Report for FDP on "MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications

September 02 - 06, 2024

Jaypee University of Information Technology (JUIT) in Solan, Himachal Pradesh, recently organized a Faculty Development Program (FDP) on "MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" in collaboration with the Electronics & ICT Academy at Centre for Development of Advanced Computing (C-DAC). The five-day online program, which took place from September 02 - 06, 2024, aimed to equip academicians and lab staff from polytechnic and engineering institutes/universities with the latest skills in image analysis and pattern recognition using MATLAB. The program was inaugurated by Prof. Balwinder Singh, Joint Director & Head, E&ICT, CDAC Mohali, Prof. Shruti Jain, Associate Dean of Innovation at JUIT, and Prof. Rajiv Kumar, Head of Electronics and Communication Department at JUIT on 2nd Sep 2024. The FDP featured lectures by renowned experts from top institutions like IITs and IIITs. The speakers of the FDP were Prof. Tapan Kumar Gandhi from IIT Delhi, Dr. Taranjit Kaur from IIT Jodhpur, Dr. Satyasai Jagannath Nanda from MNIT Jaipur, Dr Meenakshi Sood Sood from NITTTR Chandigarh, Dr. Anjali Gautam from IIIT Allahabad, Dr. Akshay Pandey from IIIT Jabalpur, Prof. R.S. Anand from IIT Roorkee, Dr. Chandresh Kumar Maurya from IIT Indore, Dr. Jitendra Virmani from CSIR-CSIO, Dr. Anita Singh from IRDE, DRDO, Prof. Shruti Jain from JUIT, Dr. Nishant Jain from JUIT, and Dr. Vikas Baghel from JUIT. Over 200 participants attended the program, which was coordinated by Dr. Vikas Baghel and Dr. Nishant Jain from JUIT's ECE Department with the lab support of Mr. Pramod Kumar and Mr. Dhirendra. The FDP was funded and supported by the Electronics & ICT Academy, Centre for Development of Advanced Computing (C-DAC).

Day1 Session 1

First session of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Real-world applications in Computer Vision, and Machine Learning”. Keynote speaker of the Session was Dr. Nishant Jain from Department of Electronics and Communication Engineering, Jaypee University of Information Technology, Solan, Himachal Pradesh.

Summary of the Presentation is as follows:

The process of acquiring digital images involves the conversion of analog signals from cameras into digital values using analog-to-digital converters (ADCs). This conversion enables the creation of a digital image, which is essentially a matrix of numbers that represents the intensity of light at each pixel location. The number of bits used to represent each pixel value plays a crucial role in determining the number of possible colors that can be represented, with 8-bit pixels capable of rendering 256 different colors. The color of each pixel is determined by the combination of red, green, and blue (RGB) values, with the precise ratio of these values determining the final color. In addition to the number of bits used to represent each pixel value, the sampling rate and quantization level also impact the quality of the acquired image.

Sampling involves dividing the original image into a grid of pixels, which can lead to loss of detail and distortion. The sampling rate, which is typically measured in pixels per inch (PPI), determines the density of the grid and can have a significant impact on the quality of the acquired image. A higher sampling rate can result in a higher-quality image with more detail, but may also increase processing time and require more memory. Quantization, on the other hand, reduces the number of possible colors in an image by representing each pixel value with a limited number of bits. Higher-bit quantization can provide more accurate color representation, but may also increase processing time and require more memory. The choice of sampling rate and quantization level depends on the application and requirements of the image processing task, with different levels of detail and color accuracy required for different applications. For example, medical imaging applications may require higher-quality images with greater detail, while web applications may prioritize faster processing times and lower storage requirements.

The four image processing applications mentioned in the presentation are:

1. Improvement of Pictorial Information for Human Perception: This application involves enhancing the quality of an image to improve human perception. Examples include enhancing contrast, brightness, and color balance to make an image more clear and visually appealing. Sub-applications include:

* Medical imaging: Enhancing medical images to help doctors diagnose patients more accurately.

* Biometric imaging: Enhancing biometric images, such as fingerprints or facial recognition, to improve accuracy and security.

2. Autonomous Machine Application: This application involves using image processing to enable autonomous machines to analyze and understand images without human intervention. Examples include:

* Face detection and recognition: Using image processing to detect and recognize faces in images or videos.

* Object detection: Using image processing to detect objects in images or videos, such as traffic monitoring or surveillance.

3. Automatic Image Caption Generation: This application involves using image processing and natural language processing to automatically generate captions for images. Examples include generating captions for images posted on social media or describing images in a database.

4. Cover Classification for Satellite Images: This application involves using image processing and machine learning to classify satellite images into different categories, such as water, land, roads, etc. Examples include monitoring environmental changes, tracking natural disasters, or monitoring urban development.

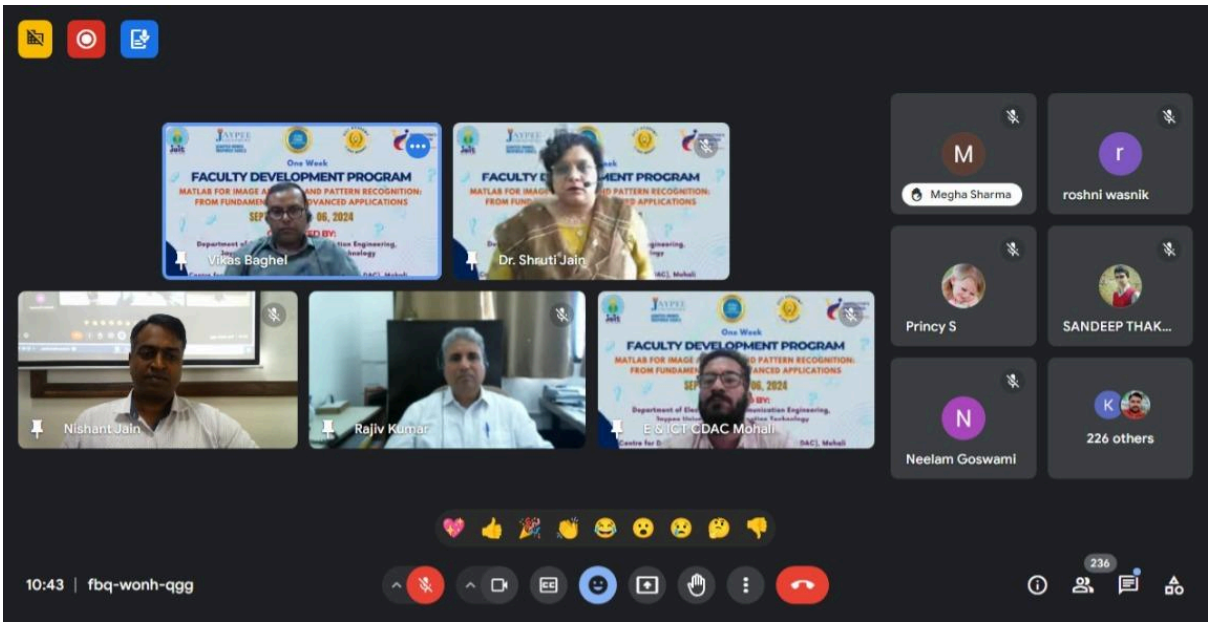
These applications can be categorised into three main categories:

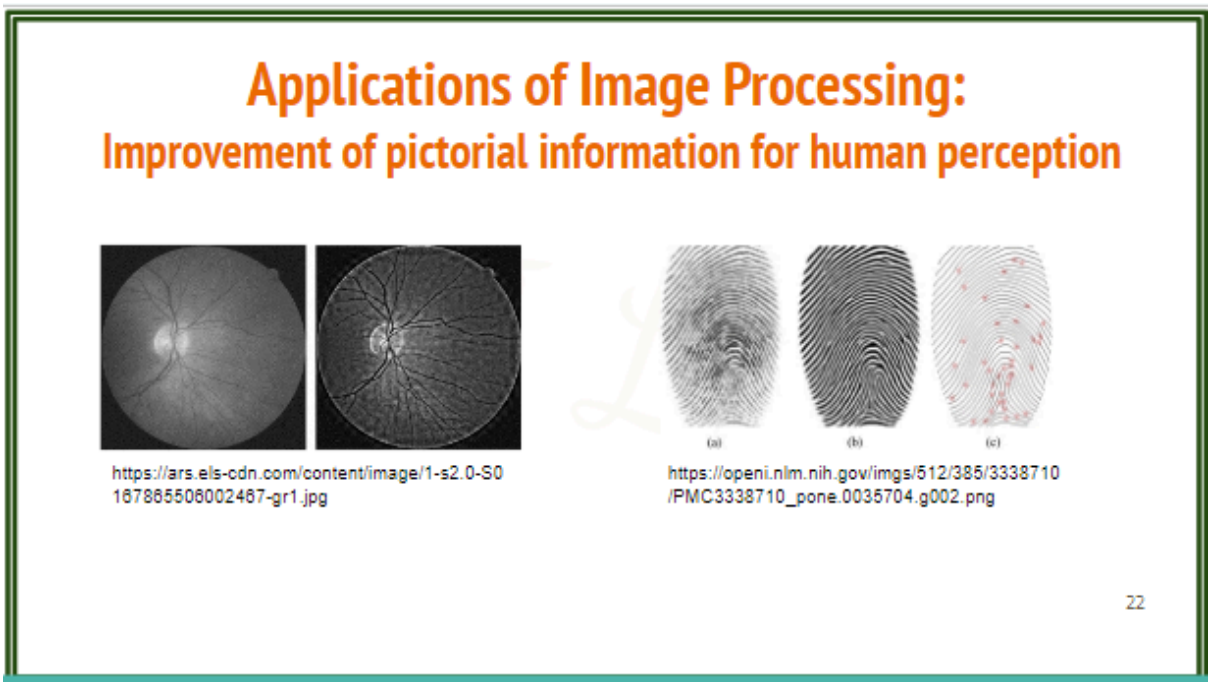
1. Improvement of Pictorial Information for Human Perception: This category includes applications that enhance the quality of an image for human consumption.

2. Autonomous Machine Application: This category includes applications that enable autonomous machines to analyze and understand images without human intervention.

3. Efficient Storage and Transmission: This category includes applications that use image processing to compress and transmit images efficiently, such as automatic image caption generation and cover classification for satellite images.

At the end the Speaker has taken up all the queries from the participants. More than 200 Participants attended the session and have submitted their feedback through the google form.





Day1 Session 2

First session of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Powerful tools used for research and analysis of Images” and on “Epilepsy Diagnosis via Neuroimaging Markers and AI”. Keynote speaker of the Session was Prof. Tapan K. Gandhi from IIT Delhi and Dr. Taranjit Kaur from IIT Jodhpur in the school of AI and Data Sciences as a scientific officer. Dr. Vikas, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of his achievements.

Summary of the Presentation is as follows:

The speaker, Taranjit Kaur, begins by introducing the topic of brain behavior and its significance in understanding neurological disorders. She explains that the brain is a complex and dynamic organ that is capable of generating a wide range of electrical activity, which is essential for maintaining normal brain function. The speaker notes that understanding the brain's behavior is crucial for diagnosing and treating neurological disorders such as epilepsy, Alzheimer's disease, and Parkinson's disease.

She mentions that one of the most common devices used to record brain activity is the electric enzymograph device, which records electrical activity from the brain using electrodes. She explains that this device is commonly used in clinical settings to diagnose and monitor neurological disorders. The speaker also highlights that there are various types of devices available, including portable systems like the Emotive Epoch X, eye trackers, and devices like Capttrack for research localization.

The speaker turns her attention to epilepsy, a neurological disorder characterized by recurrent and unpredictable interruptions of normal brain function. She notes that epilepsy is a common condition that affects millions of people worldwide. Kaur explains that EEG (electroencephalogram) is a common diagnostic tool used to record brain activity in patients with epilepsy. She notes that EEG data is recorded using electrodes placed on the scalp or intracranially, which captures the electrical activity of the brain.

The speaker highlights that normal EEG data is different from data recorded in clinical settings, where there may be artifacts, muscle activity, and other interferences. She explains that these interferences can make it challenging to diagnose epilepsy accurately. Kaur mentions that machine learning models can be used to automate the process of diagnosing epilepsy by identifying patterns in EEG data.

The speaker delves deeper into the role of machine learning in diagnosing epilepsy. She explains that machine learning models can be trained to recognize patterns in EEG data that are characteristic of epilepsy. Kaur notes that preprocessing steps are necessary before applying machine learning algorithms, including data preparation, choosing a model, training the model, evaluating the model, parameter tuning, and prediction.

