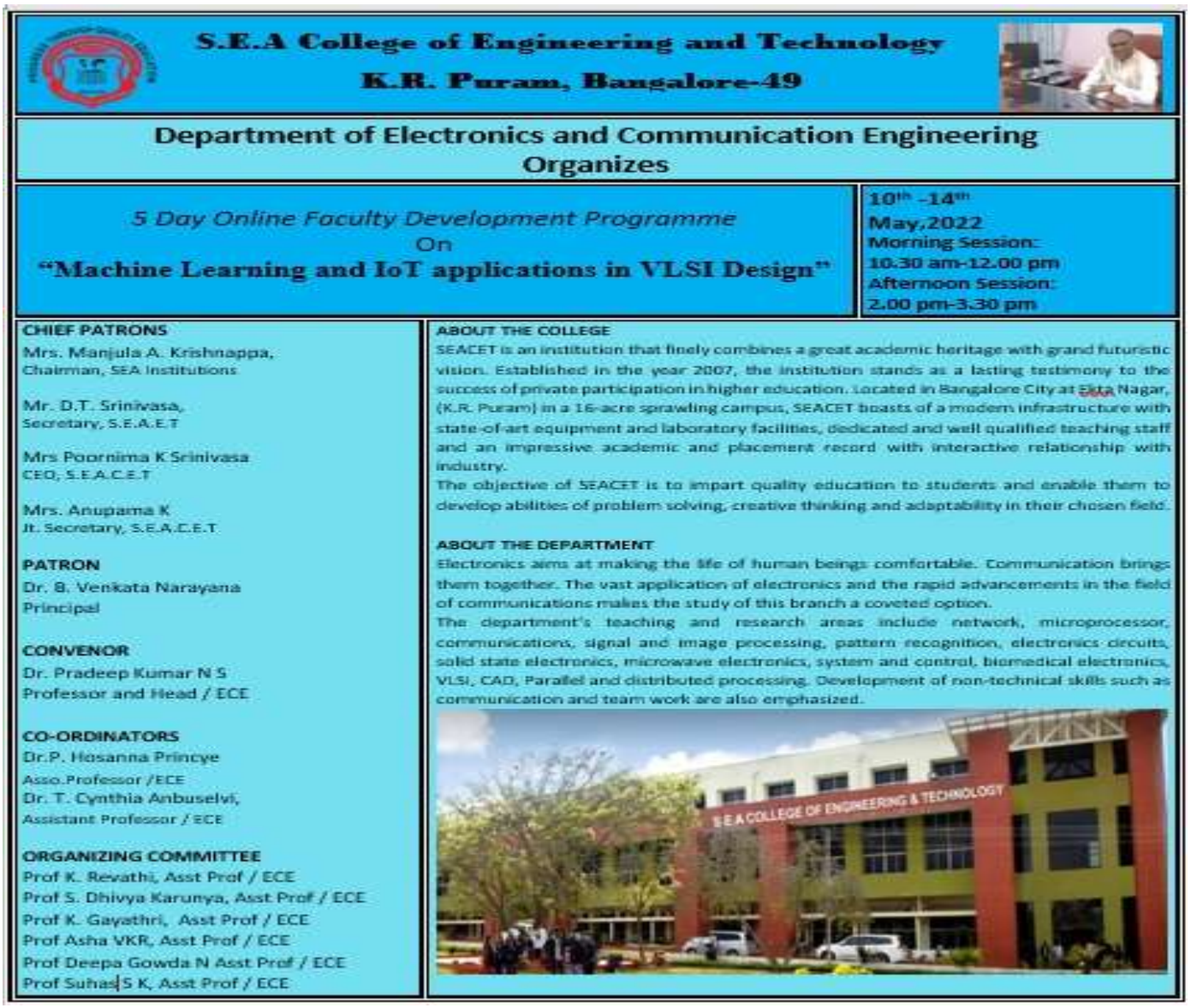
Report on the 5 Day Online Faculty Development Programme

A 5 Day Online Faculty Development Program on "Machine Learning and IoT applications in VLSI Design" was organized by Department of Electronics and Communication Engineering, S.E.A College of Engineering and Technology, Bangalore from 10th-14th May, 2022. The timings for Morning Session was 10.30 am to 12.00 pm and afternoon Session was 2.00 to 3.30 pm. There were 150 enthusiastic participants from various Engineering colleges across India. Participants attended the FDP through online mode (Google Meet). The function was presided by Dr.B.Venkatanarayana, Principal, SEACET and introduction of resource persons were given by Dr. Pradeep Kumar N.S., HOD, ECE, SEACET.

About FDP:



S.E.A College of Engineering and Technology
K.R. Puram, Bangalore-49

Department of Electronics and Communication Engineering Organizes

5 Day Online Faculty Development Programme
On
"Machine Learning and IoT applications in VLSI Design"

10th -14th May,2022
Morning Session:
10.30 am-12.00 pm
Afternoon Session:
2.00 pm-3.30 pm

CHIEF PATRONS
Mrs. Manjula A. Krishnappa,
Chairman, SEA Institutions

Mr. D.T. Srinivasa,
Secretary, S.E.A.E.T

Mrs Poornima K Srinivasa
CEO, S.E.A.C.E.T

Mrs. Anupama K
Jt. Secretary, S.E.A.C.E.T

PATRON
Dr. B. Venkata Narayana
Principal

CONVENOR
Dr. Pradeep Kumar N S
Professor and Head / ECE

CO-ORDINATORS
Dr.P. Hosanna Princye
Asso.Professor /ECE
Dr. T. Cynthia Anbuselvi,
Assistant Professor / ECE

ORGANIZING COMMITTEE
Prof K. Revathi, Asst Prof / ECE
Prof S. Dhivya Karunya, Asst Prof / ECE
Prof K. Gayathri, Asst Prof / ECE
Prof Asha VKR, Asst Prof / ECE
Prof Deepa Gowda N Asst Prof / ECE
Prof Suhas S K, Asst Prof / ECE

ABOUT THE COLLEGE
SEACET is an institution that finely combines a great academic heritage with grand futuristic vision. Established in the year 2007, the institution stands as a lasting testimony to the success of private participation in higher education. Located in Bangalore City at Ekta Nagar, (K.R. Puram) in a 16-acre sprawling campus, SEACET boasts of a modern infrastructure with state-of-art equipment and laboratory facilities, dedicated and well qualified teaching staff and an impressive academic and placement record with interactive relationship with industry.
The objective of SEACET is to impart quality education to students and enable them to develop abilities of problem solving, creative thinking and adaptability in their chosen field.

ABOUT THE DEPARTMENT
Electronics aims at making the life of human beings comfortable. Communication brings them together. The vast application of electronics and the rapid advancements in the field of communications makes the study of this branch a coveted option.
The department's teaching and research areas include network, microprocessor, communications, signal and image processing, pattern recognition, electronics circuits, solid state electronics, microwave electronics, system and control, biomedical electronics, VLSI, CAD, Parallel and distributed processing. Development of non-technical skills such as communication and team work are also emphasized.

Objective of the FDP:

The broad objective of this FDP is to introduce Machine learning concepts for implementation in VLSI Domain. ML techniques are widely used for many applications such as Biometrics, Medical Imaging, Signal Processing, NLP and so on. This FDP will give the basics of Machine Learning and deep learning concepts with applications to VLSI design. It will help to upgrade the expertise and capabilities of the faculty members and will generate a climate for research and enthusiasm for academic excellence.

- Introduction to IOT and Machine Learning
- VLSI Design Using IOT and Machine Learning
- Machine Learning Implementation using Tensor Flow

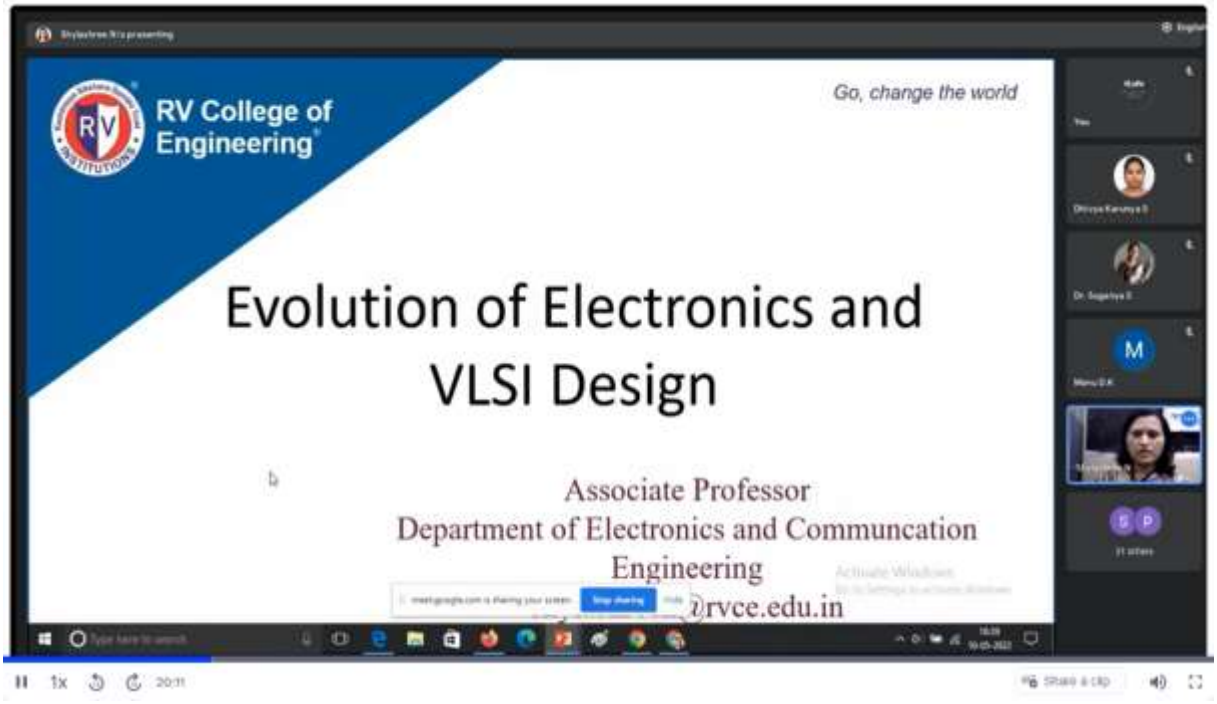
Resource Persons of the FDP:

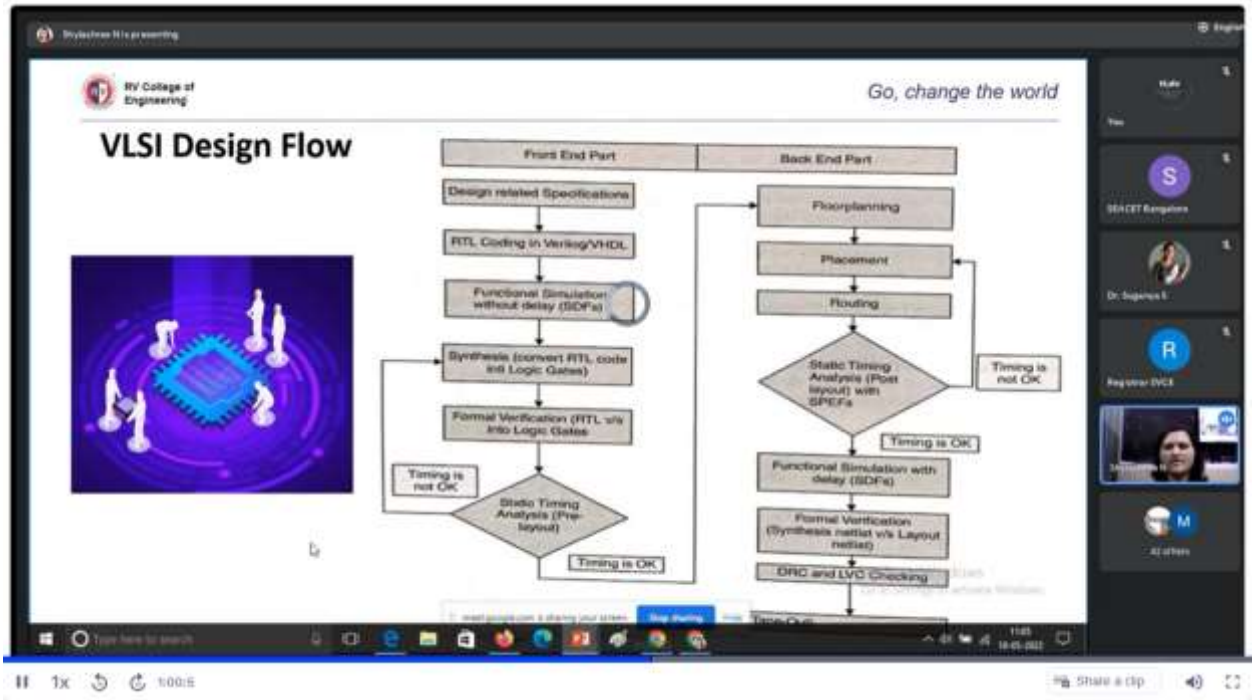
Resource Persons for the FDP were from various reputed institutions they briefed the concept in detail. The details about the resource persons are given below.

First day 10.5.22

The First day 10.5.22 Forenoon session lecture was delivered by Dr.Shylashree N, Associate Professor, R.V College of Engineering, Bengaluru in the topic 'Evolution of Electronics and VLSI Design'. The digital hardware design flow was explained in detail. She briefed about timing analysis about digital circuits and the need for low power VLSI chips.

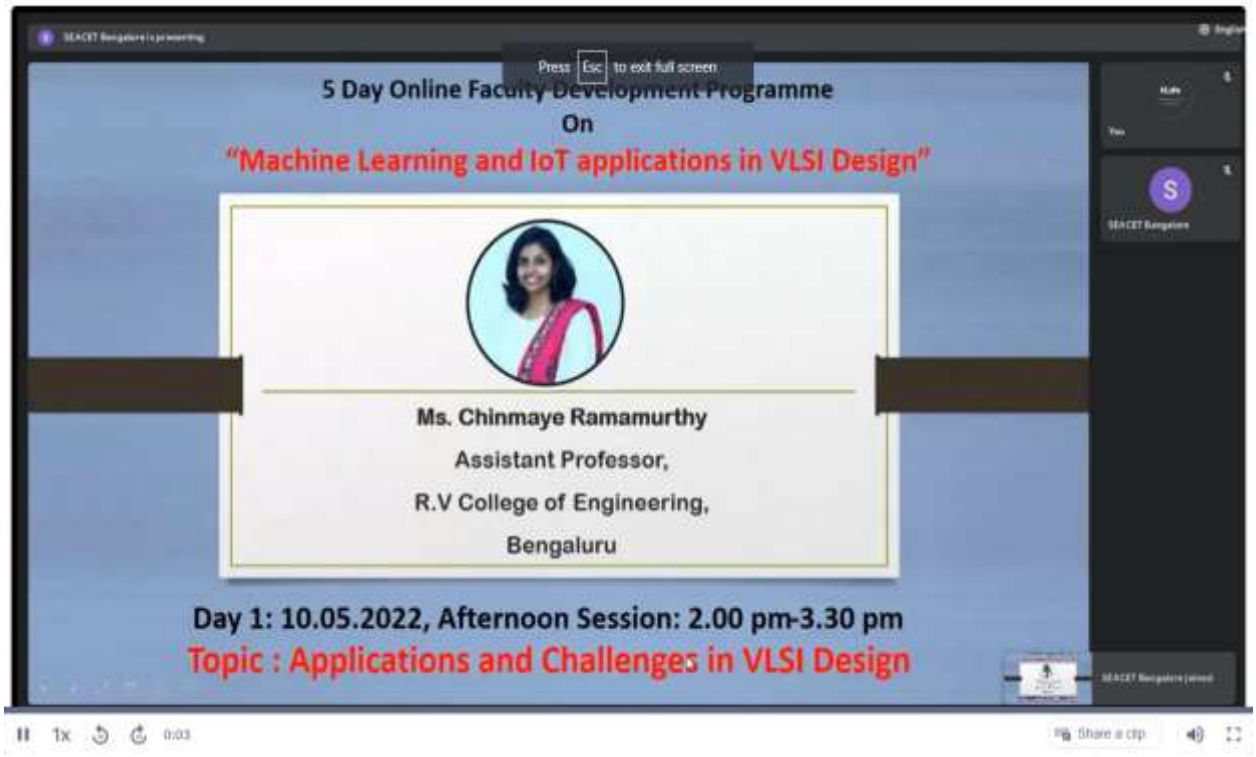
Screen Shots for First day 10.5.22 Forenoon session

