

Report
On
Short Term Training Program
on
Implementation of Internet of Things Application using
Machine Learning and Deep Learning
27-31 December, 2021

Coordinator: Prof. G. D. Makwana

Co-coordinator: Prof. Deepak Upadhyay

GTU-Graduate School of Engineering and Technology organized five days offline Short Term Training Program (STTP) on “**Implementation of Internet of Things Application using Machine Learning and Deep Learning**” held during 27-31 December, 2021. The STTP is sponsored by Information Security for Education Awareness (ISEA) Project-II.

Objectives of the FDP are to train our Indian technocrats to solve issues address by National Educational Policy (NEP), creation of new knowledge, develop robust research echo-system in IoT, Machine Learning and AI at our University with a collaborations with NIT, Warangal.

Objectives of the STTP are to explore various IoTs solutions in agriculture, health care, smart-things, and industrial automation (Industry 4.0), with machine learning and deep learning, to explore challenges and opportunities for future applications, to nurture various research opportunities in the fields IoT, ML, and AI.

The STTP is open for faculty members, industrialist, UG, PG and Ph.D. students across India. More than 65 participants across India from various institutes, industries are participants in the STTP.

In this STTP, various renowned experts from University of Southern California, USA, IISc, Bangluru, NIT, Jaipur, infochips, Ahmedabad, CDAC, Trivendrum, LabToMarket Innovation Pvt. Ltd, IISc, Bangaluru, Eaton, Pune, Harsha Engineers, Ahmedabad, Indian Agribusiness Systems Ltd, Ahmedabad, Hitachi-Hiral Power Electronics Pvt. Ltd Ahmedabad, Leaftronix, and Analogic Solution Pvt. Ltd, Gandhinagar are invited to discuss and explore various IoT implementations, case studies, live demos, real-time applications developed in India. The participants are benefits to identify various challenges, opportunities, research problems, and indigenous solutions in theme of STTP

We have invited renowned and well-experience resource persons namely,

- Dr. Nilesh Ranpura, eInfochip, Ahmedabad,
- Prof. Santosh Kumar Vipparthi, NIT, Jaipur,
- Mr. Dipak Karkhanis, Harsha Engineers, Ahmedabad
- Mr. Hiren Parekh, & Mr. Samir Bhatt, eInfochips, Ahmedabad
- Mr Nirav Prabhani, eInfochips, Ahmedabad
- Prof. Lijo Thomas, CDAC, Trivandrum
- Mr. Sampad Mohanty, University of Southern California, USA
- Mr. Suman Panchal, Lab2Market Innovation, IISc Bangaluru
- Dr. Ashish Joglekar , RBCCPS, IISc, Bangaluru
- Mr. Deepak Pareek, CEO, Indian Agribusiness Systems Ltd, Ahmedabad
- Mr. Punit Purohit, Eaton, Pune
- Mr. Rakesh Prajapati, & Mr. Dhaval Patel, Hitachi-Hiral Power Electronics Pvt. Ltd
- Mr. Darshan Patel, Leaftronix Analog Solution Pvt. Ltd, Gandhinagar

The function is inaugurated on 27th December, 2021 by Hon'ble Vice Chancellor, Gujarat Technological University and President of the inaugural function, Prof (Dr.). Navin Sheth, in presence of Chief Guest of the Function & Division Manager, Dr. Nilesh Ranpura, Prof. S. D. Panchal, Director, GTU-Graduate School of Engineering and Technology, Prof. R. A. Thakker, Adjunct Professor, GTU-GSET, Prof. G. D. Makwana, Coordinator and Prof. Deepak Upadhyay, Co-Coordinator of the STTP, faculty members of the institute and participants.

Inauguration function



1st Row (L-R): Prof. R. A. Thakker, Prof. (Dr.) S. D. Panchal, Dr. Nilesh Ranpura, Prof. (Dr.) Navin Sheth, Hon'ble Vice Chancellor, Prof. G. D. Makwana, Prof. S. K. Hadia