The speaker provides examples of how machine learning models can be used to segment EEG data into different categories, such as normal activity, artifacts, epileptic discharges, and seizure activity. She explains that this segmentation can help clinicians identify areas of interest in the data more quickly and accurately.

The speaker concludes by discussing the importance of data analysis and visualization in extracting insights from EEG data. She notes that visualizing data can help identify patterns and anomalies in the data that may not be apparent through manual analysis alone. Kaur provides examples of how to visualize EEG data using different techniques, such as plotting frequency spectra and wavelet analysis.

The speaker highlights that automated segmentation of EEG data can be useful for clinicians to quickly identify areas of interest in the data. She notes that machine learning models can be used to automate this process, allowing clinicians to focus on interpreting the results rather than manually analyzing the data. Finally, Kaur emphasizes the importance of continued research in this area to improve our understanding of brain behavior and develop more effective diagnostic tools for neurological disorders.

At the end the Speaker has taken up all the queries from the participants. More than 250 Participants attended the session and have submitted their feedback through the google form.

Day 2 Session 1

First session of Day 2 of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Image Segmentation using Traditional and Nature-inspired Clustering Techniques” with hands-on on MATLAB. Keynote speaker of the Session was Dr. Satyasai Jagannath Nanda from MNIT Jaipur. Dr. Vikas, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of his achievements.

Summary of the Speaker’s Presentation is as follows:

The speaker, Satyasai Nanda, introduces the concept of image segmentation, which is a crucial step in image processing and analysis. Image segmentation is the process of partitioning a digital image into distinct regions or groups of pixels, known as segments or clusters, based on certain characteristics such as color, texture, or intensity. He explains that image segmentation is a fundamental problem in computer vision and has numerous applications in various fields, including medical imaging, remote sensing, and surveillance. The speaker then introduces the concept of K-Means clustering, a popular algorithm used for image segmentation. K-Means clustering is a type of unsupervised machine learning algorithm that groups similar data points into clusters based on their characteristics. The algorithm works by initializing cluster centers, calculating the distance between each data point and the cluster centers, and assigning each data point to the closest cluster center. The

algorithm then updates the cluster centers based on the assigned data points and repeats the process until no further changes occur. The speaker provides a detailed explanation of the K-Means clustering algorithm, including its advantages and disadvantages. He explains that the algorithm is simple to implement and can be used for both categorical and numerical data. The speaker also discusses the limitations of the algorithm, including its sensitivity to initialization and the need for a fixed number of clusters. The speaker also explains how to implement the K-Means clustering algorithm in MATLAB. He provides an example code snippet that demonstrates how to segment a color image using K-Means clustering. The speaker provides an example of using K-Means clustering for color image segmentation. He demonstrates how to segment a color image into different clusters based on pixel values. The speaker uses a color image of a flower and applies K-Means clustering with three clusters to segment the image into different regions. The speaker also explains how to determine the optimal number of clusters using the elbow method. The elbow method involves plotting the within-cluster sum of squares (WCSS) against the number of clusters and selecting the point where the curve begins to flatten out. The speaker discusses various applications of K-Means clustering in image segmentation, including:

1. Object recognition: K-Means clustering can be used to segment objects from images based on their color, texture, or shape.

2. Image compression: K-Means clustering can be used to compress images by reducing the number of colors or textures.

3. Fire detection: K-Means clustering can be used to detect fires in images by segmenting regions with high temperatures or brightness.

4. Glacier detection: K-Means clustering can be used to detect glaciers in images by segmenting regions with high reflectivity or brightness.

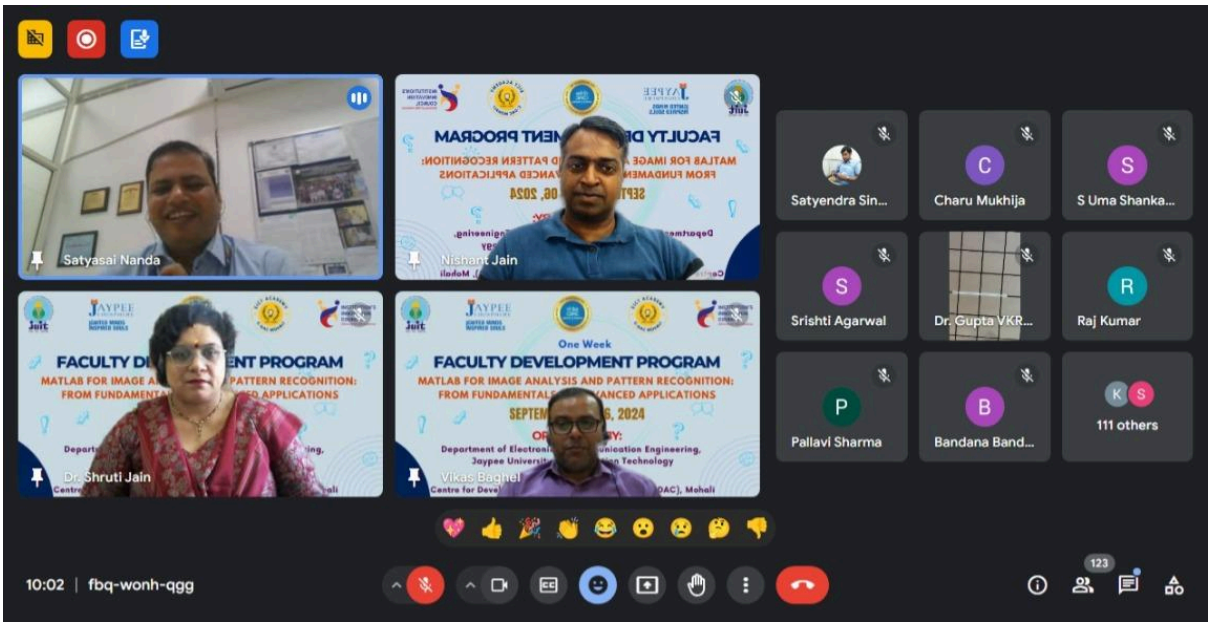
5. Landform detection: K-Means clustering can be used to detect landforms in images by segmenting regions with different textures or elevations.

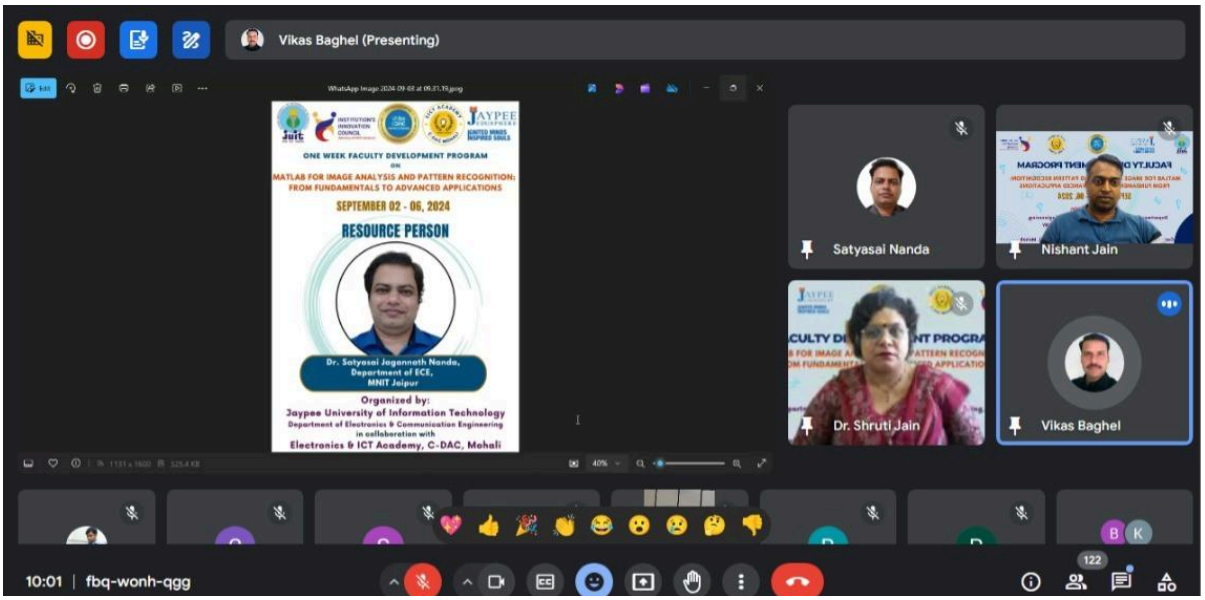
With his PhD student, Dr. Nanda then demonstrated the MATLAB code of the K-Means algorithm for image segmentation, specifically for color images. The algorithm is initialized with three centroids and iterates through the following steps:

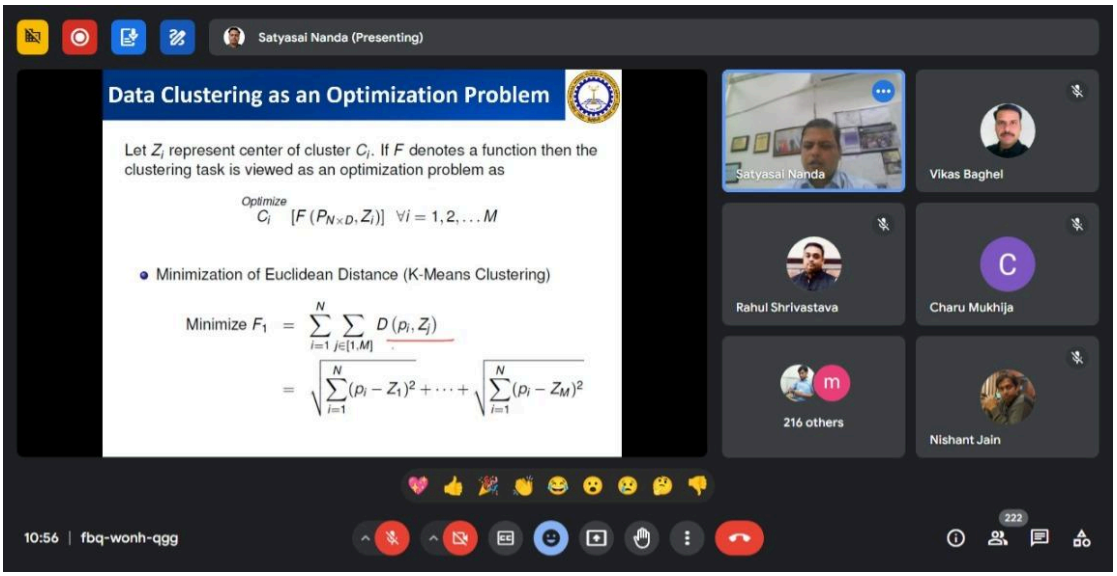
1. Calculate the distance between each pixel and the centroids.
2. Assign each pixel to the closest centroid.
3. Update the centroids by calculating the mean of each cluster.

The code presents the segmented image using different color maps for each cluster. The original image is plotted alongside the segmented image. The code shows that by increasing the number of clusters, more colors can be identified in the image. For example, increasing the number of clusters from three to five allows for more distinct colors in the background. The code demonstrates how to implement the algorithm in MATLAB and shows that it can be used for color images as well as grayscale images. The algorithm can be fine-tuned by adjusting the number of clusters, which affects the level of detail in the segmentation.

At the end the Speaker has taken up all the queries from the participants. More than 250 Participants attended the session and have submitted their feedback through the google form.