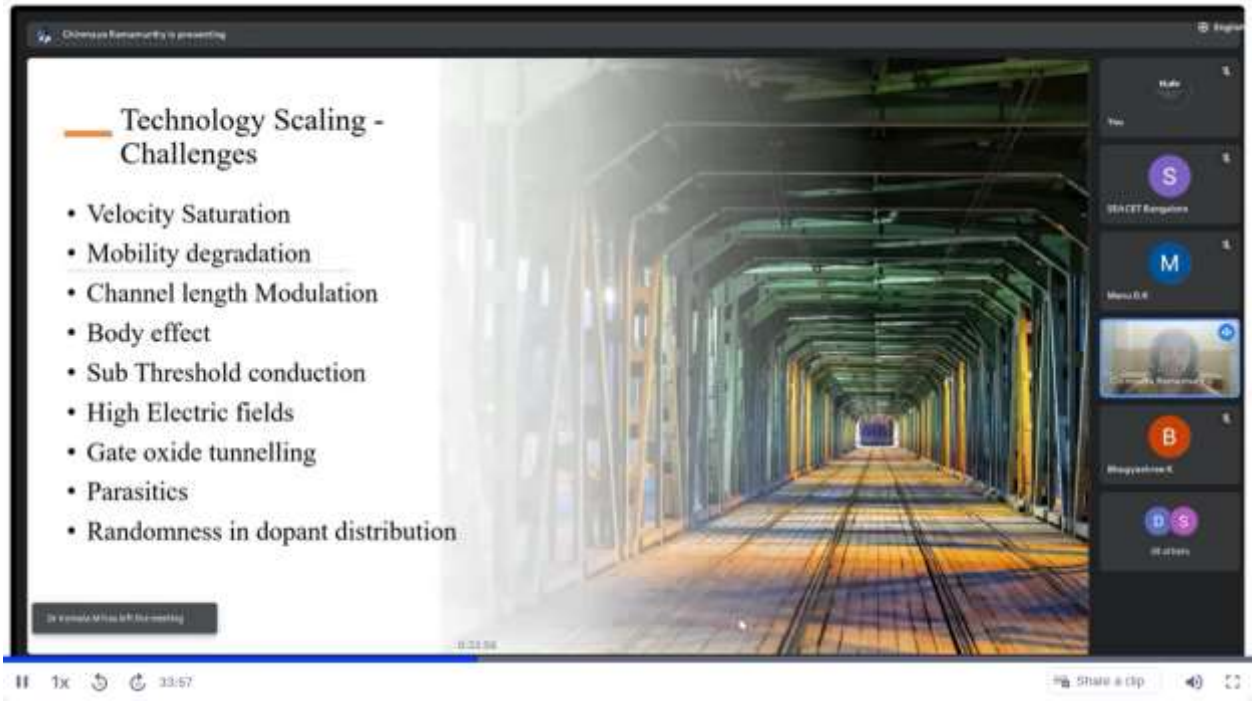


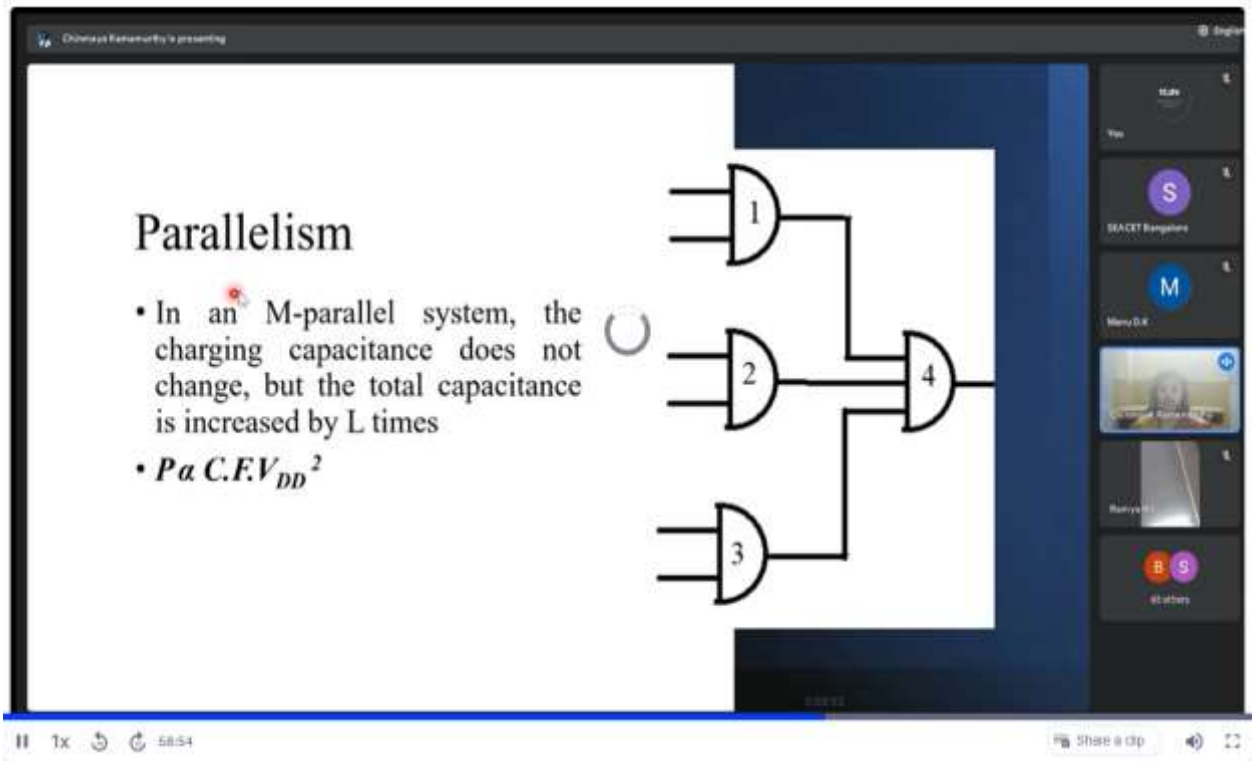


The First day 10.5.22 Afternoon session lecture was delivered by Ms.Chinmaye Ramamurthy, Assistant Professor, R.V College of Engineering, Bengaluru in the topic 'Applications and Challenges in VLSI Design'. The applications of Integrated circuits in everyday activities was explained in detail. She elaborated about challenges faced in IC design which concentrated on power and speed of Integrated circuits.

Screen Shots for First day 10.5.22 Afternoon session







Second day 11.5.22

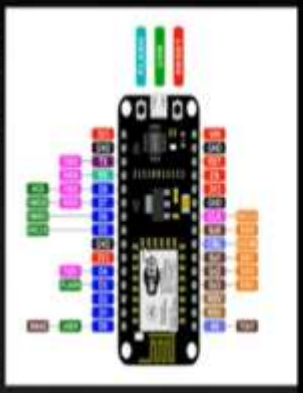
The Second day 11.5.22 Forenoon and Afternoon sessions lecture was delivered by Dr.Girish H, Associate Professor, Cambridge Institute of Technology, Bengaluru in the topics 'Introduction and Technologies of IoT' and 'Applications and Challenges of IoT'. Participants gained a brief explanation about IoT functionalities and how it is associated with our everyday

life. How to configure Ardunio for hardware and software environment which enables IoT and how IoT is used in sensors was explained.

Screen Shots for Second day 11.5.22 Forenoon session

Node MCU Architecture

- The Node MCU (**ESP8266**) is an open source firmware and development kit that helps to prototype IoT product with Arduino IDE .
- It includes firmware which runs on the ESP8266 Wi-Fi SoC and hardware which is based on the ESP-12 module.
- The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol.
- Node MCU Dev Kit has **Arduino like** Analog (i.e. A0) and Digital (D0-D8) pins on its board.
- It supports serial communication protocols i.e. UART, SPI, I2C etc.
- Using such serial protocols we can connect it with serial devices like I2C enabled LCD display, Magnetometer HMC5883, MPU-6050 Gyro meter + Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards etc.



