R E P O R T

Seasonal School on Revolutionary Solutions for Biomedical Signal and Image Analysis using AI

EVENT DATE:
1st to 5th August, 2023

ORGANIZED BY:
IEEE SPS Gujarat Chapter
in association with IEEE SCET SPS SBC & IEEE SCET
Student Branch & IEEE CKPCET SPS SBC & IEEE
CKPCET Student Branch

TEAM BEHIND THE EVENT:

General Chair: Dr. Chirag Paunwala
Program Chair: Dr. Mita Paunwala, Dr. Arpan Desai
Treasurer: Prof. Neeta Chapatwala
Organizing Chair: Dr. Ketki Pathak, Dr. Amisha Shah
Committee Members: Dr. Alpa Shah, Dr. Sarosh Dastoor, Ms. Tejal Surati
Student co-ordinators: Bhagya Patel, Aarya Shah, Prakash Bhutaiya, Harsh Bhaliya

EVENT BANNER

Seasonal School on Revolutionary Solutions for Biomedical Signal and Image Analysis using AI 2023

📅 1st – 5th August

🕐 5:30 PM to 7:30 PM IST

🚫 No Registration Fees
Registration is Mandatory

📄 Participate in Sessions and Quizzes for Certificates

📣 Attractive Prizes for Quiz Winners

ONLINE MODE

SCAN TO REGISTER

GENERAL CHAIR
- Dr. Chirag Paunwala

PROGRAM CHAIR
- Dr. Mita Paunwala
- Dr. Arpan Desai

TREASURER
- Prof. Neeta Chapatwala

ORGANIZING CHAIR
- Dr. Ketki Pathak
- Dr. Amisha Shah

COMMITTEE MEMBERS
- Dr. Alpa Shah
- Dr. Sarosh Dastoor
- Ms. Tejal Surati

STUDENT COORDINATORS
- Bhagya Patel   : +91 9099883077
- Aarya Shah   : +91 9979941905
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Event Details:

Event Type: Project Competition
Event Mode: Hybrid
Event Platform: WebEx meet
Event Category: Technical Event
Event Date and Time: 1st to 5th August 2023, 17:30 IST to 19:30 IST
Event Accessibility: For registered participants

KPIs:

We present to our valued readers a selection of noteworthy highlights & key accomplishment that significantly contributed to the event's resounding success.

Number of Experts: 11
Total participation: 229
Average Feedback Assessed: 8/10

INTRODUCTION:

The "Seasonal School on Revolutionary Solutions for Biomedical Signal and Image Analysis using AI" was a five-day educational event dedicated to advancing knowledge and expertise in the fields of biomedical signal and image analysis, with a specific focus on the application of artificial intelligence (AI). The event brought together experts, scholars and students interested in exploring the intersection of AI and healthcare.
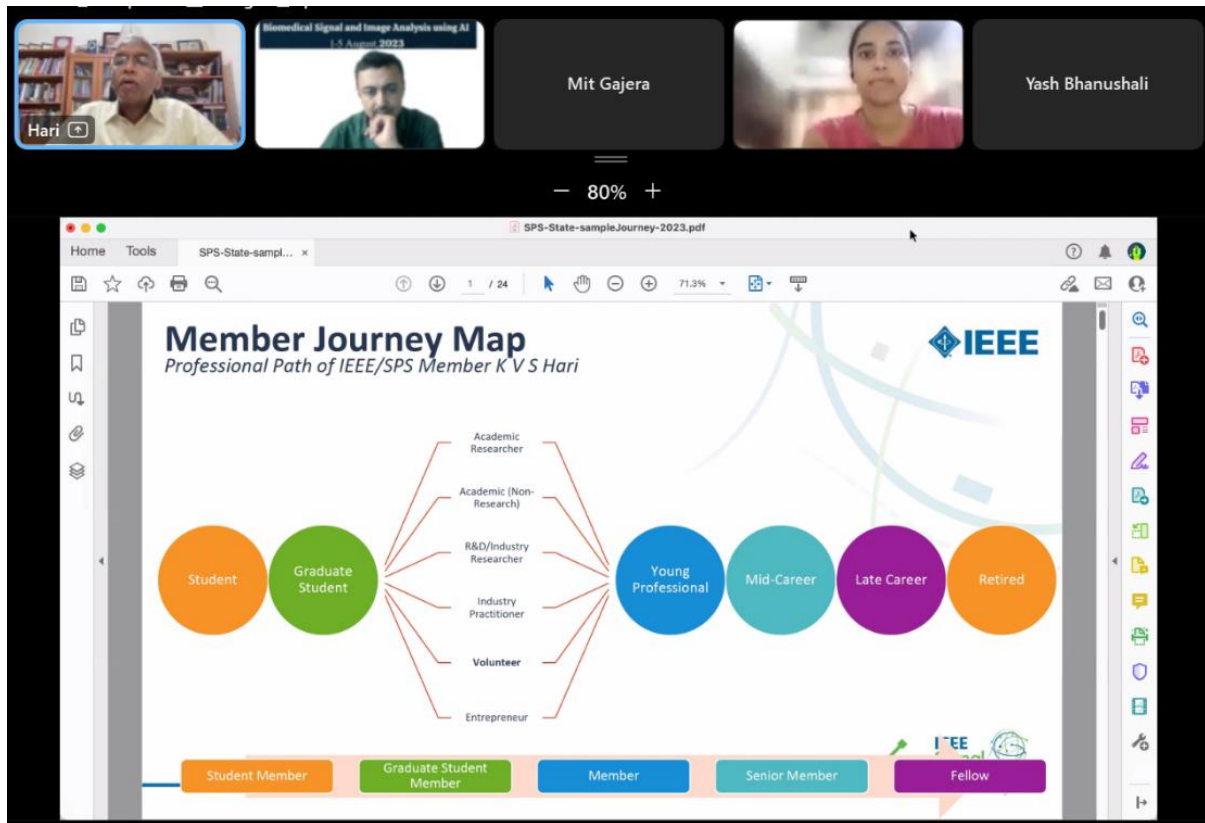

The event began by Prof. K. V. S. Hari sharing his wisdom setting the tine for the day by encouraging the students for participating in various activities held or organised under the banner of IEEE leading to the advantages of being a member of the Signal Processing Society by describing the hierarchy of the positions in the SPS and the eligibility criteria for the same.

