

# Machine Learning: Replicating Human Brain

## 7th June, 2021

Last year the Department of ECE, JUIT signed an MoU with ABVGIET Pragatinagar, Himachal Pradesh to promote and support various academic activities with each other. In this regard, under the guidance of Prof Vinod Kumar, Vice-Chancellor, JUIT and Dr. Rajiv Kumar, Head, ECE Department, JUIT, department has conducted an Expert Lecture in online mode for the students of ABVGIET Pragatinagar on 7th June 2021.

Dr. Nishant Jain has delivered an expert talk on the topic "Machine Learning: Replicating a Human Brain". During the lecture he discussed the basic steps involved in designing a good decision making machine. Main key points discussed in the lecture were Human Intelligence System, Resources available to replicate human intelligence, Building blocks to design Machine Learning System, Applications of Machine Learning and Learning Resources for the students.

The image shows a Beamer presentation slide. The slide title is "Machine Learning: Replicating Human Brain" in large orange font. Below the title, the presenter is identified as "Dr. Nishant Jain" in bold black font. Underneath, his credentials are listed: "(Ph.D. from IIT Roorkee)", "Assistant Professor, Department of Electronics and Communication Engineering", "Member, Technology Incubation and Entrepreneurship Development Cell", "Member, Centre of Excellence in Health Care Technologies and Informatics", and "Jaypee University of Information Technology, Solan, Himachal Pradesh". The slide is part of a 25-slide presentation, as indicated by the slide number "1" in the top left corner and the slide navigation bar at the bottom. The Beamer interface includes a menu bar at the top with options like "File", "Edit", "View", "Insert", "Format", "Slide", "Arrange", "Tools", "Add-ons", and "Help". There is also a "Present" button and a "Share" button in the top right corner.

meet.google.com/nue-dgiu-gtt

Sharing docs.google.com to meet.google.com [Stop](#) [Share this tab instead](#)

You are presenting

Akriti Sharma\_ECE... and 12 more

11:06 AM

Presentation (You)

Munish Patial

You're presenting to everyone

[Stop presenting](#)

Presentation audio

Meeting details

Turn on captions

You are presenting

meet.google.com/nue-dgiu-gtt

12:19 PM

You

Mohit Rattan ECE-10

Amisha Larzoo ece -2

Ashish Tandon ECE-06

Shubham 24

Diksha ECE 07

Pankaj Sharma ECE leet 15

Himanshu Thakur10

Archana Thakur Leet 8

ASHUTOSH THAKUR 08

Satish Bhatt ece 14

Nishant Thakur EC 12

Anshika Salaria

shivani sood L09

Nikhil sharma Ec 11

Sahil Rathour ECE L -18

Keerti Chouhan ECE leet 12

MANAV PAUL ECE L-13

Munish Patial has left the meeting

Akriti Sharma\_ECE\_LU3

Akanksha Sharma

Nikhil Shandil LT14

RITIK SHARMA 21

Aditi Sharma ECE LEET 02

Anmol Mehta ECE 03

Meeting details

Turn on captions

Present now

Meeting interface showing a slide titled "Could you Identify the FRUIT present inside the two boxes, given that the size of the fruit is somewhat similar to cricket ball?". The slide displays two wooden crates, one with a yellow square and one with a red square. The meeting controls show "Nishant Jain is presenting" and a list of participants including Nishant Jain, Mohit Rattan EC..., Amisha Larzoo e..., Ashish Tandon E..., neha dhiman L04, Himanshu Thak..., Nikhil Shandil LT..., Anmol Mehta EC..., vandana thakur, Anurag Sandhu..., RITIK SHARMA 21, and Diksha ECE 07.

Windows taskbar and meeting details bar. The taskbar includes a search bar and various application icons. The meeting details bar shows "Meeting details" and "Nishant Jain is presenting".

Meeting interface showing a slide titled "Building blocks to design Machine Learning System" with a sub-section "Feature Extraction". The slide displays two line graphs: one with "Mean = 10" and another with "Mean = 0". The meeting controls show "Nishant Jain is presenting" and a list of participants including Ashish Tandon E..., vandana thakur, neha dhiman L04, Anurag Sandhu..., Pankej Sharma E..., Himanshu Thak..., Nishant Jain, Archana Thakur..., Munish Patial, Heena Rani LEE..., Satish Bhatt ece..., and ravi kant sharma.

Windows taskbar and meeting details bar. The taskbar includes a search bar and various application icons. The meeting details bar shows "Meeting details" and "Nishant Jain is presenting".

Meeting details: Nishant Jain is presenting. 11:59 AM. 34 participants.

## Building blocks to design Machine Learning System

### Machine Training

Training Dataset: 60 Samples  
 30 Samples of Class 1  
 30 Samples of Class 2

Testing Dataset: 50 Samples  
 20 Samples of Class 1  
 20 Samples of Class 2

### Dataset

Sample No.	Mean	Standard Dev.	Class
1	2	3	1
2	1	5	1
3	0	1	1
4	-1	2	1
5	-2	-1	1
⋮	⋮	⋮	⋮
96	2	-2	2
97	1	-3	2
98	0	-4	2
99	-1	-5	2
100	-2	-6	2

Meeting details: Nishant Jain is presenting. 12:06 PM. 34 participants.

## Building blocks to design Machine Learning System

### Artificial Neural Network

initial weights

$W(0) = (0, 1)$

first correction

$W(1) = (0.7, 0.6)$

Meeting details: Nishant Jain is presenting. 12:06 PM. 34 participants.

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Meeting interface showing a slide titled "Image Enhancement".

**Image Enhancement**

Using Deep learning algorithms we can train a neural network to zoom in the images at 2x or even 4x ratio, making it possible to enhance the quality of low-resolution pictures.

**EG IBM/MAX Image Resolution Enhancer:**  
This deployable model allows users to upscale a pixelated image by a factor of 4, while generating photo-realistic details.



Meeting controls and participant list are visible on the right.

Windows taskbar and Windows search bar are visible at the bottom of the first screenshot.

Meeting interface showing a slide titled "Image Registration".

**Image Registration**

**Deep Learning Approaches:**

- The first way deep learning was used for image registration was for feature extraction. Convolutional neural networks' successive layers manage to capture increasingly complex image characteristics and learn task-specific features.
- In 2018, Yang et al. developed a non-rigid registration method based on the same idea. They used layers of a pre-trained VGG network to generate a feature descriptor that keeps both convolutional information and localization capabilities.
- The second way deep learning is used for image registration is that instead of limiting the use of deep learning to feature extraction, researchers tried to use a neural network to directly learn the geometric transformation to align two images.

Meeting controls and participant list are visible on the right.

Windows taskbar and Windows search bar are visible at the bottom of the second screenshot.