Sensors

Senses a physical phenomenon and converts to an electrical signal


Ultrasonic Sensors

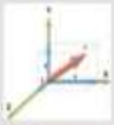

Temperature Sensor


Soil moisture sensor


Gyroscope


Light sensor


Pressure sensor


Accelerometer


Hall effect sensor


Humidity Sensor

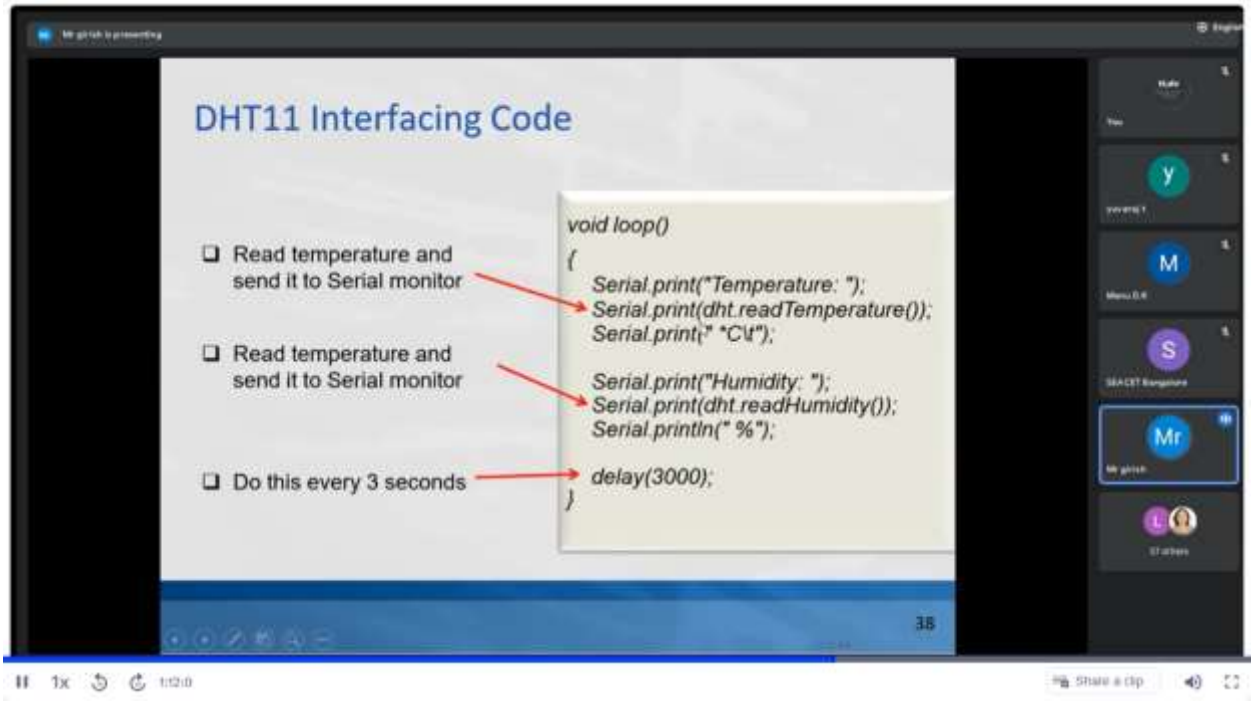

Gas sensor

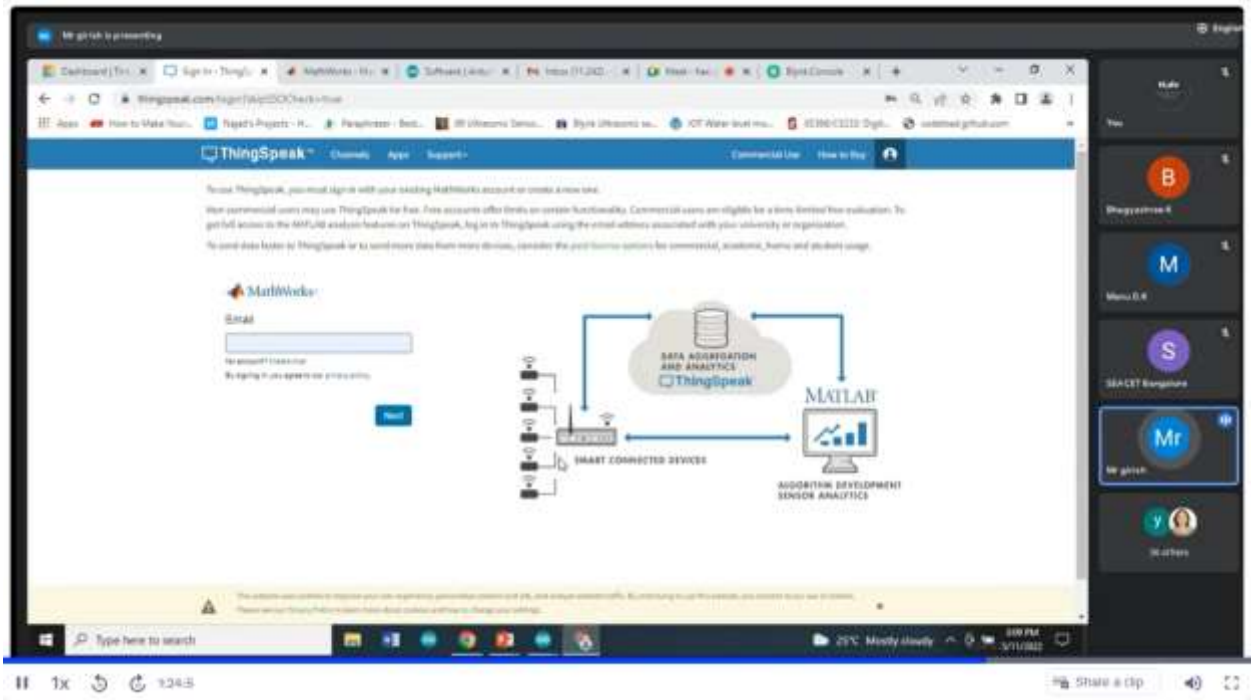

PIR Sensor


IR Receiver

30

Screen Shots for Second day 11.5.22 Afternoon session



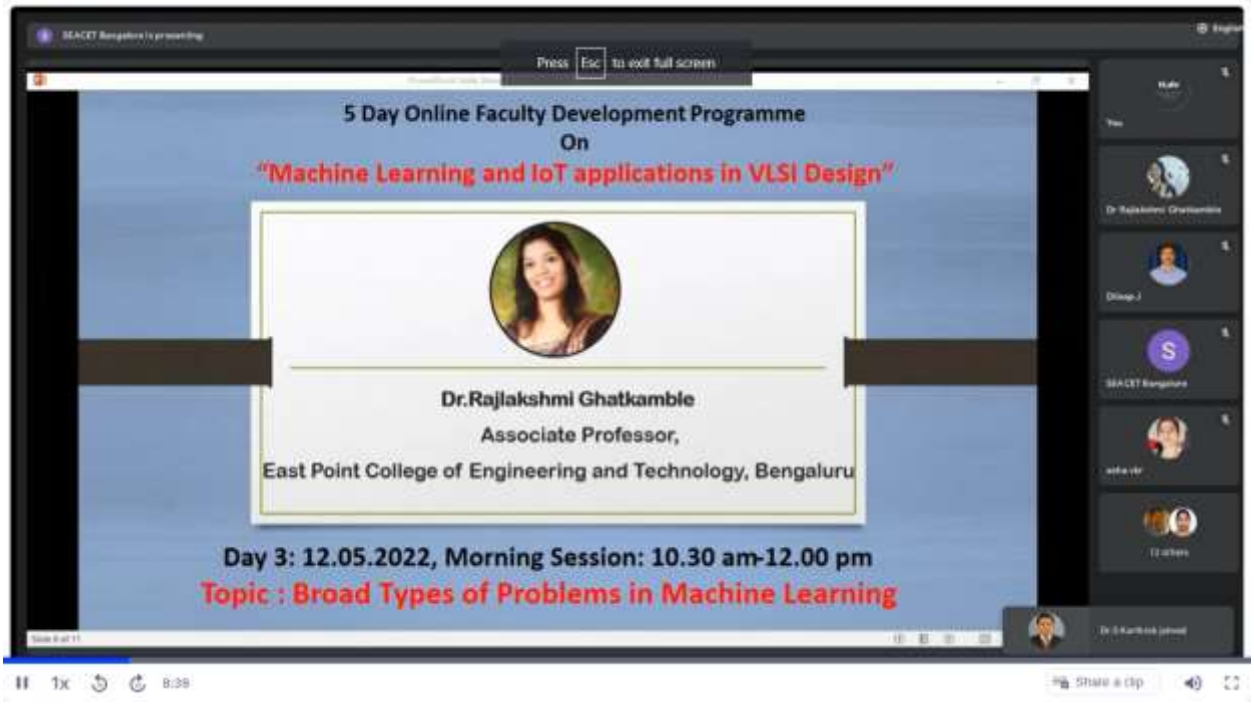


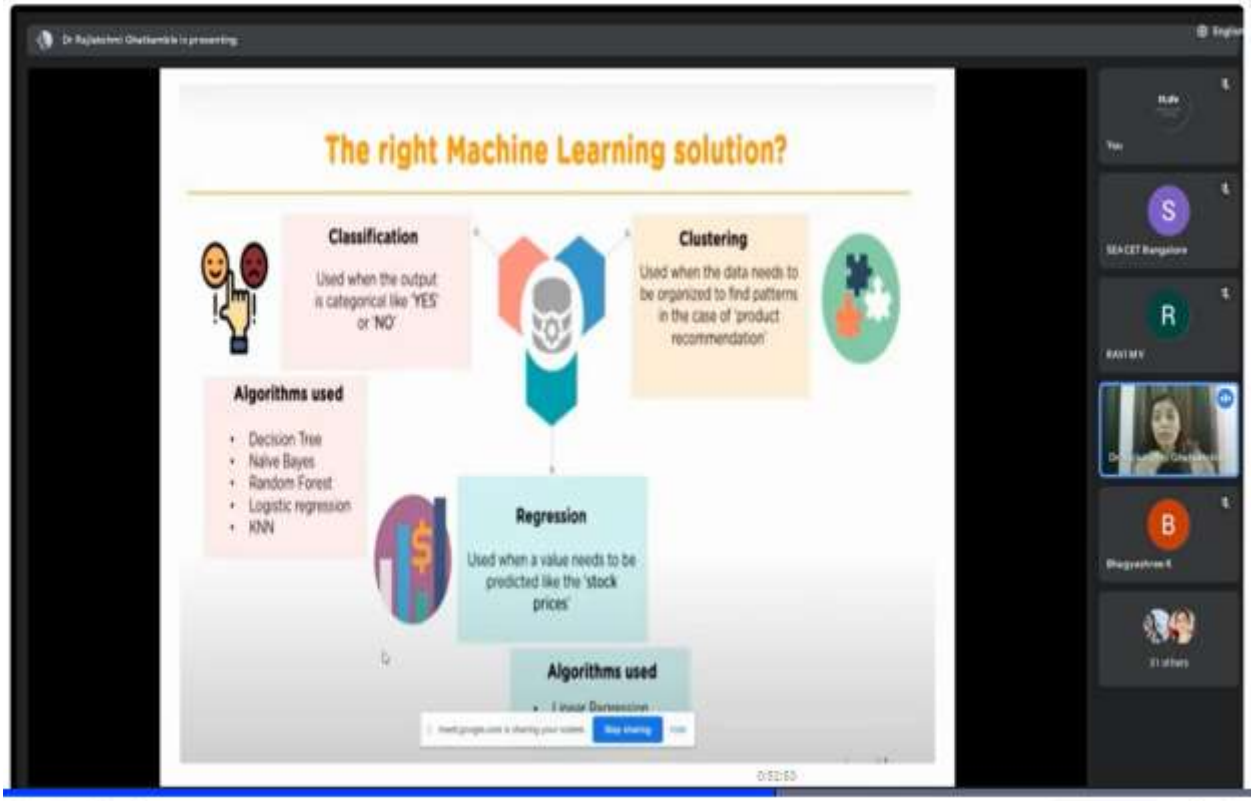
Third day 12.5.22

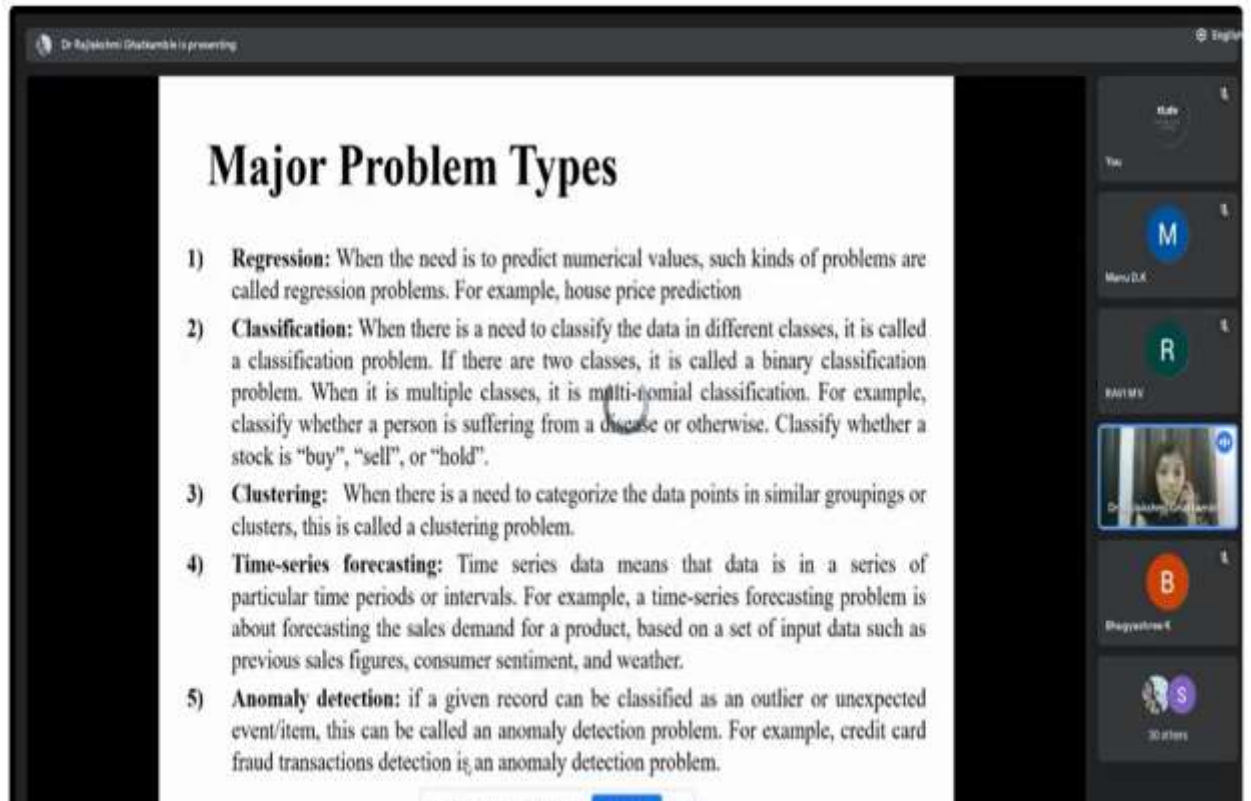
The Third day 12.5.22 Forenoon and Afternoon sessions lecture was delivered by Dr.Rajlakshmi Ghatkamble, Associate Professor, East Point College of Engineering and Technology, Bengaluru in the topics ‘Broad Types of Problems in Machine Learning’ and ‘Applications , Challenges and Issues in ML’. Participants gained a brief explanation about ML

functionalities and how it is associated with our everyday life. She explained about her research work which was very informative to the participants.