Satyasai Nanda (Presenting)
Data Clustering as an Optimization Problem
Let Z_i represent center of cluster C_i. If F denotes a function then the clustering task is viewed as an optimization problem as
$\underset{C_i}{\text{Optimize}} \; [F(P_{N\times D}, Z_i)] \quad \forall i = 1, 2, \ldots M$
Minimization of Euclidean Distance (K-Means Clustering)
$\text{Minimize } F_1 = \sum_{i=1}^{N} \sum_{j\in[1,M]} D(p_i, Z_j)$
$= \sqrt{\sum_{i=1}^{N}(p_i - Z_1)^2} + \cdots + \sqrt{\sum_{i=1}^{N}(p_i - Z_M)^2}$
Satyasai Nanda
Vikas Baghel
Rahul Shrivastava
Charu Mukhija
216 others
Nishant Jain
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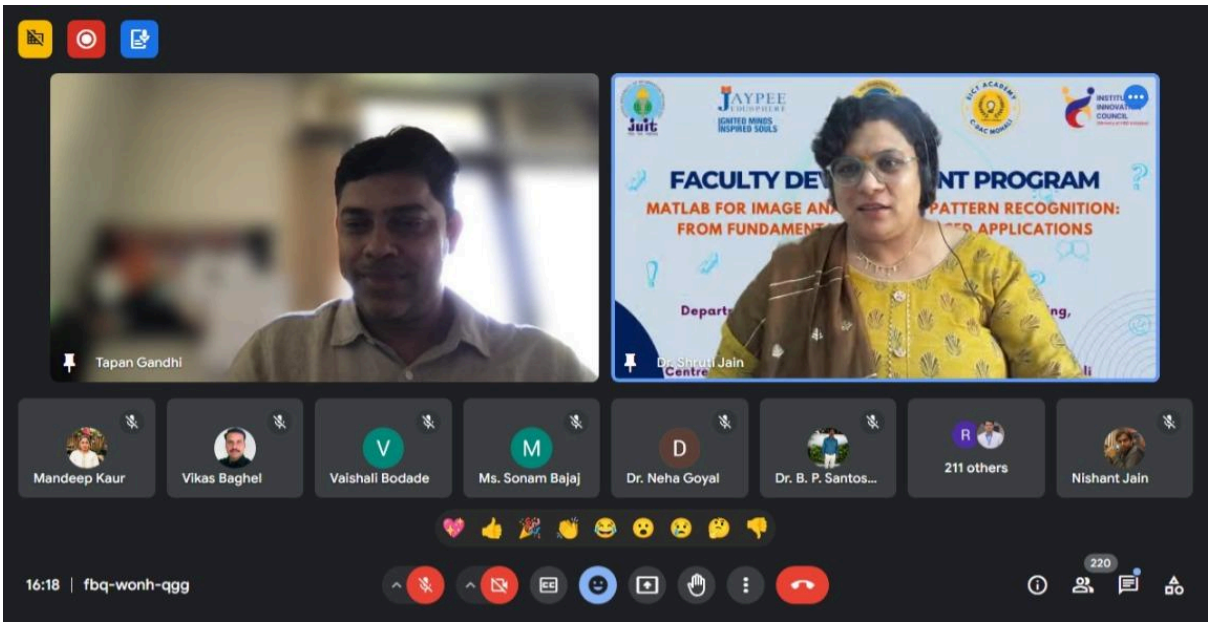
222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Vaishali Bodade
Ms. Sonam Bajaj
Dr. Neha Goyal
Dr. B. P. Santos...
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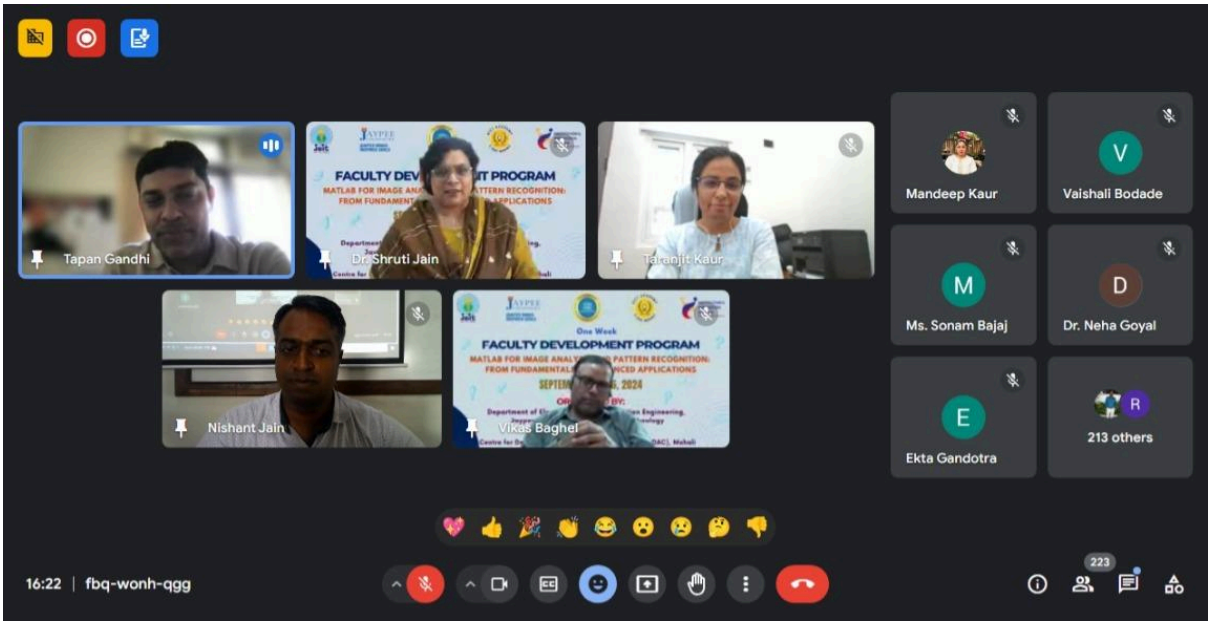
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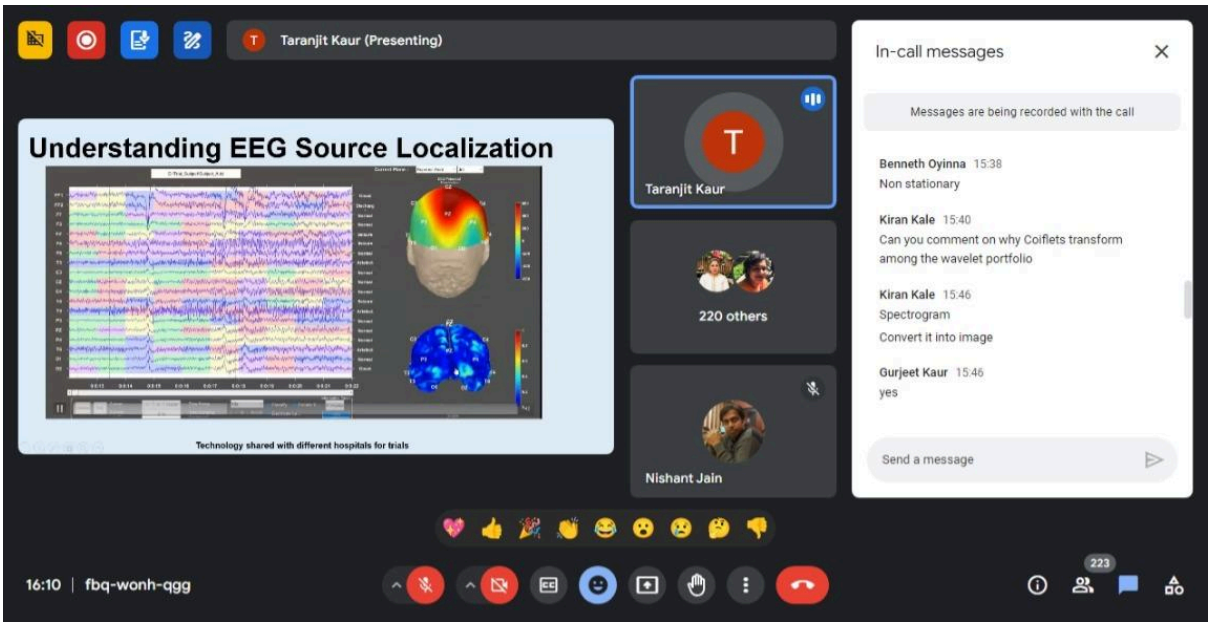
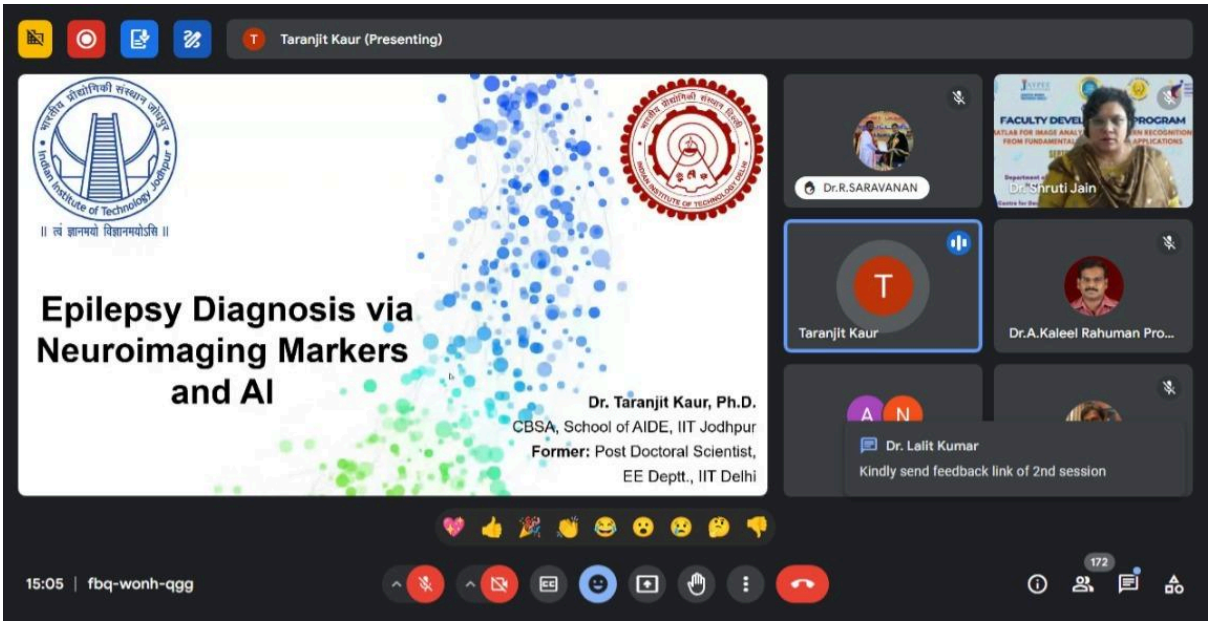




Day 2 Session 2

Second session of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Faculty preparedness for implementation of NEP2020”. Keynote speaker of the Session was Dr. Meenakshi Sood, who is currently working as Associate Professor in CDC, National Institute of Technical Teachers Training & Research (Ministry of Education, Govt. of India), Chandigarh, India. Dr. Nishant Jain, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of her achievements.

Summary of the Speaker's Presentation is as follows:

The National Education Policy (NEP) 2020 aims to revolutionise the Indian education system by providing a comprehensive framework for education from preschool to higher education. The policy emphasises the importance of teachers in implementing the policy effectively, as they play a crucial role in shaping the minds of students. The policy aims to empower teachers by upskilling and reskilling them to meet the changing needs of the education sector.

Dr. Meenakshi Sood, the speaker, highlights the rich heritage of Indian education system, which was once considered world-class. However, the system faced significant challenges due to various invaders, including the Britishers, who took away our education system by 100 years. After independence, India had a small setup of education system, with only 5,000 secondary schools, 12,000 middle schools, and 72,000 primary schools. The speaker notes that there have been significant changes in the education policy over the years, with the last major policy change being in 1986. The new policy has been implemented after a gap of 34 years, reflecting the changing needs of the education sector.

Dr. Sood emphasises the importance of considering India's demographic dividend, which is expected to be the largest in the world by 2027. The country's population will be flooded with a young labour force, making it essential to focus on education and skills development. The speaker notes that India's education system needs to be globally competitive, with a focus on holistic development, critical thinking, problem-solving, and emotional intelligence.

The speaker highlights several challenges faced by the Indian education system, including:

1. Rigid separations of disciplines: The current system forces students to choose a particular stream or subject after class 10th, limiting their opportunities for interdisciplinary learning.

2. Fragmented higher education system: The existing system is fragmented, with multiple types of institutions (universities, degree colleges, private universities) offering different types of programs.

