Inception-v3 model as a feature extractor. The pre-trained Inception-v3 model is then fine-tuned by adding a number of dense layers and updating the model weights during training with our dataset. The additional dense layers therefore stimulate the features taken from Inception v3.



(a) Acanthurus nigrofuscus (b) Amphiprion clarkia
(c) Chaetodon lunulatus (d) Chromis chrysura
(e) Dascyllus reticulatus (f) Myripristis kuntee
(g) Plectrogly-Phidodon dickii

Results

A neural network's training procedure involves a single run over the full training dataset, or epoch. The number of epochs for our model is set at 25, taking into account the difficulty of the problem statement, the quantity of the dataset, and the neural network's design. Our model's accuracy during training and validation is 93.50% and 96.09%, respectively.



ACHIEVEMENTS

BY FACULTY

- Dr.N.Kumaratharan, Professor/ECE has Completed Innovation Ambassador Advanced level Training Certificate on 29/06/2023.

- Dr.N.Kumaratharan has successfully completed FDP on Leadership and Administration conducted by PALS during the academic year 2022-2023

- Dr.S.Vijayanand has successfully completed one week online FDP on “Real TimeAutomation Solutions using AI” organized by the Department of Electronics and Communication Engineering, Hindusthan College of Engineering and Technology from 19.06.2023 to 23.06.2023.

- Mr.L.K.Balaji Vignesh has successfully completed one week online Indo-US Varja Course on “Fundamentals of Electromagnetics” organized by National Institute of Technology Silchar, Jawaharlal Nehru University Delhi, and California State University Northridge in Association with IEEE Kolkata SectionAntennas and Propagation Society Joint Chapter-Silchar and IEEE Silchar Subsection from 12.06.2023 to 16.06.2023.

- Dr.N.Kumaratharan, Prof/ECE and Dr. Nalin Kant Mohanty, Prof/EEE received the Trophy from Dr. V. Kamakoti, Director IIT Madras, for best actively participating college during the academic year 2022-2023, under the events organized by PALS on 3rd June 2023.

FACULTY PUBLICATION

- Dr.M.Bindhu, has published the paper “Hybrid Intermission-Cognitive Wireless Communication network”, Lecture Notes in Networks and Systems-Springer, 2023-06.

PARENT TEACHERS MEETING

Parent-Teacher Meeting is conducted for First Year Students (Academic Year 2022-23) organized by Department of Electronics and Communication Engineering held at Sri Venkateswara College Of Engineering on17.06.2023

- Parents felt they had a very good interaction with HOD and all subject handling faculties.
- Parents felt that the curriculum was found to be excellent and contents of the core papers are very good.

INDUSTRIAL VISIT

- First year ECE Students have undergone Industrial visit to Satish Dhawan Space Centre (SDSC SHAR), Shriharikota, Nellore from 15.05.2023, 17.05.2023 and 18.05.2023

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