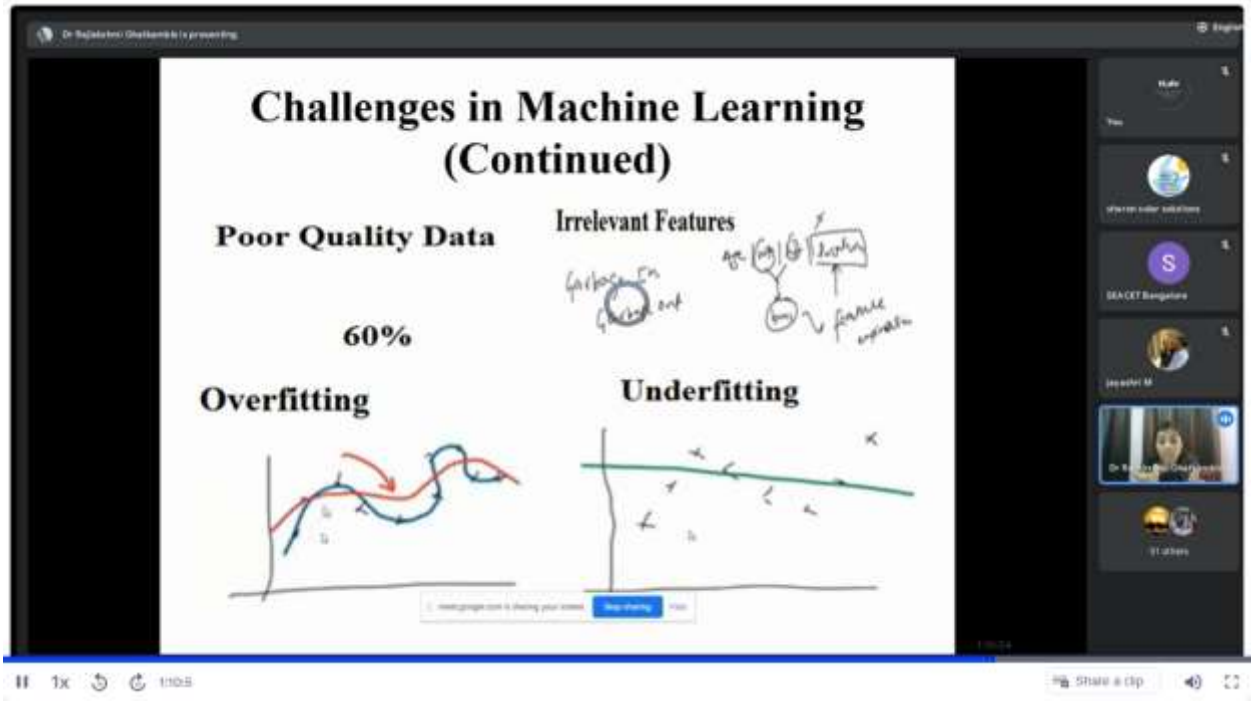
Screen Shots forThird day 12.5.22 Forenoon session

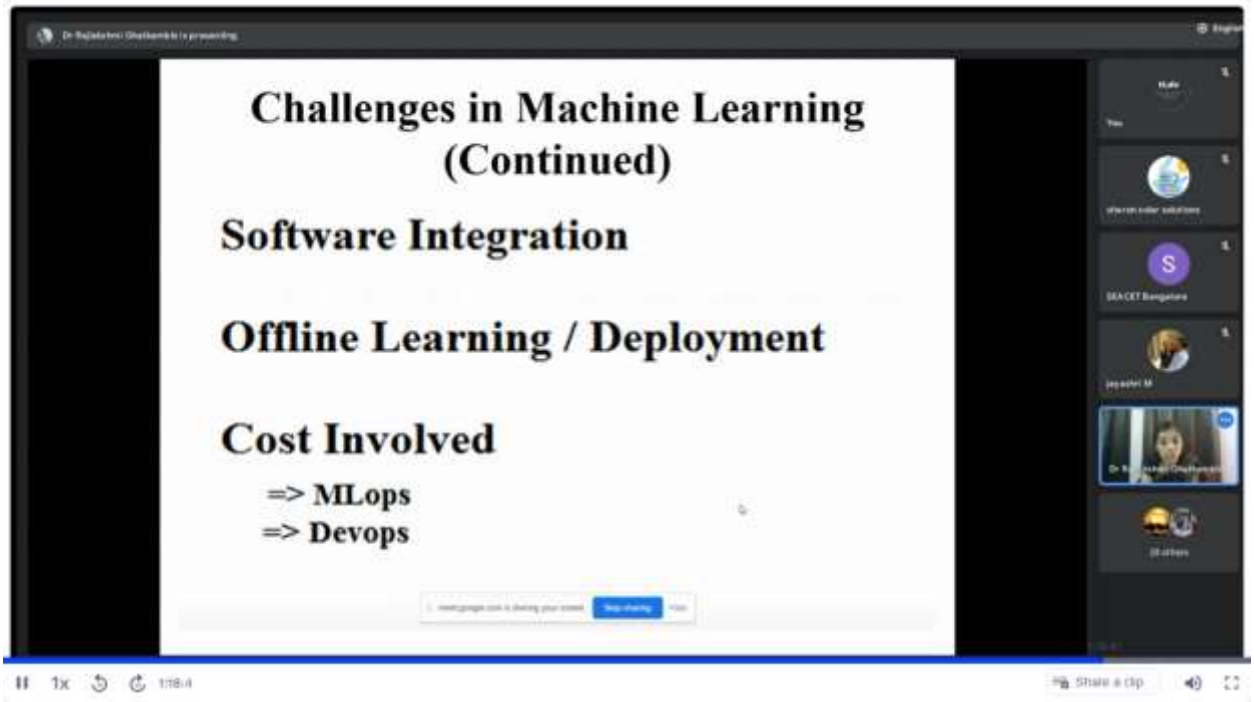



The right Machine Learning solution?
Classification
Used when the output is categorical like 'YES' or 'NO'
Clustering
Used when the data needs to be organized to find patterns in the case of 'product recommendation'
Algorithms used
Decision Tree
Naive Bayes
Random Forest
Logistic regression
KNN
Regression
Used when a value needs to be predicted like the 'stock prices'
Algorithms used


Major Problem Types
1) Regression: When the need is to predict numerical values, such kinds of problems are called regression problems. For example, house price prediction
2) Classification: When there is a need to classify the data in different classes, it is called a classification problem. If there are two classes, it is called a binary classification problem. When it is multiple classes, it is multi-nomial classification. For example, classify whether a person is suffering from a disease or otherwise. Classify whether a stock is "buy", "sell", or "hold".
3) Clustering: When there is a need to categorize the data points in similar groupings or clusters, this is called a clustering problem.
4) Time-series forecasting: Time series data means that data is in a series of particular time periods or intervals. For example, a time-series forecasting problem is about forecasting the sales demand for a product, based on a set of input data such as previous sales figures, consumer sentiment, and weather.
5) Anomaly detection: if a given record can be classified as an outlier or unexpected event/item, this can be called an anomaly detection problem. For example, credit card fraud transactions detection is an anomaly detection problem.