Day 1 - August 1ˢᵗ, 2023

Talk 1 - "Introduction to Medical Imaging"
Presented by - Mohammad Faizal

In this talk, Mohammad Faizal from Ahmad Fauzi Multimedia University Malaysia introduced the fundamental concepts and principles of medical imaging. Participants likely gained insights into various medical imaging modalities such as X-rays, CT scans, MRI, and ultrasound.
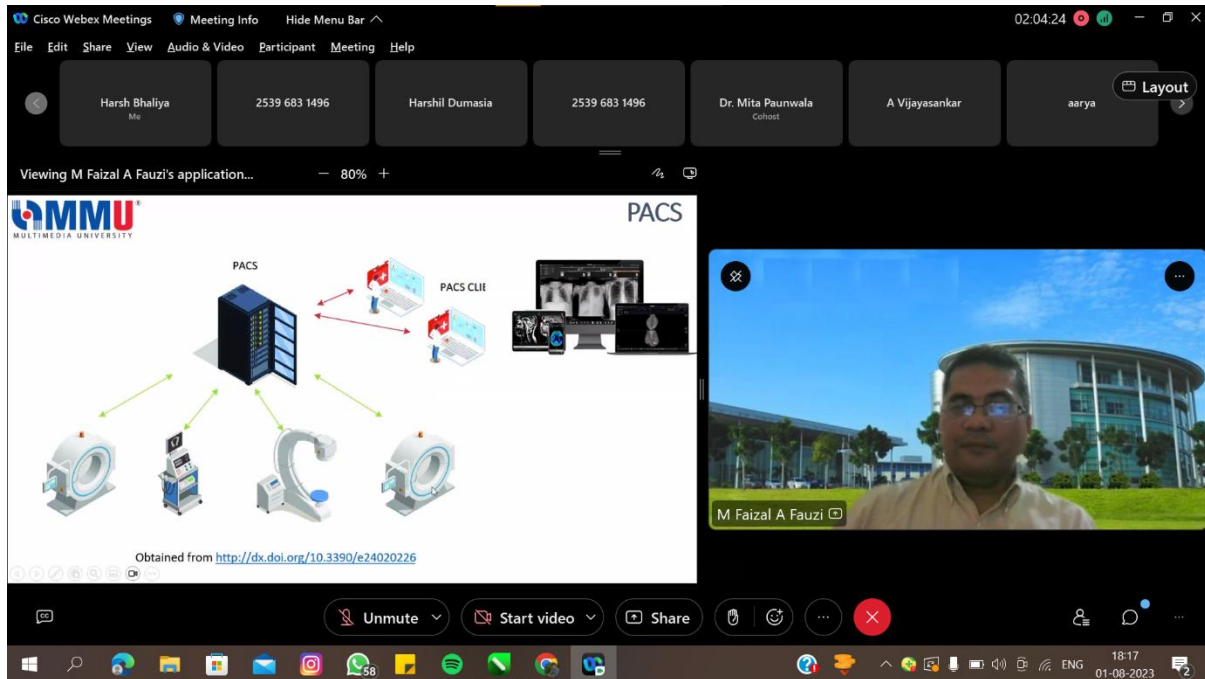
The talk covered how these techniques are used for diagnosis, monitoring, and research in healthcare. Faizal also discussed the importance of medical imaging in modern medicine and its role in non-invasive visualization of the human body.
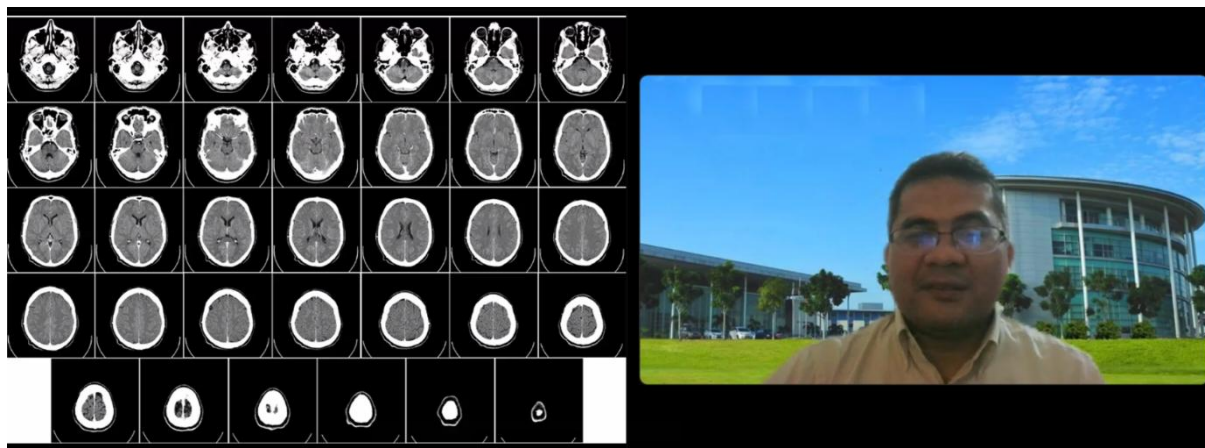
Prof. Faizal explaining the different images produced during the CT scan of a brain which can be used to map out the regions of tumours.

Talk 2 - "FOREST: White Matter Fiber Orientations Estimation using Deep Learning"
Presented by - Dr. Anubha Gupta

Dr. Anubha Gupta, a professor from IIT Delhi, presented a talk on "FOREST - White Matter Fiber Orientations Estimation Using Deep Learning." This talk delved into the application of deep learning techniques to estimate white matter fibre orientations in the brain.

White matter plays a crucial role in neural connectivity, and accurately estimating fibre orientations is vital for understanding brain function and disorders. Dr. Gupta discussed the challenges, methodologies, and potential clinical applications of this deep learning approach in   neuroimaging.