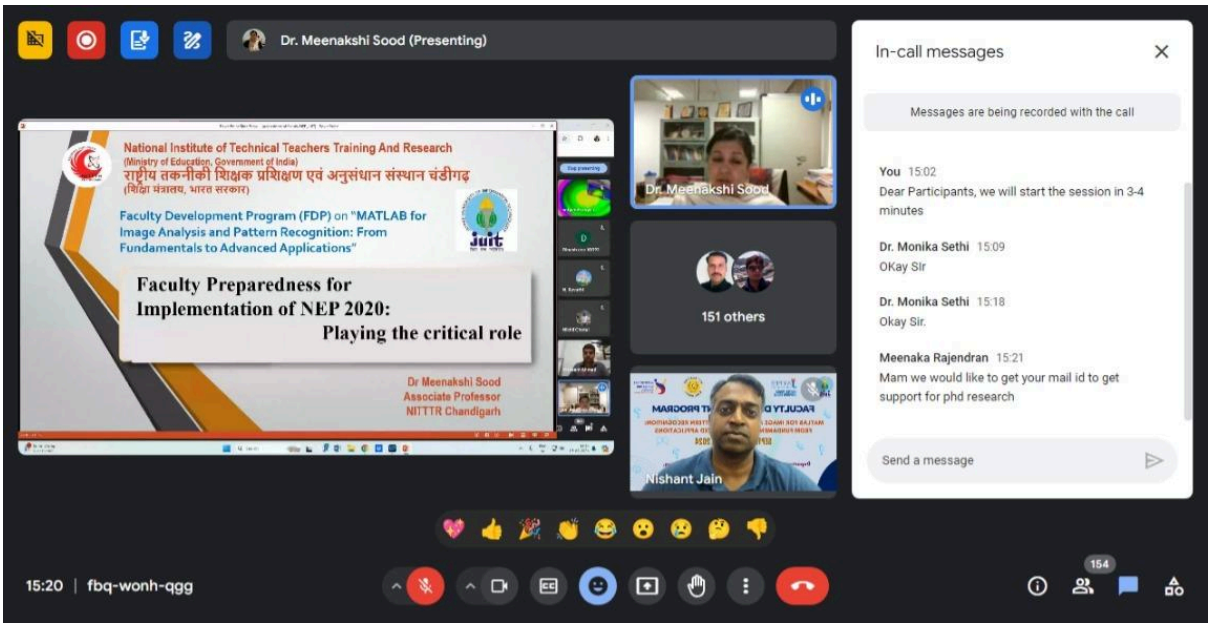
3. Less emphasis on learning outcomes: The current system focuses more on marks and grades rather than learning outcomes.

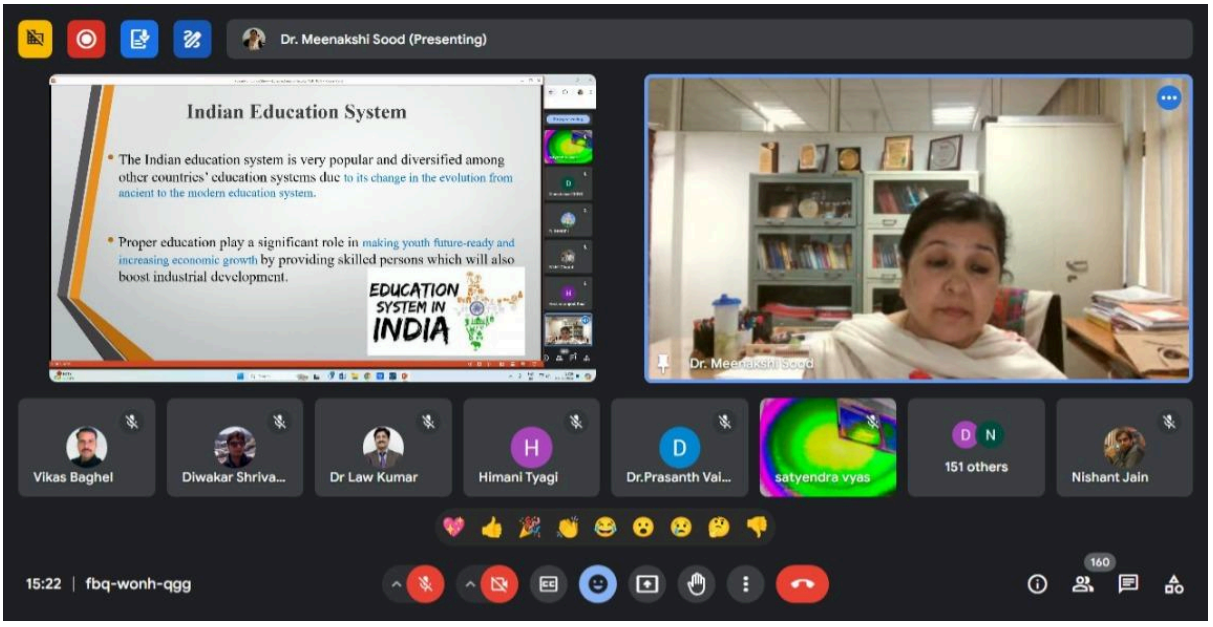
4. Lack of innovation and creativity: Students are not encouraged to think creatively or develop innovative solutions.

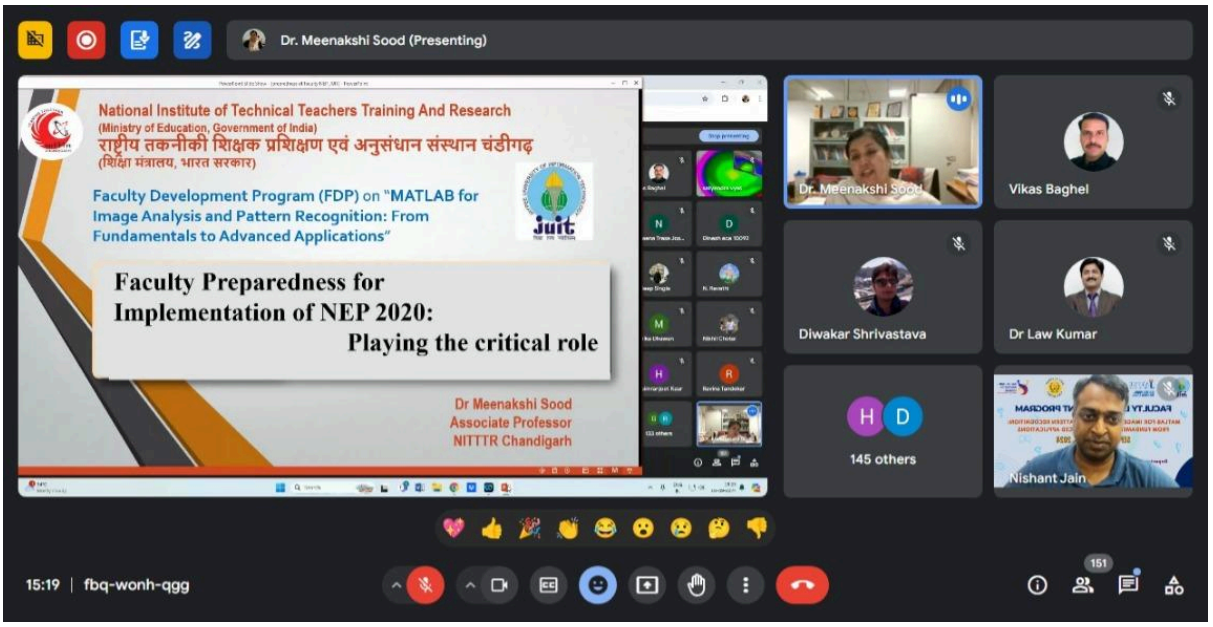
5. Disconnection between education and industry: The current system does not provide students with industry-relevant skills or knowledge.

The speaker mentioned that implementing the NEP 2020 will require significant changes in the education system, including teacher training, curriculum development, and infrastructure upgrades. The speaker emphasizes the importance of empowering teachers and providing them with necessary resources to implement the policy effectively.

At the end the Speaker has taken up all the queries from the participants. More than 200 Participants attended the session and have submitted their feedback through the google form.







Day 3 Session 1

First session of Day 3 of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Advancements in Image Segmentation”. Keynote speaker of the Session was Dr.Anjali Gautam from IIIT Allahabad. Dr. Nishant Jain, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of his achievements.

Summary of the Speaker’s Presentation is as follows:

Dr. Anjali Gautam, begins by explaining the concept of image segmentation and its importance in various domains such as computer vision, medical imaging, and aerial

imaging. She explains that image segmentation is the process of dividing an image into its constituent parts or objects, and that it can be applied to images from various sources such as videos, medical images, and satellite images.

She explains that one of the main approaches to image segmentation is thresholding, which involves dividing an image into regions based on the intensity values of the pixels. She explains that there are different types of thresholding methods, including global thresholding and adaptive thresholding. Global thresholding involves dividing an image into regions based on a single threshold value, while adaptive thresholding involves dividing an image into regions based on multiple threshold values.

Dr. Gautam explains that another approach to image segmentation is clustering, which involves grouping pixels into clusters based on their similarity. She explains that there are different types of clustering algorithms, including K-means clustering and fuzzy clustering. K-means clustering involves grouping pixels into clusters based on their intensity values, while fuzzy clustering involves assigning a probability value to each pixel indicating the degree to which it belongs to each cluster.

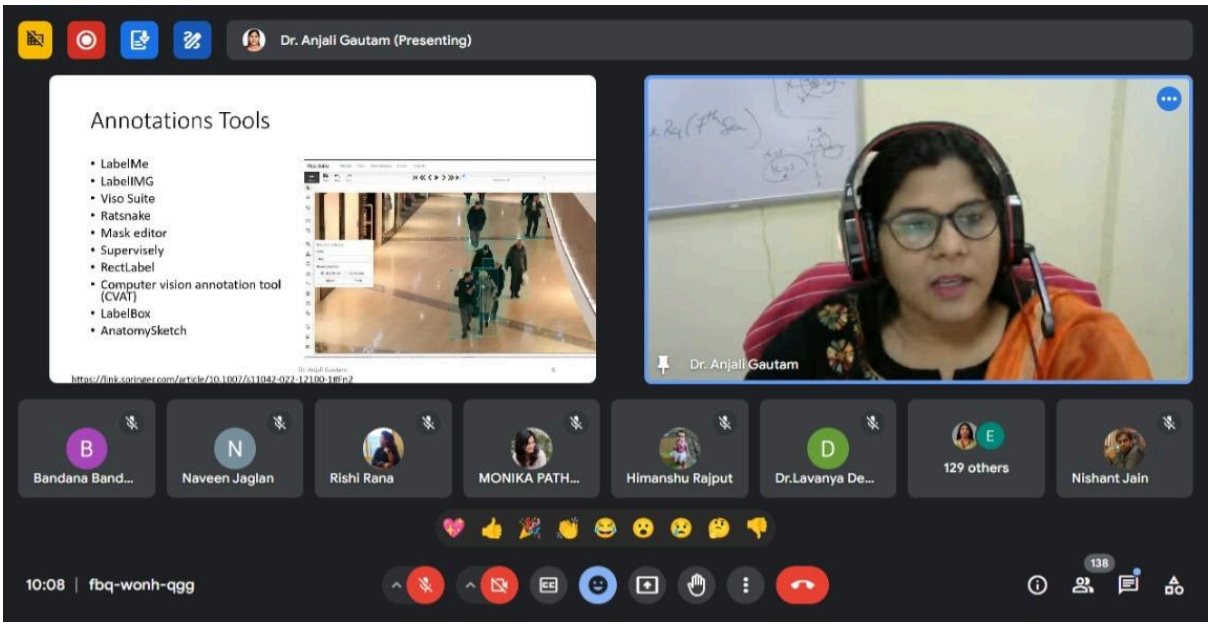
Dr. Anjali Gautam discusses convolutional neural networks (CNNs). She suggests using the concept of reducing the size of the feature maps, similar to the approach used in LNet. This involves stopping the convolution process before the classification layer and mapping the reduced feature maps back to the original size. She explained that this approach is not without its limitations. When reducing the size of feature maps, the results may not be as expected due to the loss of spatial information. To address this, people have moved away from this approach and instead use encoder-decoder architectures, which involve reducing the size of feature maps (encoder) and then increasing them back to the original size (decoder).

The encoder-decoder architecture is explained in more detail. The encoder part reduces the size of feature maps using convolutional and downsampling operations, while the decoder part increases the size of feature maps using convolutional and upsampling operations. This architecture allows for the use of stride transpose convolution and pooling layers to increase the size of feature maps. Dr. Gautam discusses two approaches to increasing the size of feature maps: unfolding nearest neighbor approach and bilinear interpolation. The unfolding nearest neighbor approach involves mapping each pixel in the reduced feature map to its corresponding location in the original feature map, while bilinear interpolation involves using a weighted average of neighboring pixels to estimate the value of each pixel.

Dr. Gautam concludes by explaining that both approaches can be used to increase the size of feature maps, but may not always produce accurate results. She notes that there are other

techniques, such as max pooling and stride transpose convolution, that can be used to increase the size of feature maps.

At the end the Speaker showed demonstrations on MATLAB and had taken up all the queries from the participants. More than 200 Participants attended the session and have submitted their feedback through the google form.