Screen Shots for Third day 12.5.22 Afternoon session

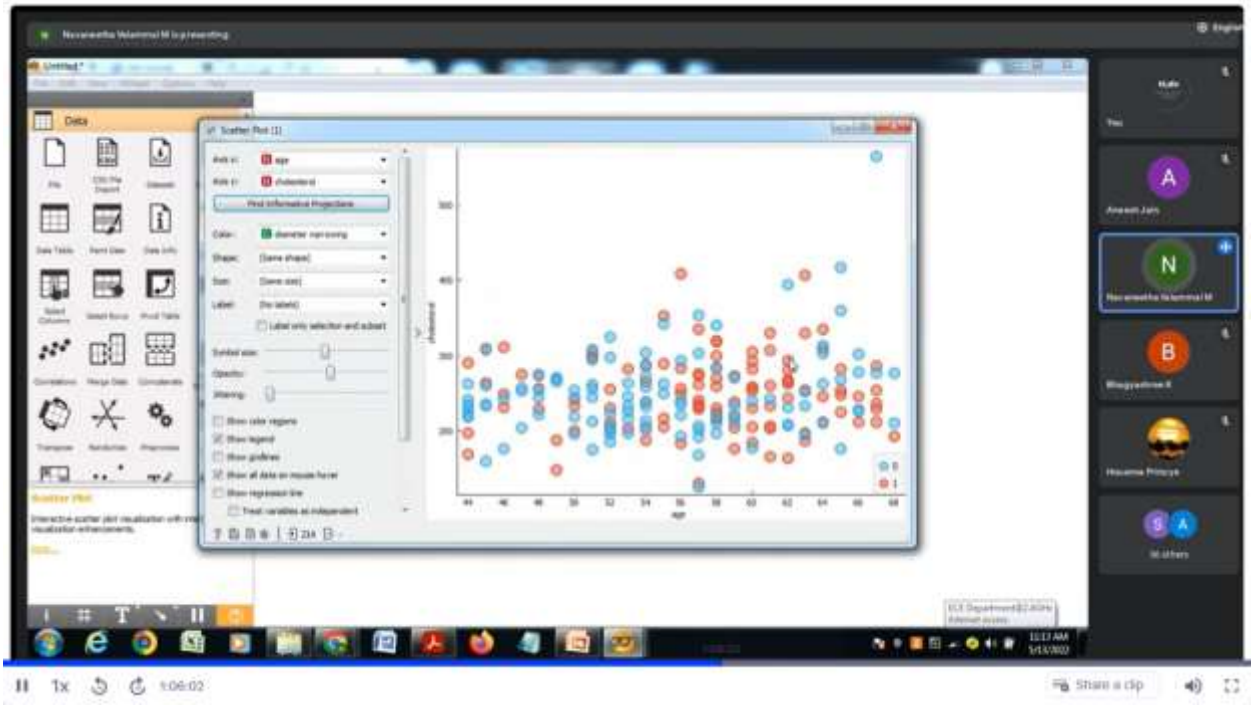


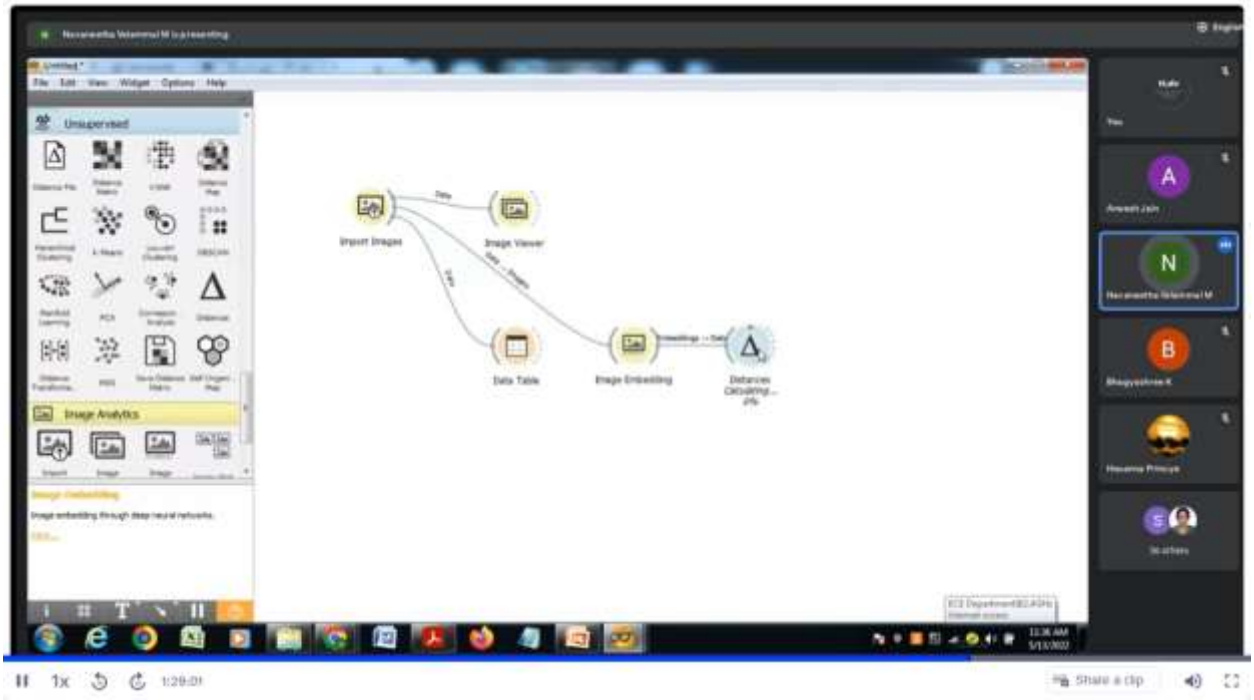


Fourth day 13.5.22

The Fourth day 13.5.22 Forenoon session lecture was delivered by Mrs Navaneetha Velammal, Associate Professor, Francis Xavier Engineering College , Tirunelveli in the topic 'Machine Learning Approaches for VLSI Hardware Implementation'. The brief explanation was delivered how ML and AI is associated with VLSI design. Various ML approaches with practical examples were briefed. In addition orange tool to implement ML algorithm in VLSI was taught.

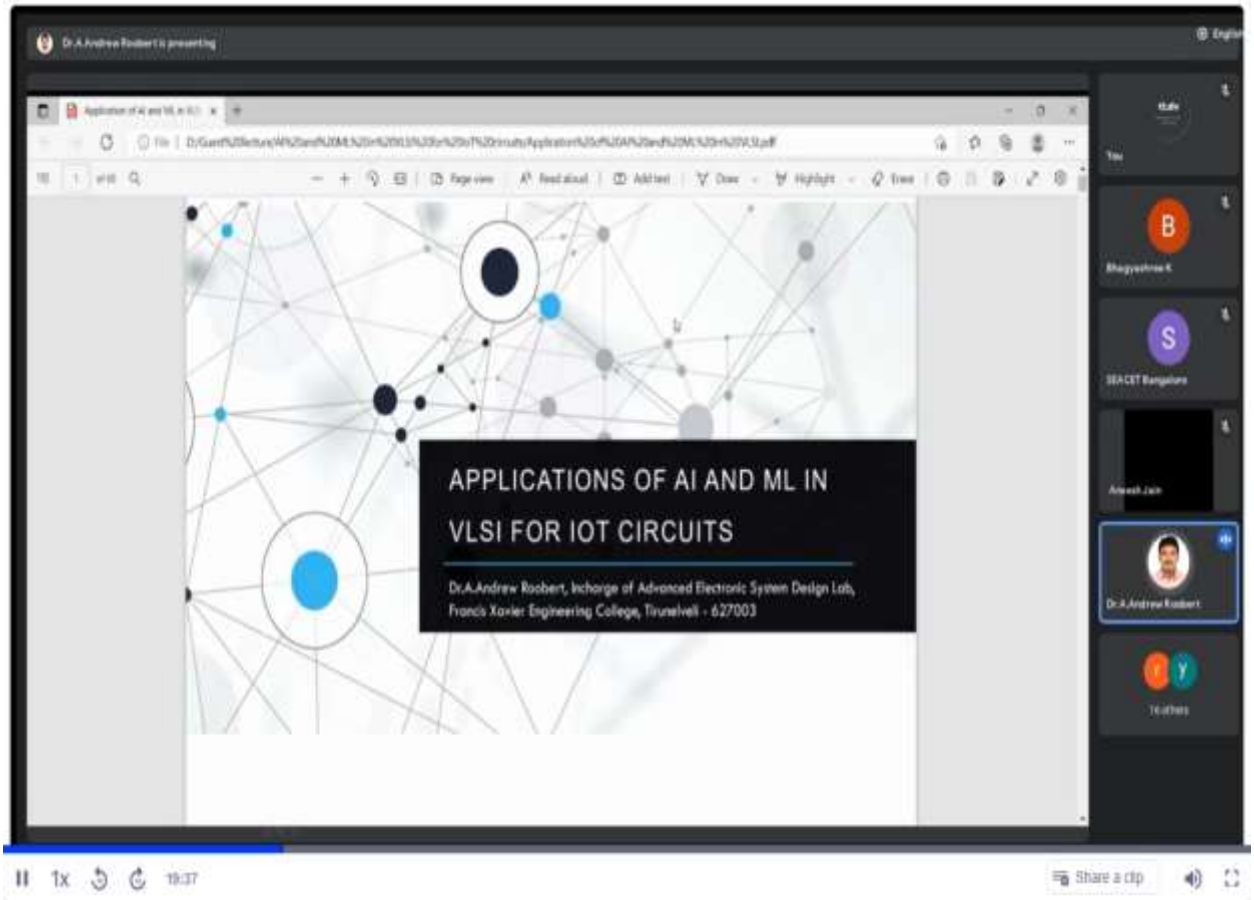
Screen Shots for Fourth day 13.5.22 Forenoon session