She used a branched multi- layer perceptron (MLP) model 'FOREST' for the estimation of the prominent white matter fiber directions in a voxel. The model architecture is chosen carefully to estimate the fiber direction, especially in the voxels with multiple fibers. We compared our model with the state-of-the-art diffusion ODF (dODF) and fiber ODF (f-ODF) estimation methods conventionally used for fiber orientation estimation. This work has recently been accepted at IEEE MLSP 2023
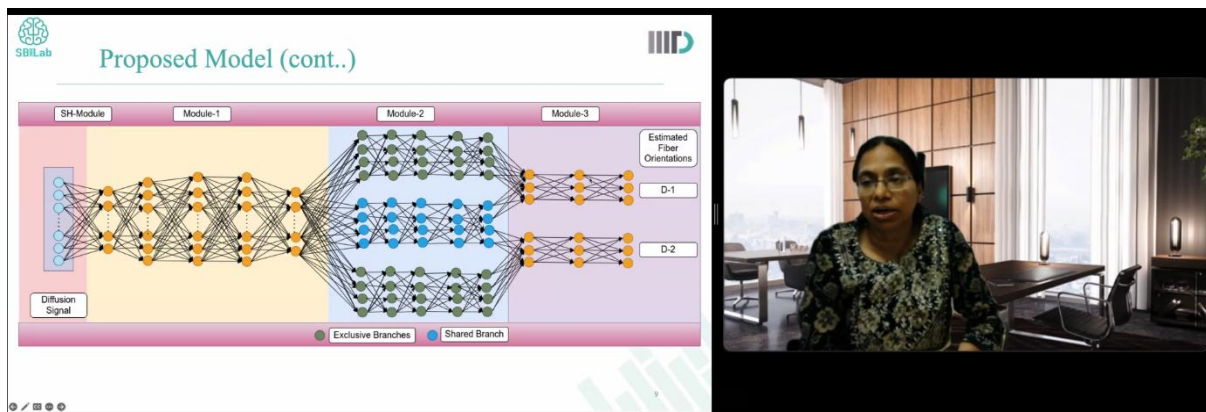
Dr. Anubha Gupta explaining the working of her ANN model, the attributes and the parameters used for estimating the Fiber orientations.

DAY 2 - AUGUST 2ND, 2023

Talk 1 - "Music Therapy for Neurological Disorders"
Presented by - Dr. Varsha Harpale

Dr. Varsha Harpale's talk on "Music Therapy for Neurological Disorders" likely explored the therapeutic use of music in managing and improving neurological conditions. Participants learned about the psychological and physiological effects of music on the brain and its potential applications in disorders such as Parkinson's disease, Alzheimer's disease, and stroke recovery.

The whole session was divided into two parts – music analysis and disease analysis. The Music Analysis was done using EEG Brain Wave Signals measured using neurosky Bluetooth headset. There was a recorded demonstration of the effect of music therapy on anxiety and depression in detail which helped the students understand more about the concept.
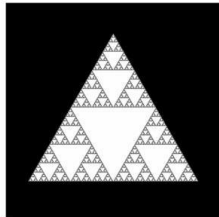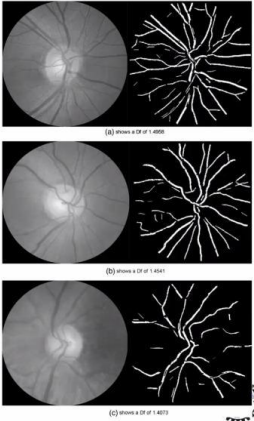
Talk 2 - "Our EYES & BRAIN: Decoding the relationship using Medical Image Processing"
Presented by - Dr. Abhishek Appaji

A graduate of the Massachusetts Institute of Technology Global Entrepreneurship Bootcamp specializing in new ventures leadership, Dr. Abhishek obtained his Bachelor of Engineering in Medical Electronics with University Rank from BMSCE, Masters of Technology in Information Technology, and a Masters of Engineering (M.E) in Bioinformatics from University Visvesvaraya College of Engineering, Bengaluru. His Ph.D. was in Mental Health and Neurosciences from Maastricht University, the Netherlands which received the best thesis award.