Dr. Anjali Gautam (Presenting)
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LabelMe
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Viso Suite
Ratsnake
Mask editor
Supervisely
RectLabel
Computer vision annotation tool (CVAT)
LabelBox
AnatomySketch
Dr. Anjali Gautam
Bandana Band...
Naveen Jaglan
Rishi Rana
MONIKA PATH...
Himanshu Rajput
Dr.Lavanya De...
129 others
Nishant Jain
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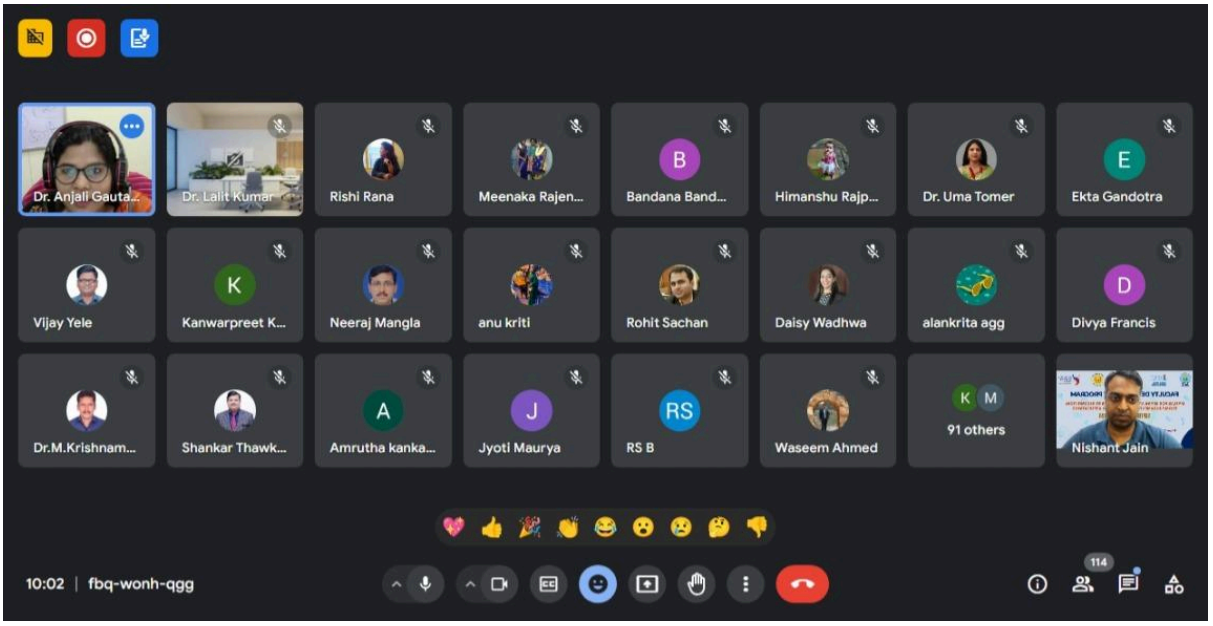
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Vijay Yele
Kanwarpreet K...
Neeraj Mangla
anu kriti
Rohit Sachan
Daisy Wadhwa
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Divya Francis
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Shankar Thawk...
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Jyoti Maurya
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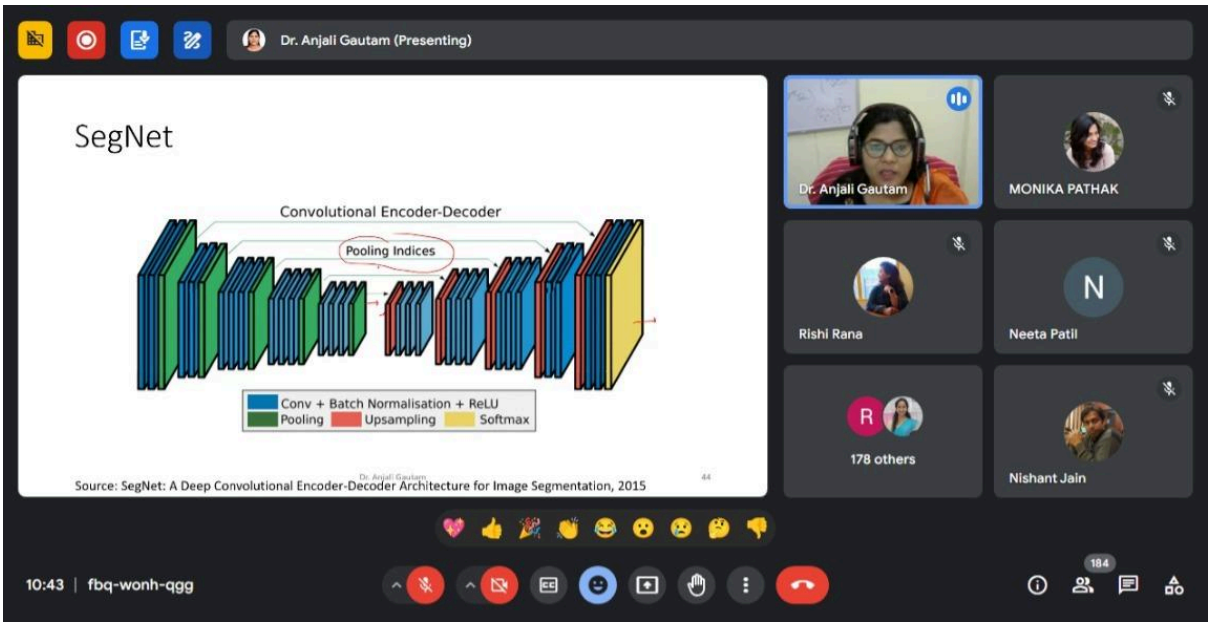
Dr. Anjali Gautam (Presenting)
SegNet
Convolutional Encoder-Decoder
Pooling Indices
Conv + Batch Normalisation + ReLU
Pooling
Upsampling
Softmax
Source: SegNet: A Deep Convolutional Encoder-Decoder Architecture for Image Segmentation, 2015
Dr. Anjali Gautam
MONIKA PATHAK
Rishi Rana
Neeta Patil
178 others
Nishant Jain
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Day 3 Session 2

Second session of Day 3 of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Multi crop identification and classification using UAV dataset”. Keynote speaker of the Session was Dr. Akshay Anand from IIIT jabalpur. Dr. Nishant Jain, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of his achievements.

Summary of the Speaker’s Presentation is as follows:

The concept of Unmanned Aerial Vehicles (UAVs) has been gaining popularity in recent years, and their applications are vast and diverse. UAVs, also known as drones, offer a unique solution for data collection and processing. With the ability to fly at high altitudes and collect data in real-time, UAVs have become an essential tool for various industries, including agriculture, construction, and environmental monitoring. A UAV consists of several key components, including the frame, motors, propellers, battery, flight controller, electronic speed controller, radio transmitter, and radio receiver. Each component plays a crucial role in the operation of the UAV. The frame is the body of the UAV that holds all the other components together. The motors are responsible for powering the propellers, which generate lift and thrust. The battery provides power to the entire system, while the flight controller is the brain of the UAV that controls its movements.

There are several types of UAVs, including fixed-wing, rotary-wing, and hybrid. Fixed-wing UAVs resemble traditional airplanes and are designed for long-range missions. Rotary-wing UAVs, also known as helicopters, are designed for vertical takeoff and landing and are ideal for applications such as search and rescue. Hybrid UAVs combine the benefits of both fixed-wing and rotary-wing designs.

Fixed-wing UAVs have several advantages, including their ability to fly long distances on a single battery cycle and their stability in high winds. However, they also have some disadvantages, such as requiring a larger takeoff and landing zone and being more expensive than rotary-wing UAVs. Rotary-wing UAVs have several advantages, including their ability to hover in place and take off and land vertically. They are also more affordable than fixed-wing UAVs. However, they have some disadvantages, such as having shorter flight times and being less stable in high winds. In this page, we will compare the advantages and disadvantages of fixed-wing and rotary-wing UAVs. We will also discuss the different types

of cameras that can be used with each type of UAV. Finally, we will discuss the process of collecting data using a UAV.

He discusses the concept of crop identification and classification using Unmanned Aerial Vehicles (UAVs) and Conjugated Dense Convolution Neural Network (CDCNN). The author, Akshay Pandey, explains that traditional methods of crop identification require manual labor and are prone to errors. The goal of the study is to develop a new CNN architecture that can accurately identify multiple crops using a single RGB camera. The data collection process involves capturing high-resolution images of different crops using a UAV camera. The images are then preprocessed to extract candidate crop features. The candidate crop features are extracted using software, and then the data is split into training and testing sets. The proposed CNN architecture is called Conjugated Dense Convolution Neural Network (CDCNN). The architecture consists of convolutional layers, max pooling layers, and dense blocks. The dense blocks are designed to concatenate features from previous layers and reduce the computational time. The output of the CNN is fed into a softmax function to generate probabilities for each crop class. The dense block is designed to concatenate features from previous layers and reduce the computational time. The conversion block is designed to reduce the size of the data by applying convolutional layers and max pooling layers. The output of the conversion block is fed into the dense block 2. The training process involves feeding the preprocessed data into the CDCNN architecture. The accuracy of the model is evaluated using metrics such as accuracy, sensitivity, specificity, F1 score, and FPR. The model is trained for 1000 iterations, and the training process is stable with no fluctuations. The results show that the CDCNN architecture outperforms traditional CNN architectures in terms of accuracy and computational time. The model is able to identify multiple crops with high accuracy, including rice, sugarcane, wheat, beans, and grass. The study concludes that the CDCNN architecture is a viable solution for crop identification and classification using a single RGB camera.

At the end the Speaker answered all the queries from the participants. More than 250 Participants attended the session and have submitted their feedback through the google form.

ONE WEEK FACULTY DEVELOPMENT PROGRAM

ON

MATLAB FOR IMAGE ANALYSIS AND PATTERN RECOGNITION: FROM FUNDAMENTALS TO ADVANCED APPLICATIONS

SEPTEMBER 02 - 06, 2024

RESOURCE PERSON

Dr. Akshay Pandey
Department of CSE
IIIT-Jabalpur

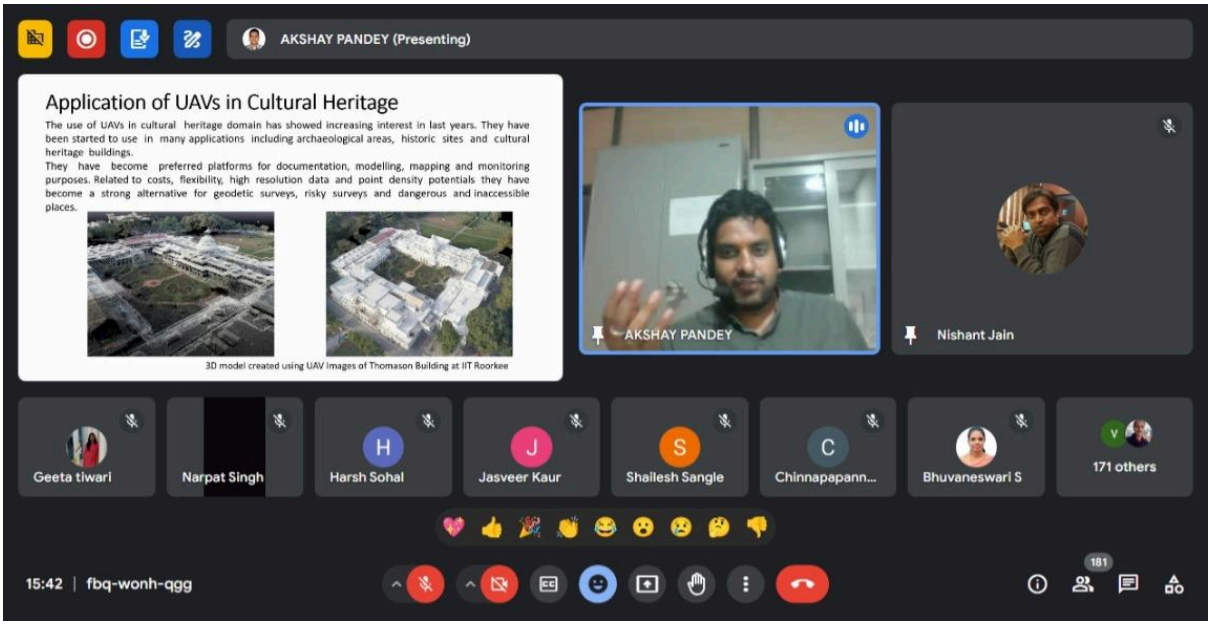
Organized by:

Jaypee University of Information Technology

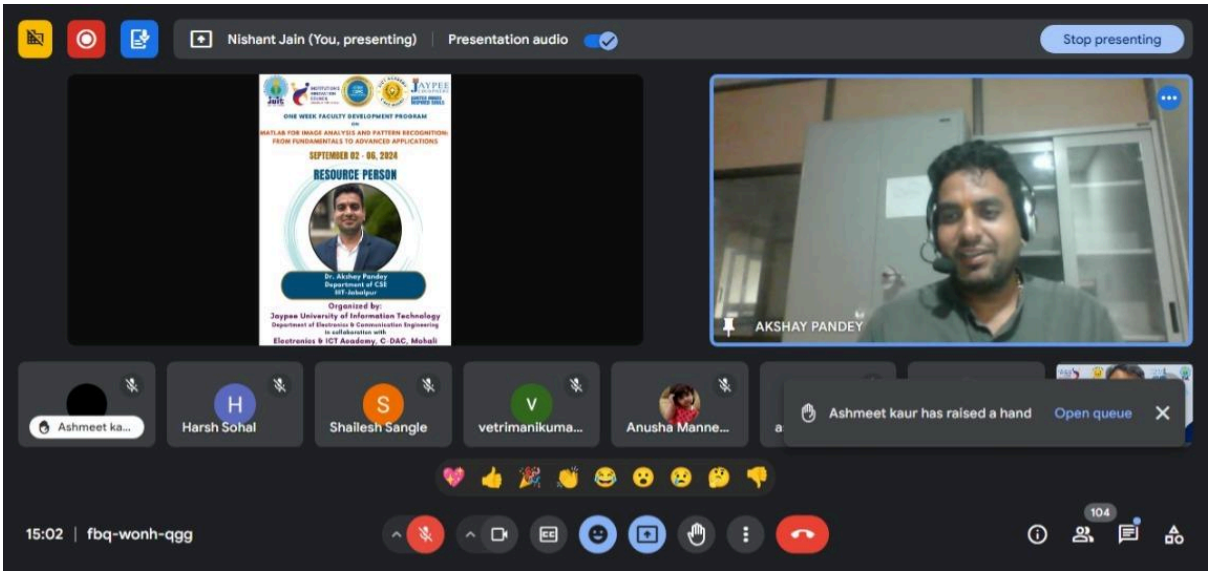
Department of Electronics & Communication Engineering

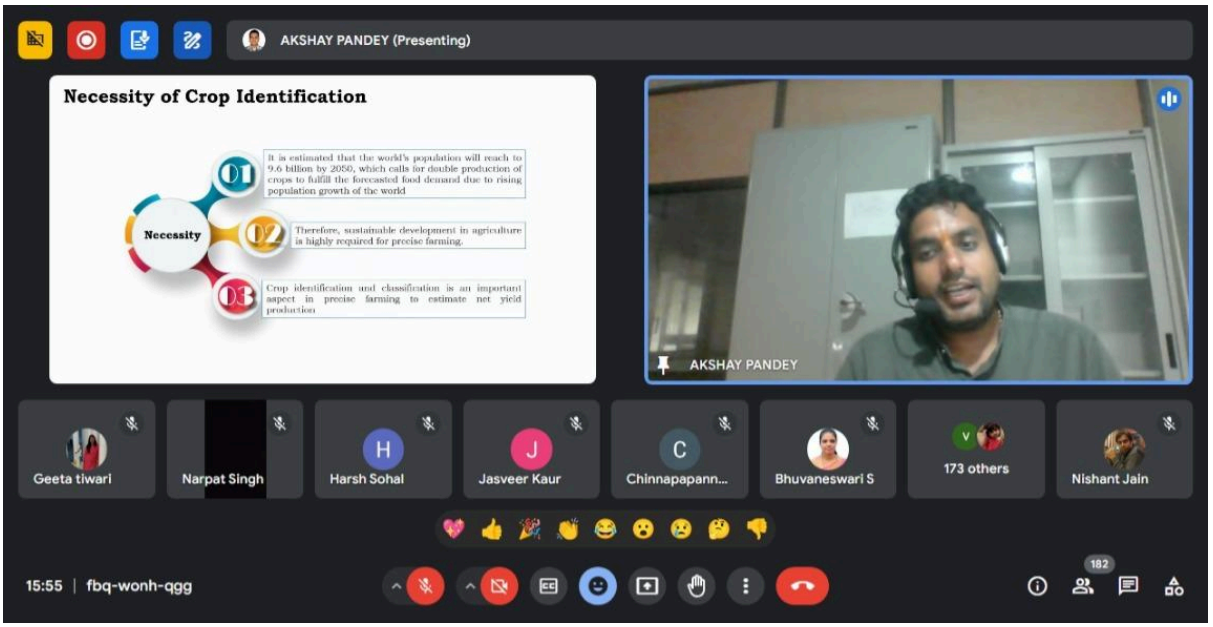
in collaboration with

Electronics & ICT Academy, C-DAC, Mohali




AKSHAY PANDEY (Presenting)
UAV : A game-changer in Agriculture
By: Dr. Akshay Pandey
Assistant Professor
Department of Computer Science & Engineering
IIIT DM Jabalpur
AKSHAY PANDEY
Nishant Jain
Ashmeet ka...
Harsh Sohal
Dr. Shruti Jain
Jasveer Kaur
Shailesh Sangle
vetrimanikuma...
aswini mishra
103 others
15:04 | fbq-wonh-qgg


Nishant Jain (You, presenting)
Presentation audio
Stop presenting
ONE WEEK FACULTY DEVELOPMENT PROGRAM
SEPTEMBER 02 - 06, 2024
RESOURCE PERSON
Dr. Akshay Pandey
Organized by:
Jaypee University of Information Technology
AKSHAY PANDEY
Ashmeet ka...
Harsh Sohal
Shailesh Sangle
vetrimanikuma...
Anusha Manne...
Ashmeet kaur has raised a hand
Open queue
15:02 | fbq-wonh-qgg


AKSHAY PANDEY (Presenting)
Necessity of Crop Identification
Necessity
It is estimated that the world's population will reach to 9.6 billion by 2050, which calls for double production of crops to fulfill the forecasted food demand due to rising population growth of the world
Therefore, sustainable development in agriculture is highly required for precise farming.
Crop identification and classification is an important aspect in precise farming to estimate net yield production
AKSHAY PANDEY
Geeta tiwari
Narpat Singh
Harsh Sohal
Jasveer Kaur
Chinnapapann...
Bhuvaneswari S
173 others
Nishant Jain
15:55 | fbq-wonh-qgg

Day 4 Session 1

First session of Day 4 of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Aspects of Different Medical Imaging Modalities”. Keynote speaker of the Session was Dr. R.S. Anand from IIT Roorkee. Dr. Nishant Jain, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of his achievements.

Summary of the Speaker’s Presentation is as follows:

Dr. RadheyShyam Anand introduces the concept of medical imaging, mentioning that it is a crucial aspect of modern medicine. He explains that medical imaging involves using various techniques to create images of the body, which helps diagnose and treat diseases. He mentions that X-ray imaging is one of the oldest and most widely used modalities. Dr. Anand explains that X-ray imaging was first discovered by William Roentgen in 1895. He describes the process of X-ray imaging, where a beam of X-rays is passed through the body, and the absorbed energy is detected by a sensor. Anand highlights that the X-ray image is created by converting the absorbed energy into visible light. He discusses the importance of electronic control systems in medical imaging. He explains that these systems are used to control the energy output, beam direction, and detection of X-rays. He mentions that computers play a crucial role in controlling the imaging process. Dr. Anand explains the process of image processing and display in medical imaging. He discusses how the detected energy signals are converted into electrical signals, which are then processed and displayed as images. Dr. Anand introduces computed tomography (CT) scanning, which uses a rotating beam to create cross-sectional images of the body. He explains that CT scanning is a non-invasive technique that does not require surgery or radiation exposure. He discusses the risks associated with invasive medical imaging techniques, such as X-ray imaging. He explains that ionizing radiation can cause cancer and other health problems, particularly at high levels. He advises patients to limit their exposure to radiation and emphasizes the importance of using minimally invasive techniques whenever possible. Throughout the summary, speaker emphasizes the importance of understanding medical imaging techniques and their limitations to ensure accurate diagnosis and treatment.

Session was concluded with answers to all the queries from the participants. More than 200 Participants attended the session and have submitted their feedback through the google form.

ONE WEEK FACULTY DEVELOPMENT PROGRAM

ON

MATLAB FOR IMAGE ANALYSIS AND PATTERN RECOGNITION: FROM FUNDAMENTALS TO ADVANCED APPLICATIONS

SEPTEMBER 02 - 06, 2024

RESOURCE PERSON

Prof. R.S. Anand
Department of Electrical Engineering
IIT Roorkee

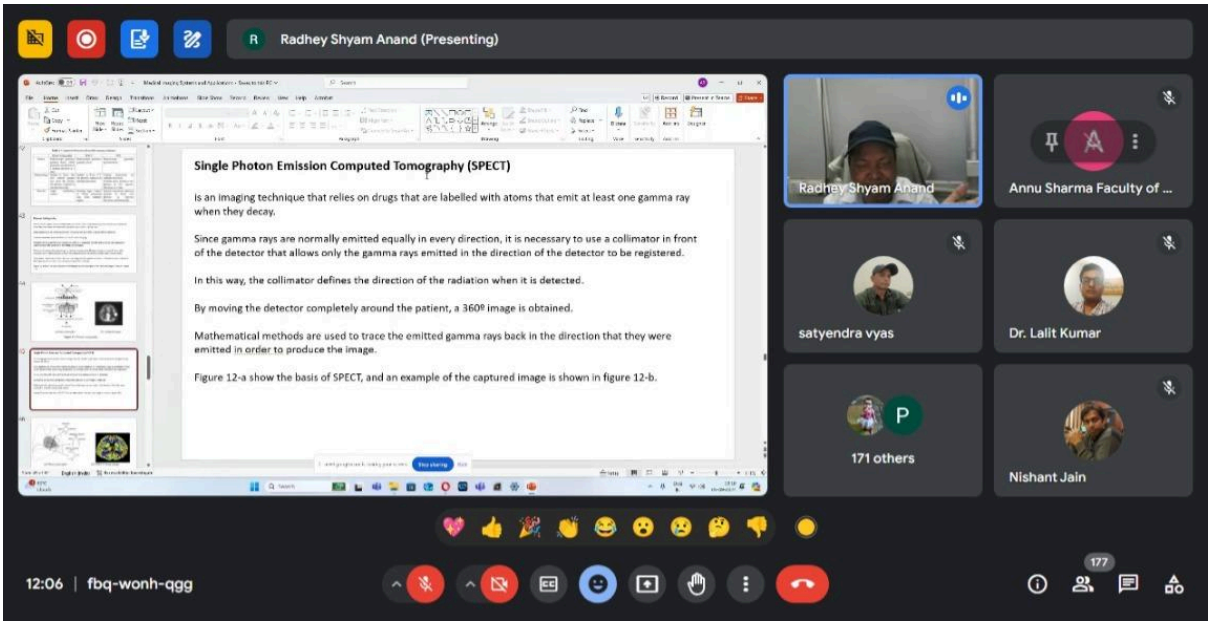
Organized by:

Jaypee University of Information Technology

Department of Electronics & Communication Engineering

in collaboration with

Electronics & ICT Academy, C-DAC, Mohali



Day 4 Session 2

First session of Day 4 of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Aspects of Different Medical Imaging Modalities”. Keynote speaker of the Session was Dr. R.S. Anand from IIT Roorkee. Dr. Nishant Jain, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of his achievements.