Presidential Speech by Vice Chancellor



Key Note Address by Chief Guest



Speech By Prof. R. A. Thakker



Welcome Speech by Prof. S. D. Panchal



Vote of Thanks by Prof. G.D. Makwana

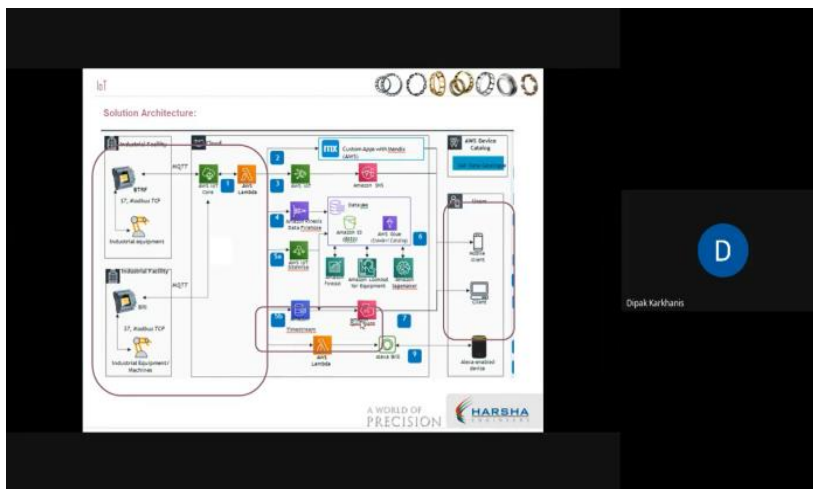


Participants of the STTP

Session Details



Key Note Address by Dr. Nilesh Ranpura



Session by Mr. Dipak Karkhanis

Topics Covered

- IoT Overview and current scenarios along with the examples like connected healthcare, home and building, retail intelligence, wearable devices, smart cities, etc.
- IoT 3.0 and Digital Signage
- IoT and Industrial Challenges and Future (AI + IoT = AIoT)
- New Technologies:- LiFi(Light Fidelity i.e. Airbus LiFi)
- IoT Security, Analytics, Devices, Networks, Processors, Operating System.
- IIoT brief introduction.
- Total Productive Maintenance and its main objective.
- 8 Pillars of TPM and Key TPM Parameters influencing IoT Project:- Location, Operation, Count, Situation, Hazard, Availability, Quality.
- User Case – Implementing IIoT in DGBB Business Unit.
- Showed AWS Management Console Live.



Session by Prof. Santosh Kumar Vipparthi



Session on Prof. G. D. Makwana



Session by Mr. Hiren Parekh

- Moving Object Detection (in conventional and aerial videos) and its application.
- Challenges in conventional and aerial scene analysis.
- Deep Learning Methods and its challenges like Scene Independent Data Division, Scene Dependent Data Division.
- MsFgNet, Result Analysis, ChangeNet, Quantitative results(3DCD, 3DFR)
- Moving Object Recognition (CDNet, MotionRec Dataset, Multilevel Pyramid, MOR-UAV, ABD Dataset).
- Difference between IoT and Embedded System and current scenario of IoT.
- Introduction of IoT Builder and its components.
- Interfacing of sensor with the IoT Builder:-
 - Temperature and Humidity Sensor
 - Noise Sensor and Ambient Light Sensor
 - Dust Sensor and Air Quality Sensor
- IoT Brief Introduction, IoT Concepts and Maps.
- IoT Protocol(MQTT, AMQP, CoAP)
- IoT in Healthcare with example of Telehealth and its protocols.
- IoT in Connected Homes and in Automotive (Connected Car - Networking)
- Cloud Based IoT Solutions – Azure IoT Reference



Session by Mr Nirav Prabtani

- IoT Architecture with Reference to Azure.
- Azure IoT Hub:-
 - Devices in IoT Hub
 - Connectivity Pattern
- Demo of Azure IoT Device Lifecycle and IoT Device and IoT Edge Device.
- Demo of creating device client through code (Visual Studio).