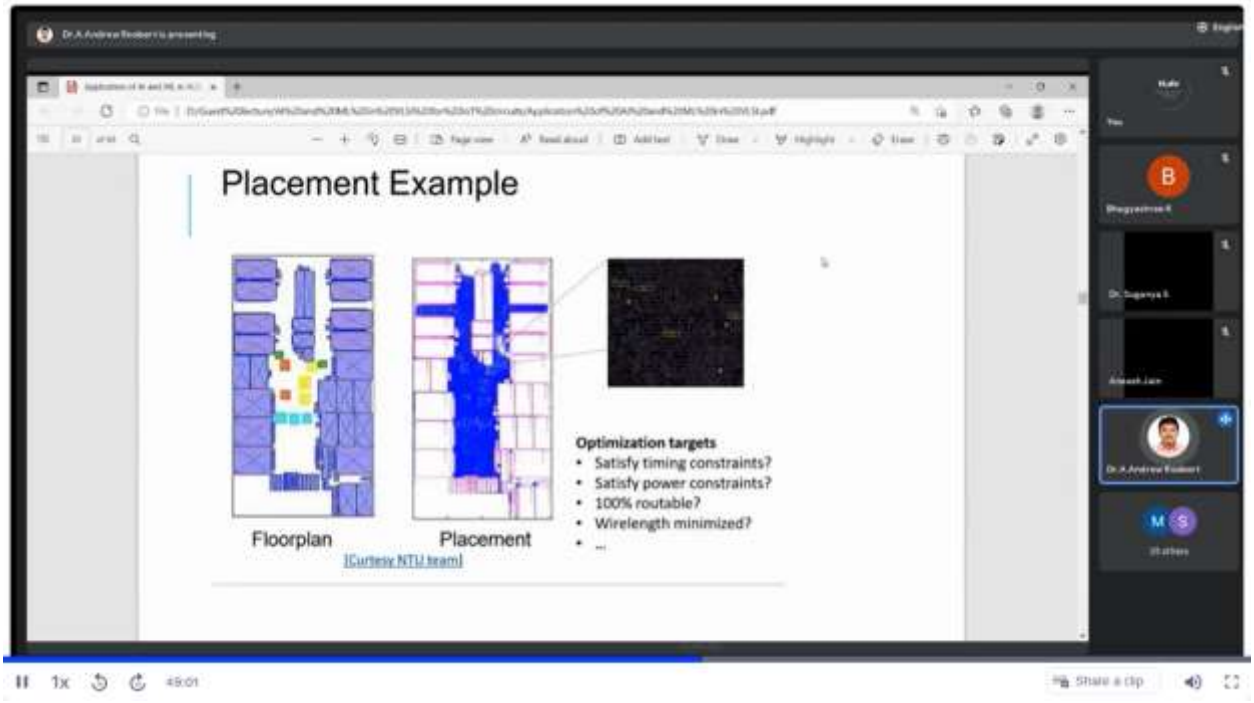


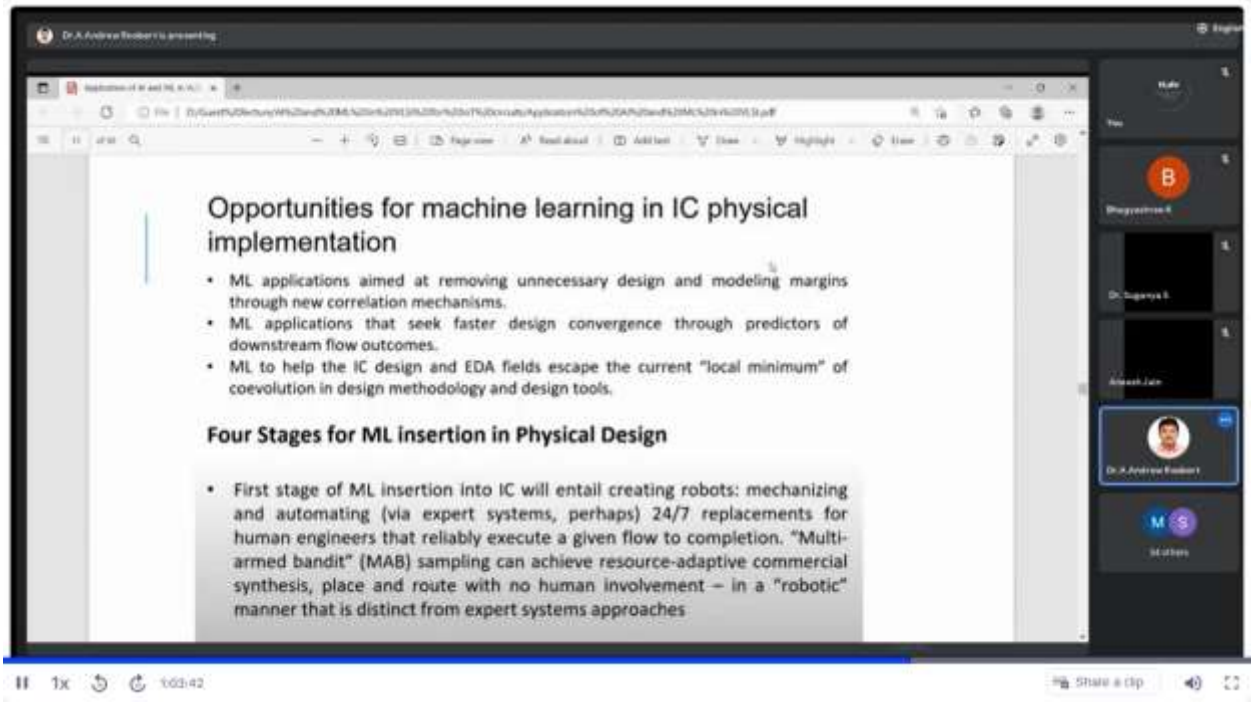


The Fourth day 13.5.22 Afternoon session lecture was delivered Dr.A.Andrew Roobert, Associate Professor, Francis Xavier Engineering College , Tirunelveli in the topic ‘Applications of AI and ML in VLSI for IoT Circuits’. The brief explanation was delivered how ML and AI is associated with VLSI design for IoT circuits. How logic circuits is linked with neural networks and how modern VLSI layout is designed and implemented with AI and ML is breifed with practical examples.

Screen Shots for Fourth day 13.5.22 Afternoon session



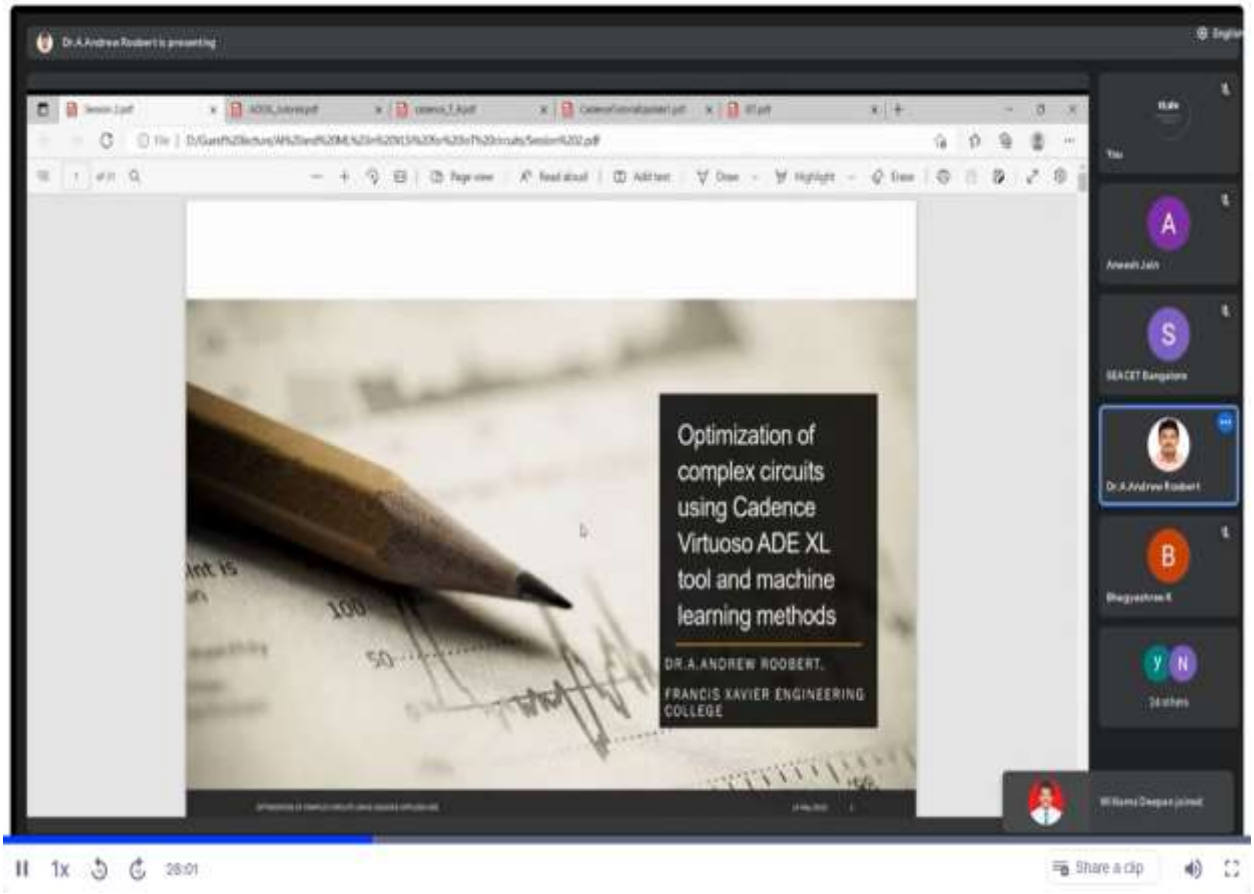




Fifth day 14.5.22

The Fifth day 14.5.22 Forenoon session lecture was delivered Dr.A.Andrew Roobert, Associate Professor, Francis Xavier Engineering College , Tirunelveli in the topic 'Optimization of complex circuits using Cadence Virtuoso ADE XL tool and Machine Learning Methods'. Participants learned to implement ML techniques in IC designing using cadence software.

Screen Shots for Fifth day 14.5.22 Forenoon session



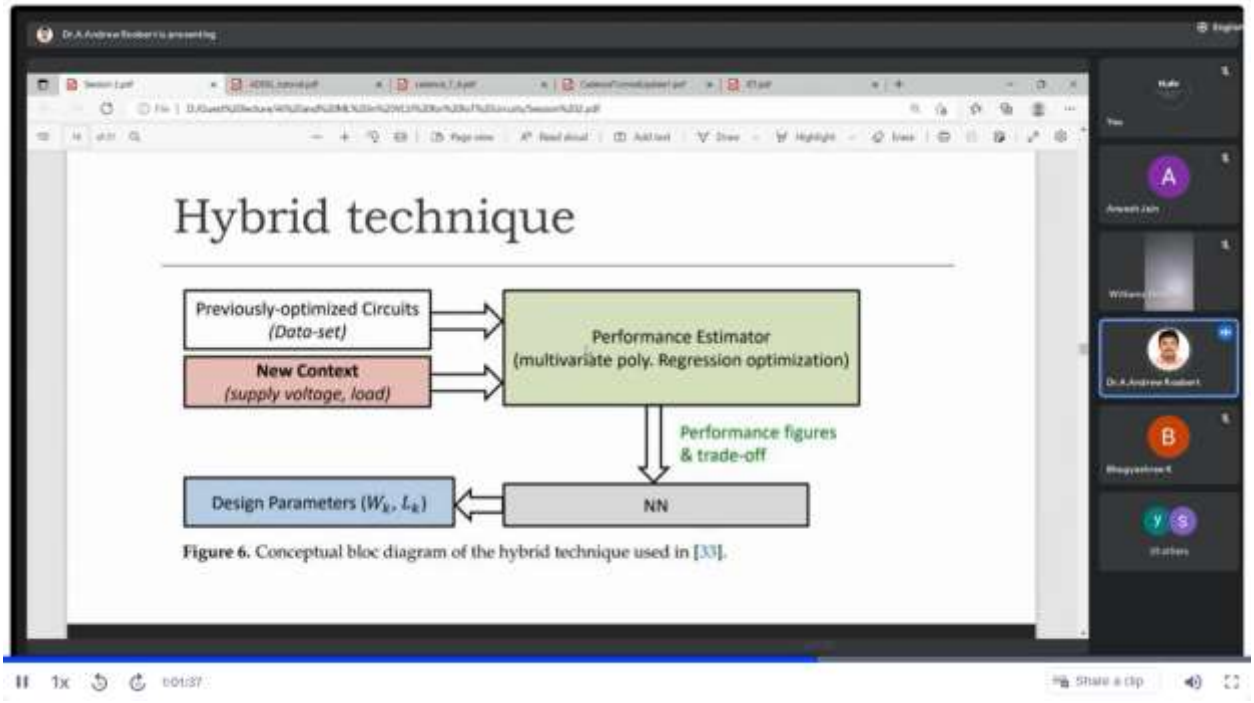


Figure 6. Conceptual bloc diagram of the hybrid technique used in [33].