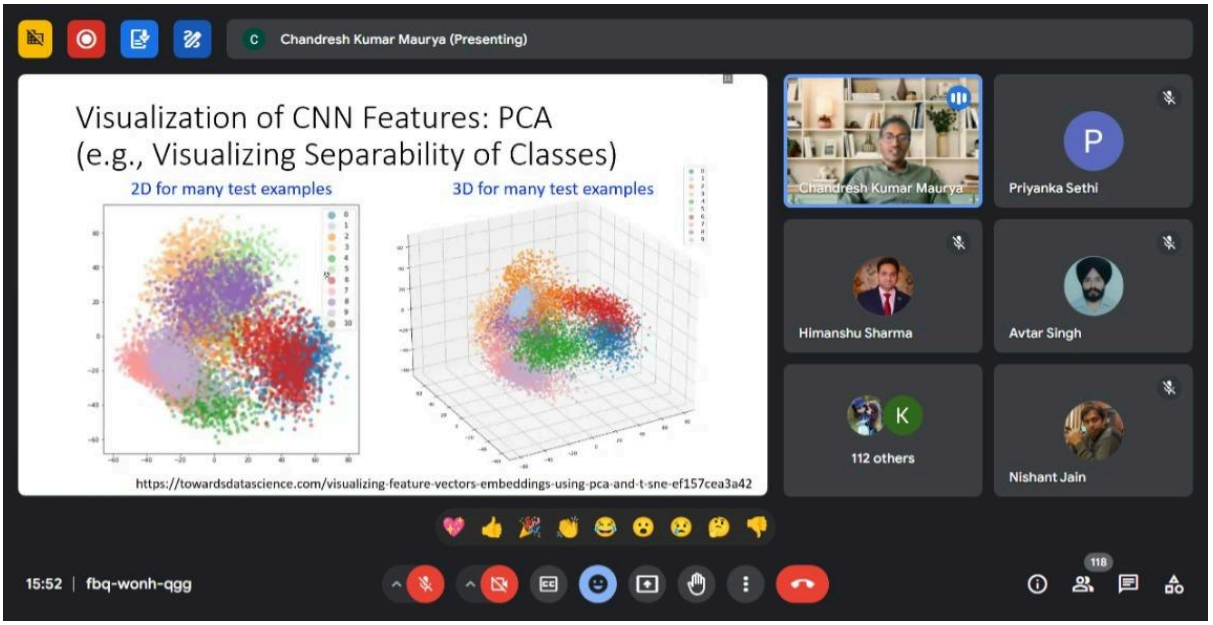
Summary of the Speaker’s Presentation is as follows:

Deep learning is a field of artificial intelligence that aims to learn features from data. It is a part of machine learning, where computers are trained to act like humans. The goal is to train machines to extract features from data and make predictions. The traditional approach to

feature engineering involves manually extracting features from data and then feeding them into a model. However, this approach is time-consuming and may not be effective. Deep learning solves this problem by automating the feature extraction process. Neural networks can learn features from data without manual intervention. The goal is to learn a representation of the data that can be used for classification or prediction. A neural network is a type of model that consists of multiple layers. Each layer learns to extract features from the data and passes it on to the next layer. The output of the final layer is the predicted class or label. The issue with traditional neural networks is that they can be inefficient and require many trainable parameters. Deep learning solves this problem by designing more efficient models that reduce the number of trainable parameters. Convolutional Neural Networks (CNNs) are a type of deep learning model that is particularly effective for image classification. They use convolutional layers to extract features from images and pooling layers to reduce the spatial dimensions of the data. The filters in a CNN are responsible for detecting features such as edges, lines, and colors. The output of these filters is an activation map that represents the presence of these features in the image. The activation maps can be visualized to understand what features the model is detecting. This can be done using techniques such as filter visualization, where the weights of the filters are plotted. The VGG16 model is a popular CNN architecture that consists of 16 layers. It has been shown to be effective for image classification tasks and has been used in many applications. The Lxnet and Alexnate models are other examples of deep learning architectures that have been used for image classification tasks. They have been shown to be effective and have been used in many applications.

Session was concluded with answers to all the queries from the participants. More than 200 participants attended the session and have submitted their feedback through the google form.


Chandresh Kumar Maurya
Nishant Jain
jayachitraece e...
Himanshu Shar...
Kanwarpreet K...
Avtar Singh
Vidyullatha S
Meenu Satiza
Shiv Kumar Gu...
60 others
15:06 | fbq-wonh-qgg


Chandresh Kumar Maurya (Presenting)
Visualization of CNN Features: PCA
(e.g., Visualizing Separability of Classes)
2D for many test examples
3D for many test examples
https://towardsdatascience.com/visualizing-feature-vectors-embeddings-using-pca-and-t-sne-ef157cea3a42
Chandresh Kumar Maurya
Priyanka Sethi
Himanshu Sharma
Avtar Singh
112 others
Nishant Jain
15:52 | fbq-wonh-qgg


Chandresh Kumar Maurya (Presenting)
Representation Learning: Pre-training
vs Fine-tuning
Course Instructor: Chandresh
AI Lab Coordinator @IIT Indore
Chandresh Kumar Maurya
Nishant Jain
jayachitraece e...
Himanshu Shar...
Kanwarpreet K...
Avtar Singh
Meenu Satiza
Shiv Kumar Gu...
Abhishek Shar...
67 others
15:11 | fbq-wonh-qgg

Day 5 Session 1

First session of Day 5 of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Data Augmentation for implementing Deep Learning Networks” and on “Implementation of Machine Learning Models on MATLAB”. Keynote speaker of the Session was Dr. Jitendra Virmani from CSIR-CSIO and Dr. Vikas Baghel from JUIT, Solan. Dr. Nishant Jain, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of his achievements.

Summary of the Speaker’s Presentation is as follows:

The speaker discusses the importance of data augmentation in deep learning networks, specifically in the context of medical images. He explains that the goal of data augmentation is to increase the size of the training dataset and improve the performance of the machine learning model. He discusses the concept of texture features in medical images and how they are used to diagnose diseases. He explains that texture features can be homogeneous, heterogeneous, hyperacute, or hypoeaque. The importance of shape features in medical images, particularly in the diagnosis of liver diseases was discussed. He explains that shape features can be used to differentiate between benign and malignant tumors. The speaker discusses the concept of color features in medical images and how they can be used to diagnose diseases. He explains that color features can be used to differentiate between different types of cancer. He discusses the importance of feature engineering in machine learning, particularly in the context of medical images. He explains that feature engineering involves selecting and extracting relevant features from the dataset. The concept of ROI (Region of Interest) selection in medical images and how it is used to select relevant regions of the image for analysis was also explained. He discusses the importance of radiologist consultation in selecting ROIs and extracting relevant features from medical images. The concept of feature selection and feature space dimensionality reduction algorithms, which are used to reduce the number of features extracted from the dataset was explained. The speaker concludes by discussing the importance of data augmentation and feature engineering in improving the performance of machine learning models on medical image datasets. He also emphasizes the importance of consulting with radiologists and extracting relevant features from medical images.

Session was concluded with answers to all the queries from the participants. More than 200 Participants attended the session and have submitted their feedback through the google form.

ONE WEEK FACULTY DEVELOPMENT PROGRAM

ON

MATLAB FOR IMAGE ANALYSIS AND PATTERN RECOGNITION: FROM FUNDAMENTALS TO ADVANCED APPLICATIONS

SEPTEMBER 02 - 06, 2024

RESOURCE PERSON

Dr. Jitendra Virmani
Senior Technical Officer
CSIR-CSIO

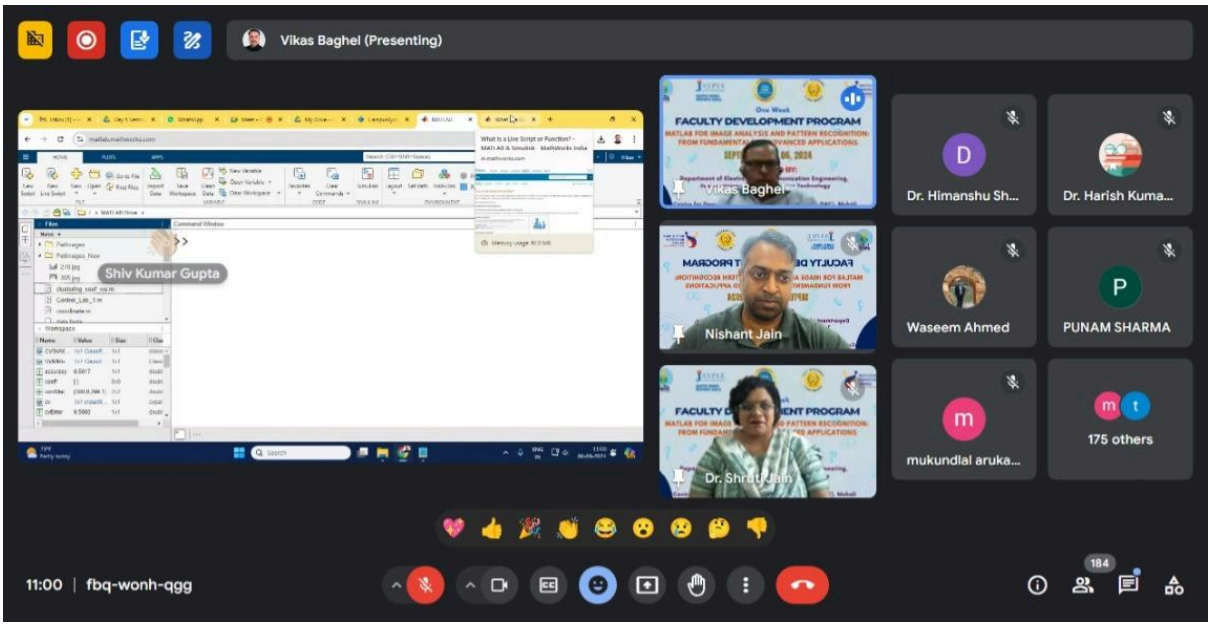
Organized by:

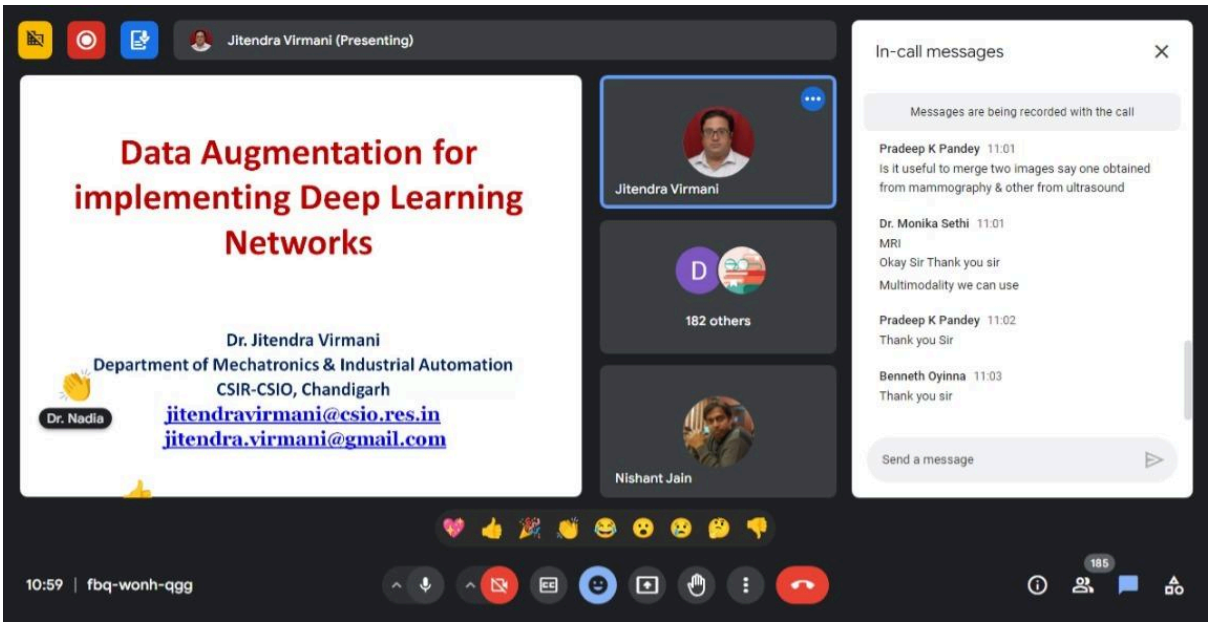
Jaypee University of Information Technology