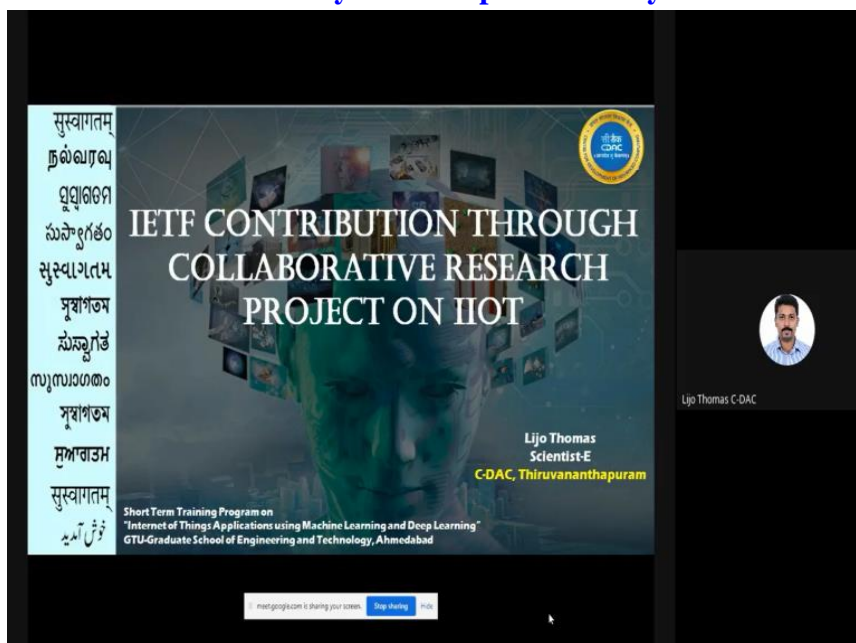
Session by Mr. Sameer Bhatt

- Data and Analytics along with Natural and Artificial Intelligence.
- Introduction to ML (Supervised, Unsupervised and Reinforced Learning).
- Feature Learning and Iterative Process of Feature Selection)
- Azure ML Cheat Sheet and How to select ML Algorithms and improve ML Algorithm Accuracy?
- Water Event Classification and CT Scan Anomaly Detection demo.
- Use Case: Driver Behavior End Point, Hunter Camera
- Hierarchical Data Collection scenarios and Object Detector Model Porting, Overall Approach.



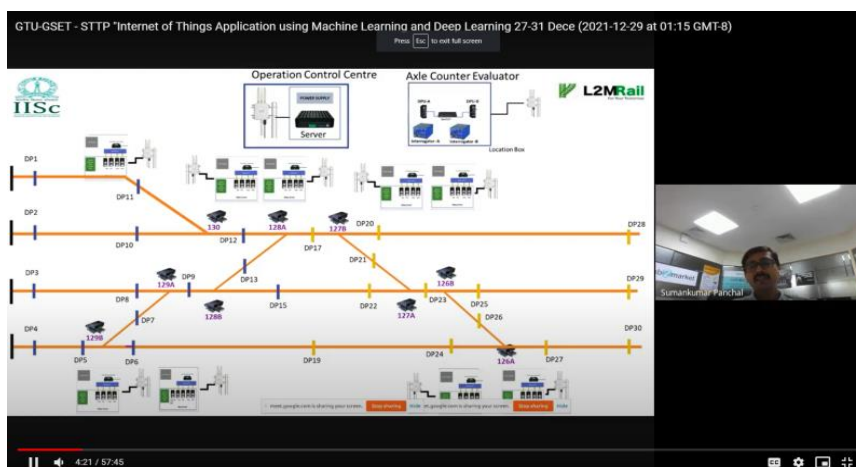
- Overview of Machine Learning (Supervised Learning:- Classification and Regression).
- Dataset in Linear Separable
- Perceptron (Schematic of Rosenblatt's perceptron, Hyper plane, Geometric Intuition)
- K- Nearest Neighbours and Logistic Regression
- Artificial Neural Networks.

Session by Mr. Sampad Mohanty



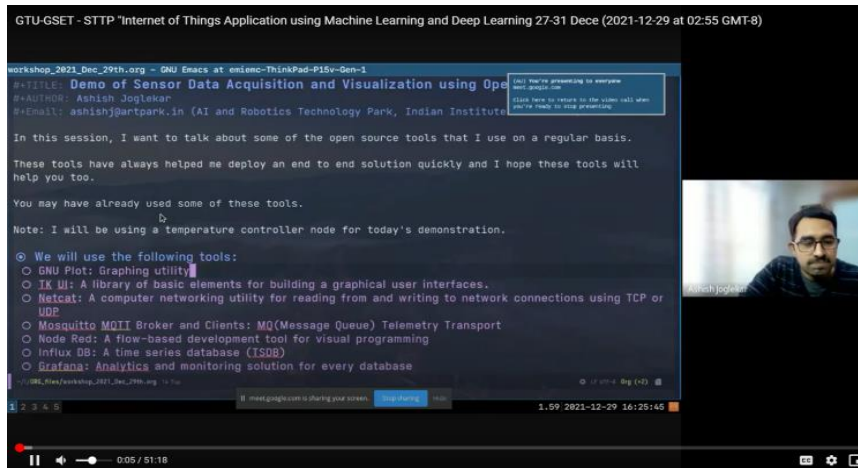
- IT Networks, Eco-system, Business Challenges, IIoT (Requirements, Protocol and Standards).
- IETF (Internet Engineering Task Force) goals and working groups, IEEE 802.15.4.
- IEEE 6LoWPAN WG (Stack and Architecture) :- IPv6 over Low Power WPAN, RFC4919, RFC4944.
- IETF 6TiSCH WG, Internet Drafts
- IETF cultural and proceedings, WIPSen Project and 6Lo:- Implementation of Deadline Drafts.