In his talk on Decoding the relationship using Medical Image Processing, Dr. Abhishek talked about how the basic human eye and brain works in co-ordination to percept, decode and map out some logical data using the neurological arrangement of the human body.


The session then went on to unveil different effects of perception on the brain and how it manipulates the human brain into thinking something illogical or non-existing. The participants also learnt about the side-effects of being in an unhealthy environment look-wise and the remedies to recover from the same.

Talk 1 - "Designing Deep Neural High-Density Compression Engines for Radiology Images"
## Presented by - Dr. Debdoot Sheet

Currently serving as the Assistant Professor at the Electrical Engineering and the Centre of Excellence in Artificial Intelligence at the Indian Institute of Technology, Kharagpur. His current research and interests include multimedia compression, medical imaging, machine learning, image and multidimensional signal processing.
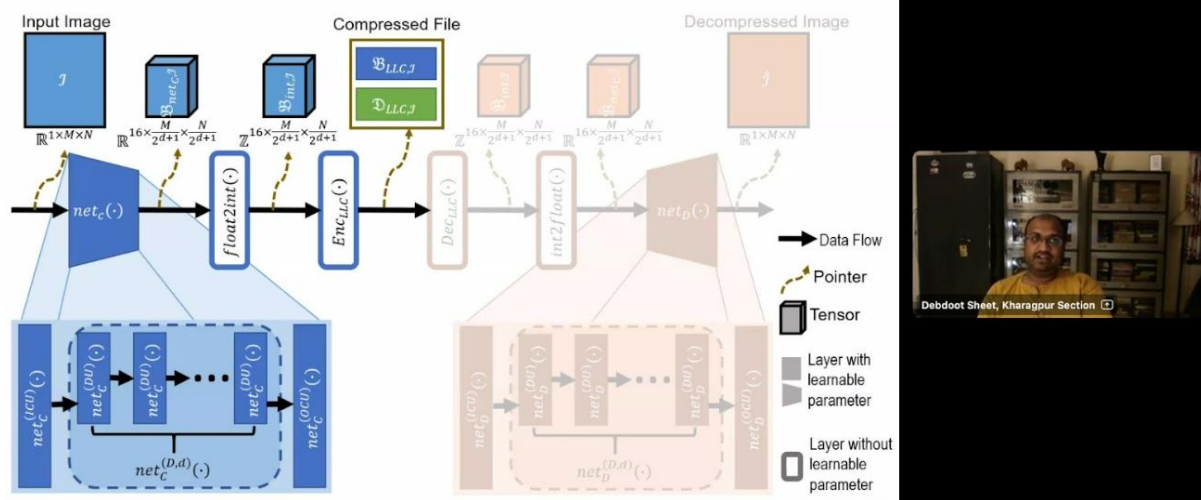
Designing deep neural high-density compression engines for radiology images is a challenging task due to the following reasons:

i)   Modality-specific variations: Each modality has distinct characteristics, such as dynamic range, resolution, and spatial and statistical distribution.

ii)   Clinically relevant information: Radiology images contain a wealth of clinically relevant information, such as the presence or absence of lesions, the size and shape of lesions, and the relationship between lesions and other anatomical structures.

iii)   Computational complexity: Deep neural networks are computationally expensive to train and deploy. This can be a problem for high-density compression engines, which need to be able to compress images in real time or near-real time.
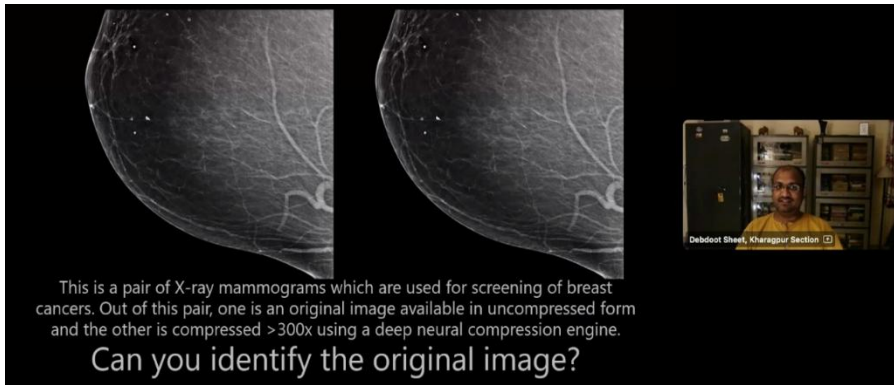
Participants gained insights into the challenges associated with storing and transmitting high-resolution medical images and how DNNs can be designed and trained to achieve high-density compression while preserving diagnostic quality.

