

Department of
Electronics and Communication Engineering

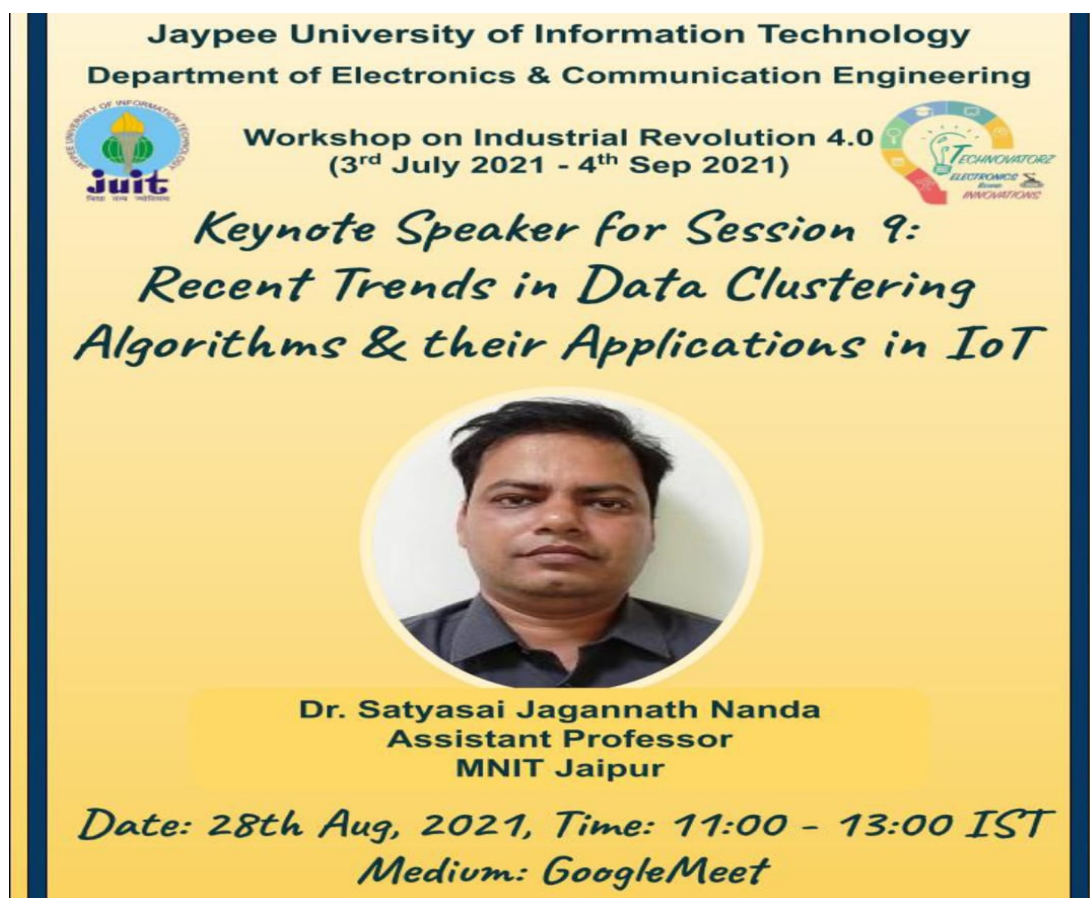
**Jaypee University of Information Technology
Waknaghat**

WORKSHOP ON INDUSTRIAL REVOLUTION 4.0

Event Report: Session-9

28th August, 2021


Department of Electronics and Communication Engineering of Jaypee University of Information Technology, Solan organized an amazing 9th session of “Workshop on Industrial Revolution 4.0” on 28 August 2021. The topic of the 9th session was “**Recent Trends in Data Clustering Algorithms & their Applications in IoT**” delivered by our honorable speaker **Dr. Satyasai Jagannath Nanda, Assistant Professor, MNIT Jaipur.**



Jaypee University of Information Technology
Department of Electronics & Communication Engineering

Workshop on Industrial Revolution 4.0
(3rd July 2021 - 4th Sep 2021)

*Keynote Speaker for Session 9:
Recent Trends in Data Clustering
Algorithms & their Applications in IoT*