Department of Electronics & Communication Engineering

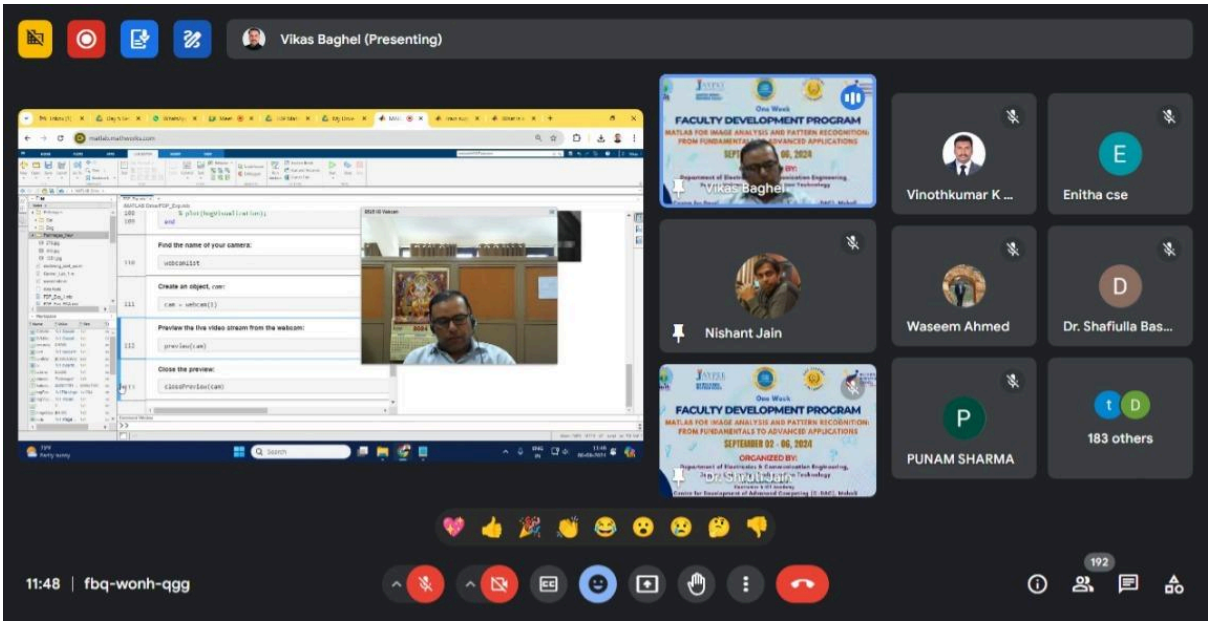
in collaboration with

Electronics & ICT Academy, C-DAC, Mohali




Jitendra Virmani (Presenting)
Data Augmentation for implementing Deep Learning Networks
Dr. Jitendra Virmani
Department of Mechatronics & Industrial Automation
CSIR-CSIO, Chandigarh
jitendravirmani@csio.res.in
jitendra.virmani@gmail.com
Dr. Nadia
Jitendra Virmani
182 others
Nishant Jain
In-call messages
Messages are being recorded with the call
Pradeep K Pandey 11:01
Is it useful to merge two images say one obtained from mammography & other from ultrasound
Dr. Monika Sethi 11:01
MRI
Okay Sir Thank you sir
Multimodality we can use
Pradeep K Pandey 11:02
Thank you Sir
Benneth Oyinna 11:03
Thank you sir
Send a message
10:59 | fbq-wonh-qgg
185


Jitendra Virmani (Presenting)
Data Augmentation for implementing Deep Learning Networks
Dr. Jitendra Virmani
Department of Mechatronics & Industrial Automation
CSIR-CSIO, Chandigarh
jitendravirmani@csio.res.in
jitendra.virmani@gmail.com
Jitendra Virmani
Nishant Jain
Neha Patwari
google meet
Raj Kumar
Anita
Waseem Ahmed
mukundlal aru...
N. Revathi
73 others
10:01 | fbq-wonh-qgg
83


Vikas Baghel (Presenting)
FACULTY DEVELOPMENT PROGRAM
Vikas Baghel
Vinothkumar K ...
Enitha cse
Nishant Jain
Waseem Ahmed
Dr. Shafiulla Bas...
PUNAM SHARMA
183 others
11:48 | fbq-wonh-qgg
192

Day 5 Session 2

Second session of Day 5 of the Faculty Development Program (FDP) on “MATLAB for Image Analysis and Pattern Recognition: From Fundamentals to Advanced Applications" under Electronics & ICT Academy C-DAC Mohali was on “Convolutional Neural Networks (CNNs) for Computer Vision”. Keynote speaker of the Session was Dr. Anita Singh, Scientist ‘F’ , IRDE, DRDO, Ministry of Defence. Dr. Nishant Jain, Assistant Professor, Department of Electronics and Communication Engineering welcomed the speakers with a brief introduction of his achievements.

Summary of the Speaker’s Presentation is as follows:

The introduction to Artificial Intelligence (AI) and its subfield, Computer Vision (CV), is discussed. AI is defined as a system that mimics the human brain's cognitive characteristics, such as learning, perception, and decision-making. The three main paths of AI are discussed: sensor, agent, and disease. The importance of CV is highlighted, with its applications in robotics, surveillance, navigation, and pattern recognition. The concept of visual features is introduced, including detection, recognition, and identification. The supervised and unsupervised learning techniques are discussed, with examples of linear classification, logistic regression, and clustering algorithms. The importance of feature engineering and label data is emphasized. The concept of a neural network is introduced, with a comparison to the human brain's neural processing. The perceptron algorithm is discussed, including its weights and biases, and how it can be used for classification and regression tasks. The activation function is mentioned, but not further explained. The concept of multi-layer perceptron is introduced, with the idea that neurons can be connected to multiple layers to form complex decision-making processes. Overall, the introduction provides a foundation for understanding the basics of AI, CV, and neural networks, setting the stage for further exploration of these topics.

Session was concluded with answers to all the queries from the participants. More than 200 Participants attended the session and have submitted their feedback through the google form.

ONE WEEK FACULTY DEVELOPMENT PROGRAM

ON

MATLAB FOR IMAGE ANALYSIS AND PATTERN RECOGNITION: FROM FUNDAMENTALS TO ADVANCED APPLICATIONS

SEPTEMBER 02 - 06, 2024

RESOURCE PERSON

Dr. Anita Singh
Scientist 'F' , IRDE, DRDO
Ministry of Defence

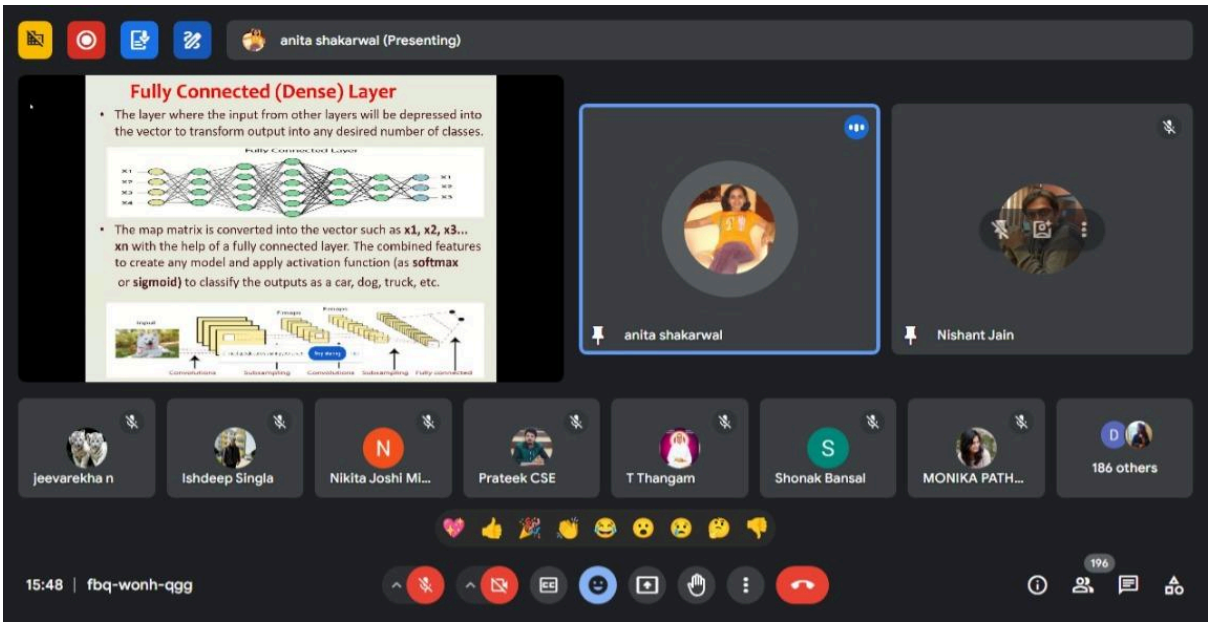
Organized by:

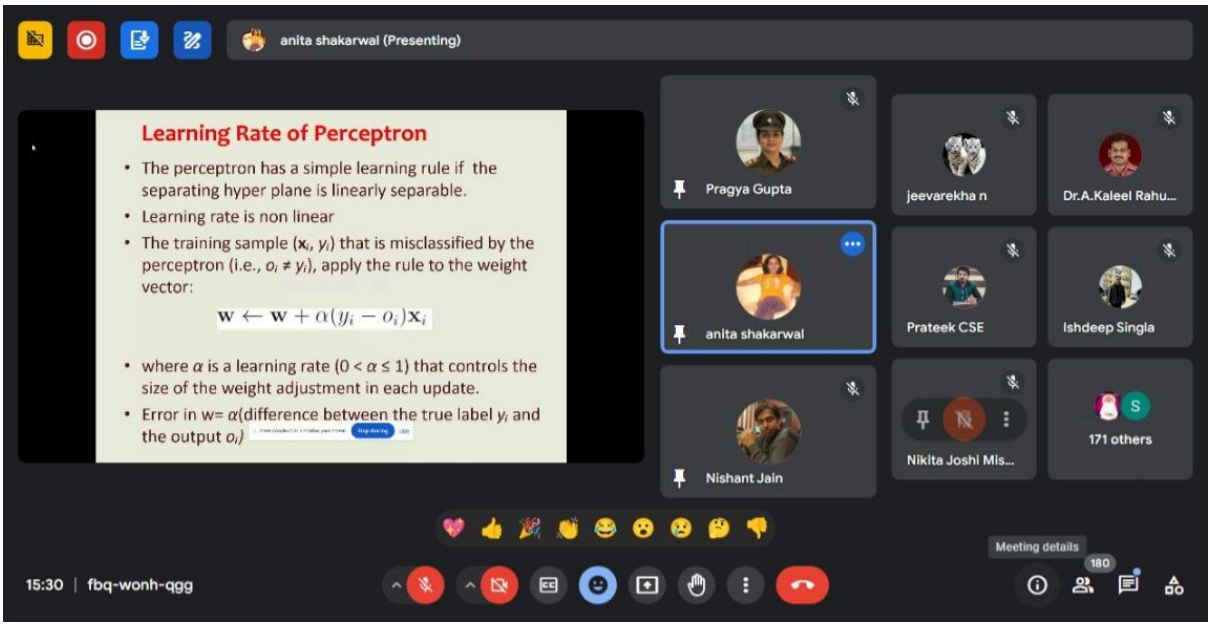
Jaypee University of Information Technology

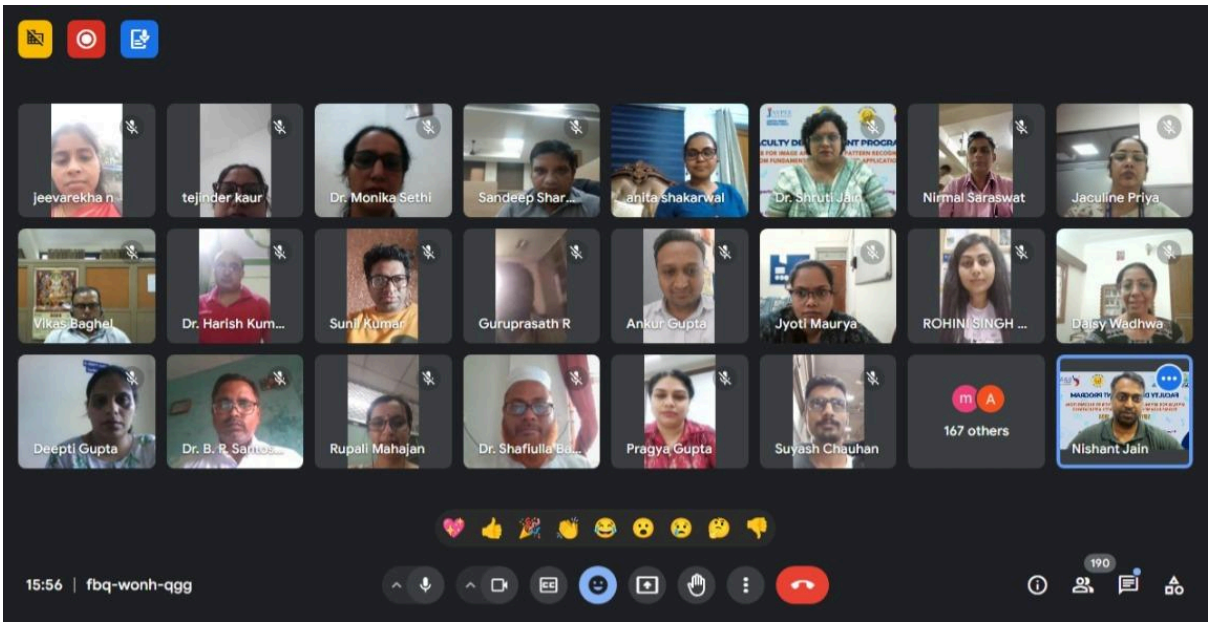
Department of Electronics & Communication Engineering

in collaboration with

Electronics & ICT Academy, C-DAC, Mohali







FDP ended with the Valedictory and Quiz. On the basis of Quiz marks and attendance in the FDP, e-Certificates were provided to 169 Participants.