Talk 2 - "Biomedical systems and signal processing techniques as spinoffs of basic science research" Presented by - Dr. B. Satyanarayana

Dr. B. Satyanarayana is working at the Department of High Energy Physics, TIFR since 1983 and is currently a Scientific Officer (H) and the Coordinator of India-based Neutrino Observatory Project - one of the national mega science projects. The talk began from the basics of different scanning and reports which are usually recommended by the Doctors to the patients for diagnosing various diseases in them.

Dr. Satyanarayan discussed the challenges of black-box AI models in healthcare and presented solutions and examples of explainable AI in action within the context of biomedical image processing.
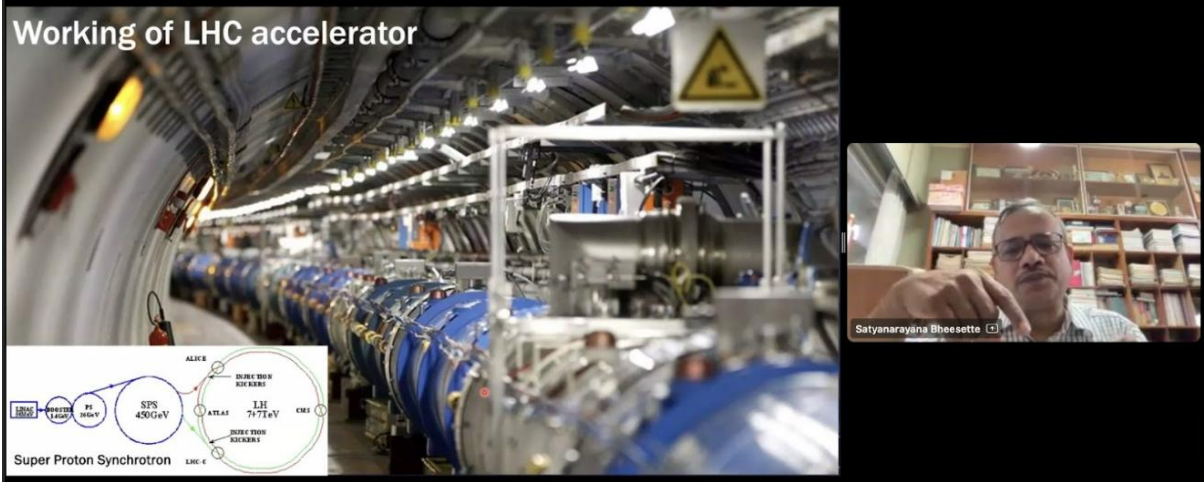
Then, he took us on a journey of his expertise on working of different techniques which can easily overpower the existing traditional research methods which filled everyone with enthusiasm. This also helped the participants in understanding how the Tata Institute of Fundamental Research operates.
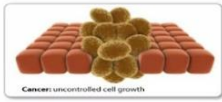
Talk 1 - "Artificial Intelligence (AI) for Early Breast Cancer Detection"
Presented by - Dr. Siva Teja Kakileti