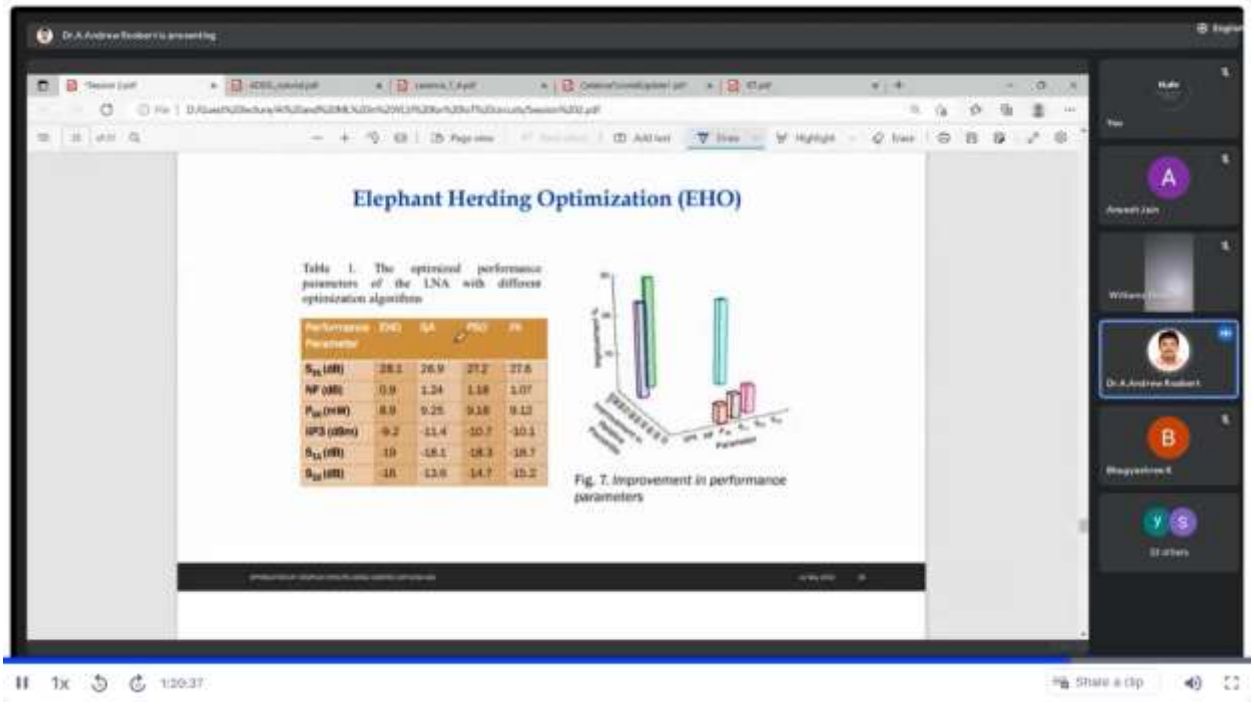


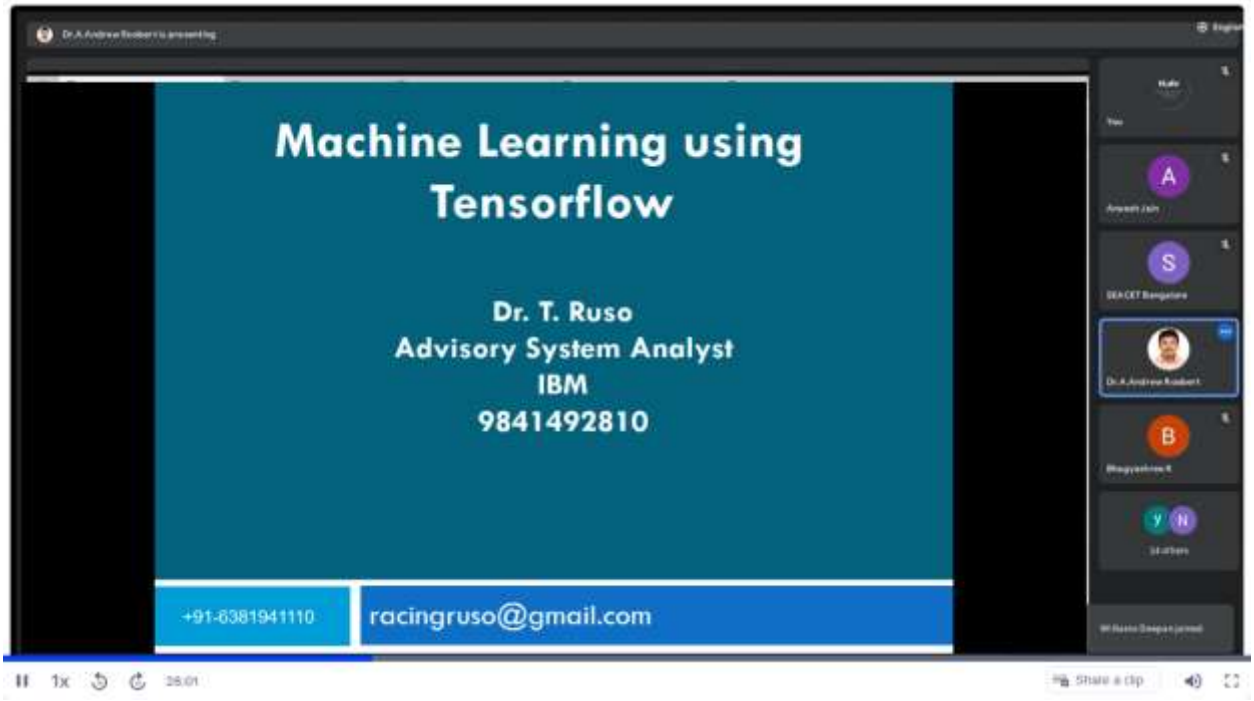
Table 1. The optimized performance parameters of the LNA with different optimization algorithms

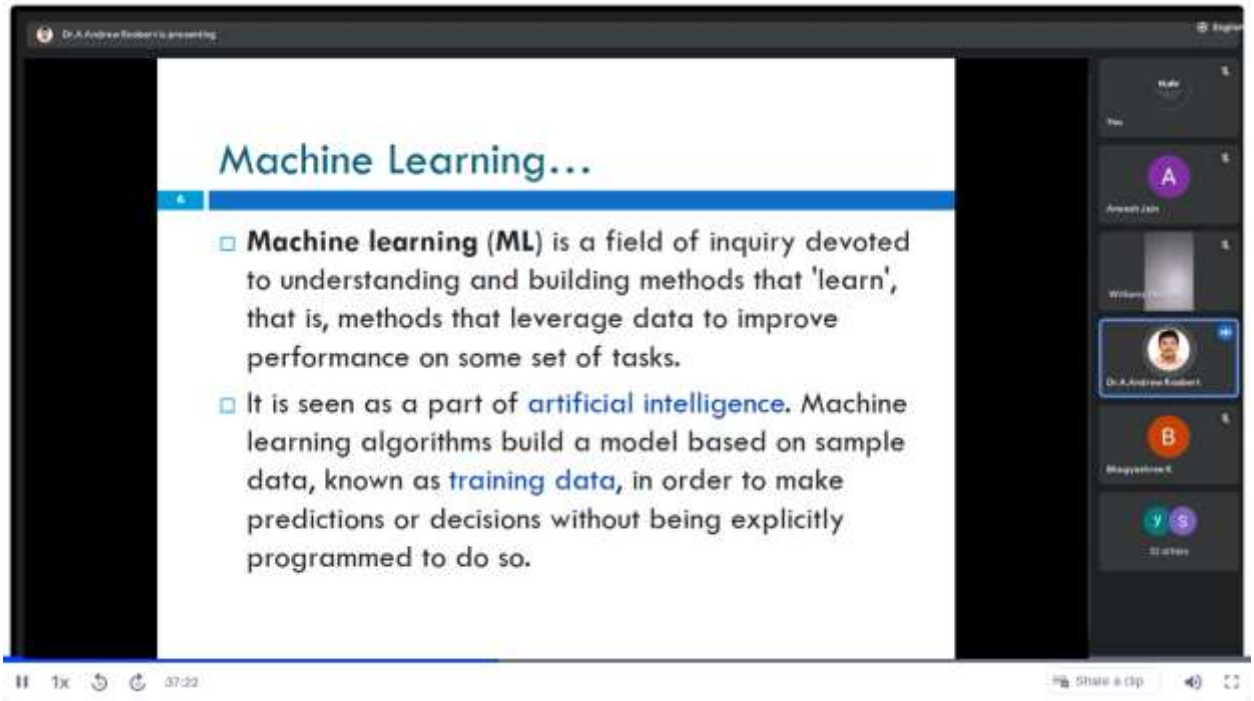
Performance Parameter	EHO	GA	PSO	FA
S_{21} (dB)	28.1	26.9	27.2	27.6
NF (dB)	0.9	1.24	1.18	1.07
P_{DC} (mW)	8.9	9.25	9.18	9.13
IIP3 (dBm)	-9.2	-11.4	-10.7	-10.1
S_{11} (dB)	-19	-16.1	-16.3	-16.7
S_{22} (dB)	-16	-13.6	-14.7	-15.2

Fig. 7. Improvement in performance parameters

The Fifth day 14.5.22 Afternoon session lecture was delivered by Dr.T Ruso, Advisory System Analyst, IBM India Private Limited, Bangalore in the topic ‘Machine Learning using Tensorflow’. Participants learned to implement ML techniques using Tensorflow software.

Screen Shots for Fifth day 14.5.22 Afternoon session





The FDP was concluded at 3.30pm. The workshop ended with the vote of thanks by Dr. Pradeep Kumar N.S., HOD, ECE, SEACET. Online submission of feedback form was collected at the end of all sessions. The FDP was highly informative to staffs. Thus FDP provided valuable awareness and insights on the various aspects of Machine Learning and IoT applications in VLSI Design.