Session by Prof. Lijo Thomas



- Next Generation Signaling- Cyber Signaling
- Next Generation Axle Counter Plus
- L2MRail (Features, Live View of the yard, remote operation of point from track and from engine)
- Cyber Signaling Overview and Fiber Bragg Grating (Working principle) and Fiber Optic sensors.
- OBCM with FBG-PoC demonstrations.

Session by Mr. Suman Panchal



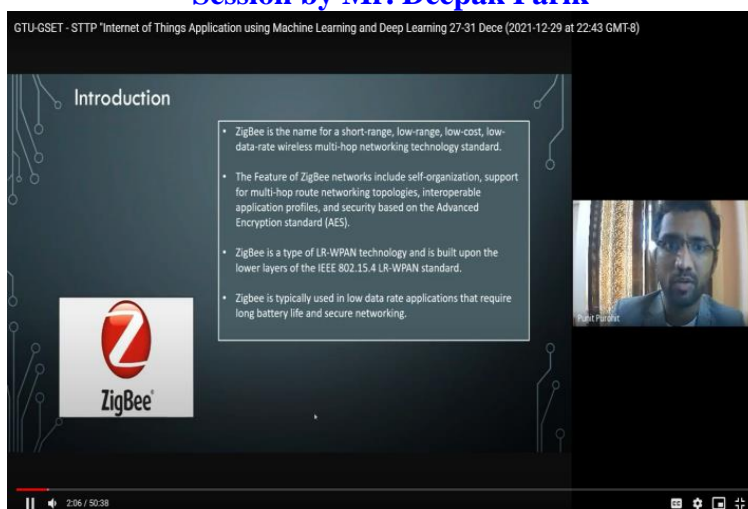
Session by Dr. Ashish Joglekar

- Next Generation Signaling- Cyber Signaling
- Next Generation Axle Counter Plus
- L2MRail (Features, Live View of the yard, remote operation of point from track and from engine)
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- OBCM with FBG-PoC demonstrations.



Session by Mr. Deepak Parik

- Current scenario of agriculture.
- The solution – A truly sustainable agrifood system.
- Gaps in developing economics along with it, Agriculture Eco-system
- 5V's Of Agriculture Data, Data deluge enabling smart agriculture.
- Machine Learning Models and types of crop- growth models.
- Impact of AI and ML in Agriculture.



Session by Mr. Punit Purohit

- Wireless Standards and their comparison.
- Introduction to ZigBee (Characteristics and Architecture).
- Cyber Security (Colonial Pipeline).
- ZigBee Security Keys.

- Current scenario of



Session by Mr. Dhaval Patel

agriculture.

- The solution – A truly sustainable agrifood system.
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Session by Mr. Rakesh Prajapati



Session by Mr. Darshan Patel

- Business Vertical
- Product Development
- DCU Gateway and Data Capture on the server side.
- IoT Device Structure and Reference Architecture
- Design Considerations and Development of IoT structure for wireless charging along with mobile applications.
- Proposed Charging solutions and Open Charge Point Protocol 2.0.1



Session by Prof. G. D. Makwana

- Practical demonstration of smart agriculture,
- Practical demonstration of Smart Motion Detection,
- Practical demonstration to MQTT Server-Client Setup
- Practical demonstration of GSM module,
- Practical demonstration of smart environment

Industrial Visit @ eInfochip – An Arrow Company, Ahmedabad





Expert Session by Mr. Vijay Patel

Valedictory Function



Feedback by the Participant

Certificate Distribution to the Participants



Participants of the STTP



Vote of thanks
By Prof. Deepak Upadhyay



During the Hands on Practices



With Student Volunteers

Feedback of the STTP



Outcome of the STTP

At the end of the STTP, participants are able to

- Identify algorithms, technologies to develop future IoT solutions,
- Explore various research directions and challenges in the area of IoT, ML and AI.
- Nurture and acquire guidance from the industrial experts to carry out PG dissertation and research work.
- Aware various hardware and software platforms to implement any future solutions based on IoT, ML, and AI.
- To identify of optimized algorithms, technologies to develop any future applications.
- To explore various research opportunities and challenges in the field of IoT, ML, and AI and its applications.
- Our institute, GTU-GSET is an attempt to establish a strong Academic-Industry interaction through this STTP and strengthen our program – M.E. Computer Engineering (Internet of Things).