While creating awareness about breast cancer, Dr. Siva also introduced the participants to the curing and medical ailment that can be provided to the women suffering from such disease.
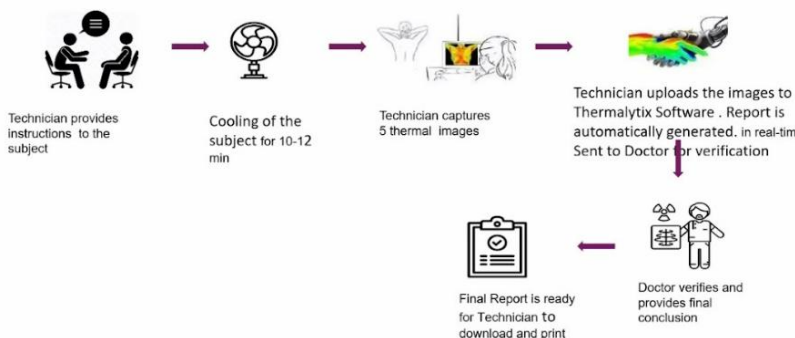
Dr. Siva shared the experience of a patient who suffered a lot due to the slow traditional process of identifying the disease leading to slower recovery of the patient or sometimes event resulting in death which could have been avoided if diagnosed earlier. This motivated Dr. Siva to design a diagnostic system which can easily classify whether the subject is diagnosed with a disease or not.

This way Dr. Siva Teja Kakileti used his years of experience in AI/ML for Medical Imaging and developed a Model to detect the Breast Cancer at an early stage.

Talk 2 - "Revolutionizing healthcare telemedicine system: An exploration in signal processing and recent advance technologies like Robotics and AI"
Presented by - Dr. Ketki Pathak

Currently working at the Electronics and Communication Department of the Sarvajanik College of Engineering and Technology, Dr. Ketki Pathak is actively involved and interested in working with the medical field by using her expertise in the Signal Processing domain to develop some value adding devices in different disease diagnosis and curing techniques.

She explained the integration of Biology, Signal Processing and Robotics by extending the boundaries of medical science by designing small instruments which can be mounted on the living organisms. Taking inspiration from nature, she developed these instruments which motivated and inspired the participants.

Moreover, she discussed the challenges of imaging, mapping and restoration of data while dealing with the living organisms. Then coming on to human beings, she explained how the various parts of the human brain are affected in various diseases. She also shared some of the insights of different devices developed by her and her students which is more accurate and cheaper than the existing sensing devices.

Talk - "Explainable AI in Biomedical Image Processing"

Presented by - Ojas Ramwala

As a first-year Ph.D. student at the University of Washington, Seattle, in the Department of Biomedical Informatics and Medical Education, School of Medicine, Ojas Ramwala is a researcher having enthusiasm for solving problems using AI. His interests include developing and applying Artificial Intelligence and Deep Learning techniques for Biomedical Signal and Image Processing, Bioinformatics, and Genomics.
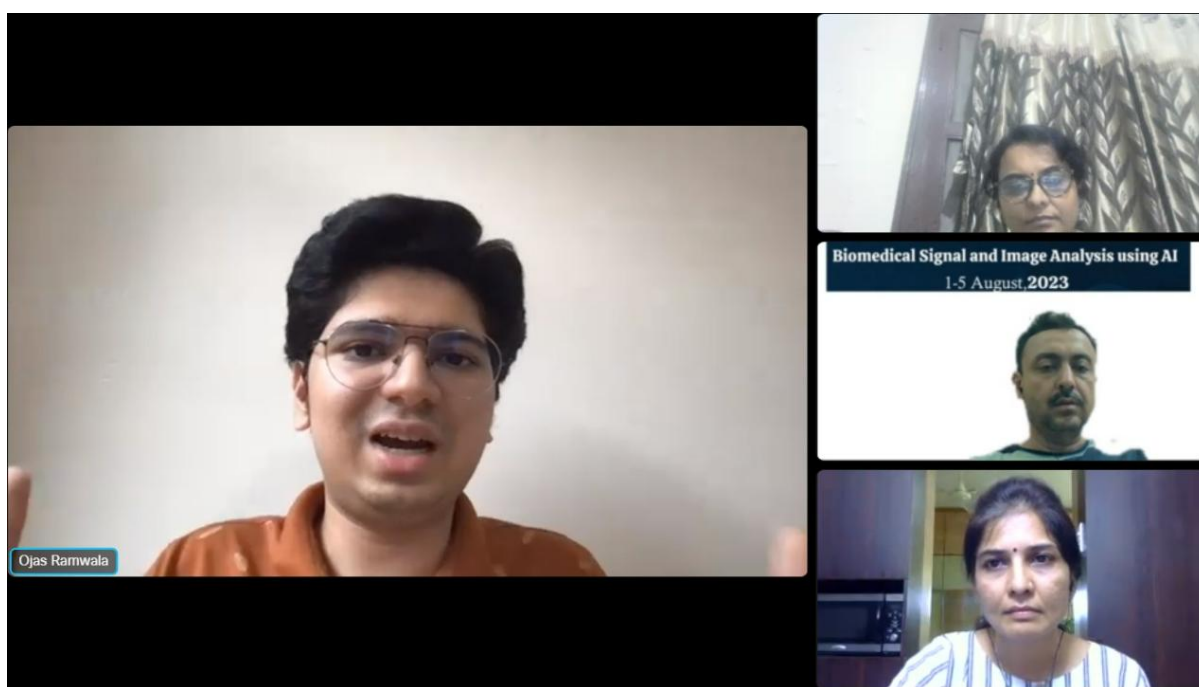
In his session, Ojas sir expanded the horizon of utilization of AI as in how it can be used to decreases the human effort by asking the AI bot to explain or justify the results provided by it. He also interacted with the students, Faculty co-ordinators and the chair persons of the event to clear their vision about their understanding of the Explainable AI and how one can further dive into the subject using the already available sources.