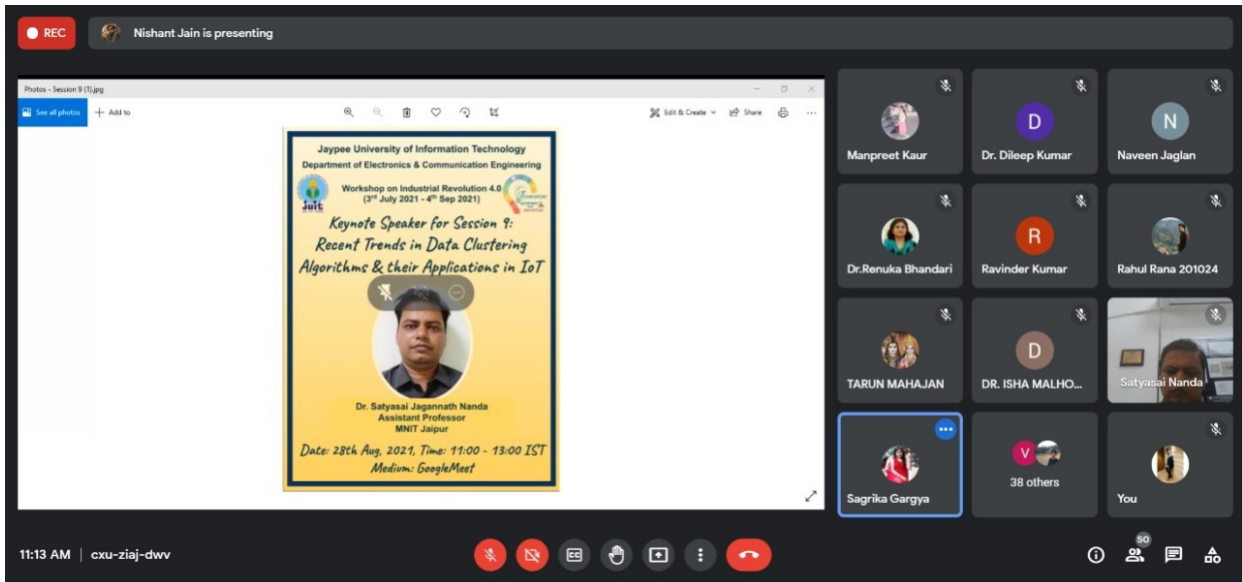


Dr. Satyasai Jagannath Nanda
Assistant Professor
MNIT Jaipur

*Date: 28th Aug, 2021, Time: 11:00 - 13:00 IST
Medium: GoogleMeet*

Our eminent speaker introduced by Ms. Pragya and Ms. Sagrika from the branch of

Electronics and Communication Engineering served as an inspiration to several participants & students by delivering their motivation towards the field of IOT.



He also gave us the knowledge about the clustering and the importance of unsupervised learning in the field of IoT. With vast knowledge in the field of IOT, Dr. Nanda explained the algorithms of data clustering and their applications in IOT in day to day life. He continued explaining its optimization, computation and how it is applicable and used nowadays in every field.

Partitional Clustering

Given a dataset

$$P_{N \times D} = \begin{bmatrix} p_{1,1} & p_{1,2} & \dots & p_{1,D} \\ p_{2,1} & p_{2,2} & \dots & p_{2,D} \\ \vdots & \vdots & \ddots & \vdots \\ p_{N,1} & p_{N,2} & \dots & p_{N,D} \end{bmatrix} = \begin{bmatrix} \vec{p}_1 \\ \vec{p}_2 \\ \vdots \\ \vec{p}_N \end{bmatrix}$$

It represents N patterns each having D attributes (also called features)

Objective: Partition the dataset into M groups (Clusters) such that

- Every cluster must contain at least one pattern

$$C_i \neq \phi \quad \forall i \in \{1, 2, \dots, M\}$$
- There should not be common patterns between any two clusters

$$C_i \cap C_j = \phi \quad \forall i, j \in \{1, 2, \dots, M\} \text{ and } i \neq j$$
- Dataset consists of sum of all the cluster

$$\bigcup_{i=1}^M C_i = P_{N \times D}$$

11:40 AM | cxu-ziaj-dwv

Derivative Based Optimization

Uni-modal

Process continues until and unless slope changes from positive to negative or vice versa where the algorithm assumes presence of maxima

$\frac{dy}{dx} = 0$

$\frac{dy}{dx} = 0$

Multi-modal

Global Maxima

Maxima

Maxima

11:52 AM | cxu-ziaj-dwv

Satyasai Nanda

Nishant Jain

Sagrika Gargya

Manpreet Kaur

Dr. Dileep Kumar

Rahul Shrivastava

Naveen Jaglan

Ravinder Kumar

Rahul Rana 201024

DR. ISHA MALHO...

44 others

You

Satyasai Nanda

Nishant Jain

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Naveen Jaglan

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Rahul Rana 201024

DR. ISHA MALHO...

46 others

You

He also explained the IOT and remote sensing, hyper spectral imaging etc. and also about the various IOT applications in Industry 4.0 'The 9th Industrial Revolution'. He broadly explains about the data clustering algorithms and its applications. And also shared some problems like Band Selection and its clustered image.