List of Participants:

Sr. No.	Name of the Participant	Category	Name of /Organization
1	SHRADHDHA BHASKARBHAI BHALODIA	Ph.D Research Scholar	Parul University, Vadodara
2	Punit Kishorbhai Mendapara	Faculty / Academia	Dr Subhash Technical Campus
3	Sanjaykumar D. Joshi	Faculty / Academia	Govt. Engg. College, Patan
4	PRAVINA KARSHANBHAI PARMAR	Faculty / Academia	ALPHA COLLEGE OF ENGINEERING & TECHNOLOGY
5	KRUTIKA PARADKAR	Ph.D Research Scholar	SVIT, VASAD ,GTU
6	PALVINDER SINGH MANN	Faculty / Academia	GTU-GSET
7	Poonam Vinodkumar Singh	PG Student	GTU-GSET
8	Kachhadiya Kishan Kishorbhai	PG Student	GTU-GSET
9	Mishra Parixit UdayNarayan	PG Student	GTU-GSET
10	Parekh Devangi Kashyapbhai	PG Student	GTU-GSET
11	Darji Aditi Nilang	Others	GTU-GSET
12	Rutika Ghariya	Faculty / Academia	GTU-GSET
13	Harsha Gangadiya	PG Student	GTU-GSET
14	Bhoomi Rameshbhai Vekariya	PG Student	GTU-GSET
15	Mayurkumar Nitinbhai Dave	PG Student	GTU-GSET
16	Meet R Thakkar	PG Student	GTU-GSET
17	KAUSHAL KAMLESHKUMAR SHAH	PG Student	GTU-GSET
18	Tank Swetaben Girdharbhai	PG Student	GTU-GSET
19	Archana B Machhoya	PG Student	GTU-GSET
20	JAY ASHAY SHINDE	PG Student	GTU-GSET
21	Precius Dennish Wallace	PG Student	GTU-GSET
22	DANGIYA SUSHILKUMAR PRAKASHBHAI	PG Student	GTU-GSET
23	RAJEEV RAHIRAVBHAI MALVISH	PG Student	GTU-GSET
24	KOMAL DHANABHAI PRAJAPATI	Others	GTU-GSET
25	SEEMA B. JOSHI	Faculty / Academia	GTU-GSET
26	Bhavna Modhvadiya	PG Student	GTU-GSET
27	SHAH BHARGAVKUMAR KISHORKUMAR	PG Student	GTU-GSET
28	Rutu Mukeshbhai Delvadiya	PG Student	GTU-GSET
29	Rakesh Kumar	PG Student	GTU-GSET
30	SUDHANSHU KUMAR	PG Student	GTU-GSET
31	Krishn Kalicharan Chauhan	PG Student	GTU-GSET
32	Arpita Maheriya Pareshkumar	Ph.D Research Scholar	GTU-GSET
33	Grishma Achyutbhai Jani	Ph.D Research Scholar	GTU-GSET
34	Aanal Raval	Ph.D Research Scholar	GTU-GSET
35	Sarman K Hadia	Faculty / Academia	GTU-GSET
36	Nayak Zalak Arvindbhai	Others	GTU-GSET
37	Hardikkumar Gunavantray Patel	PG Student	GTU-GSET

38	Suraj Biniwale	PG Student	GTU-GSET
39	TIWARI BHAVESH SHREESOMDATT	PG Student	GTU-GSET
40	Kinjal Manishkumar Patel	PG Student	GTU-GSET
41	Piyushkumar Panchal	PG Student	GTU-GSET
42	Akhilesh yadav	PG Student	GTU-GSET
43	Hemal Dineshbhai Nayak	Faculty / Academia	GTU-GSET
44	Margam Suthar	Faculty / Academia	GTU-GSET
45	Vagmin Joshi	Faculty / Academia	GTU-GSET
46	Patel Krutik	PG Student	GTU-GSET
47	JEET JAYESHKUMAR JOSHI	Faculty / Academia	GTU-GSET
48	Shailesh D Panchal	Faculty / Academia	GTU-GSET
49	Deepak Upadhyay	Faculty / Academia	GTU-GSET
50	Gautam D Makwana	Faculty / Academia	GTU-GSET

Prof. G. D. Makwana, Coordinator
Prof. Deepak Upadhyay, Co-coordinator