Physically sharing of mementos to the speakers address in an online event.

QUIZ WINNERS:

Day 1:

1st Anurag Tiwari
2nd Asmita Vijay Kharat
3rd Vipsa Badiyani

Day 2:

1st Preity
2nd Mr. Sujay D. Mainkar
3rd Shrikrishna Kolhar

Day 3:

1st Mr. Sujay D. Mainkar
2nd Kunj Bihari Meena
3rd Yesthish Y

Day 4:

1st Pramila Shinde
2nd Pushpa Y
3rd Sundari Tribhuvanam

Day 5:

1st Jafar Gangardiwala
2nd Meet Kathiriya
3rd Ebisa Leta Desisa

Quiz-A-Champ:

1st Dr. Prashant Upadhyaya
2nd Taronish Foroogh
3rd Rajeshwari Ajit Raorane
3rd Anurag Tiwari

Conclusion:

The event brought together a diverse array of professionals, experts, and enthusiasts, fostering a dynamic environment for the exchange of knowledge, insights, and ground-breaking ideas.

The event played a pivotal role in pushing the boundaries of their knowledge, allowing them to explore advanced topics, challenge existing paradigms, and gain exposure to innovative approaches. The interactive nature of the event fostered an environment where attendees felt encouraged to ask questions, share their insights, and engage in discussions that expanded their perspectives.

Feedback Summary:

1. Arrange more events like that includes such Interactive Sessions.

2. It was very insightful and the knowledge shared was exceptional.

3. Good management and such knowledgeable speakers created a great atmosphere.

4. It was very informative, and, in this session, I understand new words and term of technical world.

5. Intellectual and knowledgeable event.

6. It was very knowledgeable and the part of schizophrenia and bi polar disorder was very interesting and helpful.

7. Intriguing insights into eyes and the mind. Wonderful session

8. The way how results were explained was amazing.

9. Good session on medical imaging.

Volunteer credits:

Event Head:
Harsh Bhaliya
Prakash Bhutaiya
Aarya Shah
Bhagya Patel

Session Chair:
Rahul Agarwal
Niket Singal
Harsh Bhaliya
Aarya Shah

Designing:
Mombasawala Aleemuddin
Sneha Gajjar
Sahil Jadhav
Harsh Bhaliya

Marketing:
Harsh Bhaliya
Prakash Bhutaiya
Upasna jivani
Aary Patel
Jainesh Tarasariya
Chai May U Marma
Piyush
Vivek Pal
Amrito Ladh
Hemanshi Dhanani
Sneha Gajjar

Social Media:
Prakash Bhutaiya
Hetasvi Bhimani

Host:
Khushi Meshari

PhotoGraphy(SS):
Harsh Bhaliya
Hemanshi Dhanani
Aary Patel
Maitri Desai
Hema Sen

Technical:
Harsh Bhaliya
Bhagya Patel
Mombasawala Aleemuddin

Report presented by – Harsh Bhaliya, Dev Joshi