The image displays three sequential screenshots from a Zoom meeting, each showing a presentation slide on the left and a grid of participant avatars on the right. The meeting is recorded, as indicated by the 'REC' icon in the top left corner of each slide.

Slide 1: Hyper-spectral Imaging
 The slide title is "Hyper-spectral Imaging". The text explains that hyperspectral imaging collects and processes information from across the electromagnetic spectrum. It notes that it collects hundreds of images at different wavelengths for the same spatial area. The AIM is to obtain the spectrum for each pixel in the image of a scene, with the purpose of finding objects, identifying materials, or detecting processes. A diagram shows a 3D volume of a landscape with many thin slices representing different wavelengths. Text below states: "Human eye sees color of visible light in mostly three bands". A list of bullet points follows:

- long wavelengths - perceived as red
- medium wavelengths - perceived as green
- short wavelengths - perceived as blue

 The final sentence reads: "Spectral imaging divides the spectrum into many more bands."

Slide 2: Internet of Things and Remote Sensing
 The slide title is "Internet of Things and Remote Sensing". It lists several points:

- Recent advances in home automation, smart environments, smart cities and sensor networks for civilian and military applications have combined to create the Internet of Things (IoT).
- With it has also emerged a transformation of the Internet and mobile communication networks into a single infrastructure.
- The goal is to be able to access, secure, manage, control and scale the single IoT infrastructure from anywhere and with any device.
- This transformation creates new industrial opportunities in smart environments, sensor software, IoT platforms, cyber security, cryptographic schemes for sensor networks, digital forensics and sales.
- New frontiers for IoT include sensor networks on land, underwater and in space to monitor environmental conditions, the remote supervision of large-scale farms, precision agriculture, remote surgery, remote laboratories, the retail industry and auto devices including drones and unmanned aerial vehicles (UAV).

Slide 3: Problem 2- Band Selection
 The slide title is "Problem 2- Band Selection". It shows a flowchart illustrating the process:

- A "Raw Image" (a multi-colored aerial view of a city) is processed through "Band Selection" to produce "Selected Bands" (a grayscale aerial view).
- The "Selected Bands" are then processed through "Clustering" to produce a "Clustered Image" (a multi-colored aerial view where different areas are highlighted in different colors).

The participant grid on the right of each slide shows the following names: Satyasaal Nanda (presenting), Nishant Jain, Sagrika Gargya, Manpreet Kaur, Dr. Dileep Kumar, Rahul Shrivastava, Ravinder Kumar, Naveen Jaglan, Rahul Rana 201024, Manoj Kumar R, and 47 others (Slide 1), 49 others (Slide 2), and 44 others (Slide 3). The time shown at the bottom of each slide is 12:30 PM, 12:27 PM, and 12:36 PM respectively.

Two hour session on the trends in data clustering and their applications in IOT was great, participants gained a lot of knowledge in this field and they really appreciated this session. Hoping to implement the knowledge we gained during the session in future.

REC Satyasai Nanda is presenting

6. Non-Dominant Male Movements

Exploitation

$$S_{NM}^{k+1}(i) = S_{NM}^k(i) + \alpha(\vec{X}_w - S_{NM}^k(i))$$

12:23 PM | cxu-ziaj-dwv

Participants: Satyasai Nanda, Nishant Jain, Sagrika Gargya, Manpreet Kaur, Dr. Dileep Kumar, Rahul Shrivastava, Rahul Rana 201024, Naveen Jaglan, Ravinder Kumar, Manoj Kumar R, 47 others, You.

REC Satyasai Nanda is presenting

Particle Swarm Optimization

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graph TD; Start([Start]) --> Init[Initialize particles with random position and velocity vectors.]; subgraph Loop [Loop until all particles exhaust]; direction TB; Eval[For each particle's position (p) evaluate fitness]; UpdatePbest[If fitness(p) better than fitness(pbest) then pbest= p]; UpdateGbest[Set best of pBests as gBest]; UpdatePos[Update particles velocity and position]; end; Init --> Eval; Eval --> UpdatePbest; UpdatePbest --> UpdateGbest; UpdateGbest --> UpdatePos; UpdatePos --> Stop[Stop, giving gBest, optimal solution.];
```

12:04 PM | cxu-ziaj-dwv

Participants: Satyasai Nanda, Nishant Jain, Sagrika Gargya, Manpreet Kaur, Dr. Dileep Kumar, Rahul Shrivastava, Naveen Jaglan, Ravinder Kumar, Ashutosh Sharma, D ARUN KUMAR, 49 others, You.

In the conclusion, the several doubts were cleared and developed immense interest in the applications of IOT and data clustering algorithms. The session was worthy and taught us lot of things.

