TEQIP-3

Technical Education Quality Improvement Programme

TEQIP-III Sponsored workshop

on

Applications of Deep Learning Techniques for Communication and Signal Processing

Sept. 15-19, 2020

Organized by

Department of Electronics and Communication
&
Computer Science Engineering
National Institute of Technology
Meghalaya, India

Course Coordinators

Dr. Satyendra Singh Yadav,
Assist. Prof., ECE
&
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Assist. Prof., CSE,
NIT Meghalaya, India

Introduction

The advancement in computing systems such as high performance computing (HPC), supercomputers and general purpose graphics processing units (GPGPUs), the use of machine learning (ML) and deep learning (DL) algorithms to solve the estimation and optimization problems for communication and signal processing systems is a recent paradigm. The DL algorithms can be used to solve a variety of complex signal processing problems in wireless networks such as modulation classification, signal detection, channel estimation, and resource allocation, to name a few. The role of DL algorithms is to deduce a trained model for the above applications. A faster training of models is possible with GPU based HPC systems to further enhance the performance of the communication system and leading to new technology fifth generation and beyond (B5G). GPUs accelerate artificial intelligence (AI) and ML based applications by reducing the computation time during training and testing of the models.

Systematic and focused introductory lectures, including hands-on sessions, will be delivered over five days, which helps participants to segue into this exciting field of emerging technology. This course has been specially designed for the students, researchers, faculties, and industry personnel to provide them with an introductory yet exhaustive knowledge. It is expected that the course will help in enabling the participants to contribute to the academics, research and industry in the field of wireless communication and signal processing.

Broad Scope

This workshop is addressed to participants who are beginners in the field of Machine
Learning. The major focus here will be to provide its participants with the core concepts in the field of Machine Learning, allowing them to think about solutions in real life. However, we will also delve into understanding some of the current state of the art algorithms and analyze them for their applicability to communication and signal processing. The field of machine learning is vast and in this short span, it will
not be possible to cover all topics. However, we will be delving into topics which are most relevant in industries and research today. For hands-on exercises, we will be using Keras and Tensorflow libraries.

Target Audience

The course is suitable for Faculty Members, Research Scholars, Students and Industry Professionals.

How to apply

No registration fee will be charged from the participants.

To register, please visit:

https://docs.google.com/forms/d/e/1FAIpQLSfgofhKH5iw43TFI4NTjw70ZlUb5Ic8J1GBBUk1CFi9SFoEXA/viewform?usp=sf_link

Last date for registration: **14.09.2020, 2 PM**

More Info: http://nitm.ac.in/

Due to limited seats, applications will be considered on a First Come First Serve basis.

Course Contents

- Introduction to ML for Communication
- Types of ML algorithms and introduction to deep learning
- MATLAB and Python for machine learning
- DL for signal processing and computer vision
- Hands-on Session on Communication and Signal processing using MATLAB, Python.
- Deep learning acceleration using GPUs
- Introduction to deep architecture modules
- Hands-on Session on Training Image Classification Network and live Demo on Object Detection
- Introduction to Recurrent Neural Networks (RNN)
- Hands-on Session on Word Prediction, application Screening Problem and Sentiment Analysis
- Hands-on Session on Tracking of Moving Objects in Video Scenes.
- State-of-the-art Research Highlights

Patron

Prof. B. B. Biswal

Director NITM

Conveners

1. **Dr. S. S. Yadav**, Dept. of ECE, NIT Meghalaya
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   Mob. No: 9692975494
2. **Dr. B. Balabantaray**, Dept. of CSE, NIT Meghalaya
   Email: bunil@nitm.ac.in
   Mob. No: 9485185916

Invited Speakers

	**Prof. Sarat Kumar Patra** **Director, IIIT Vadodara**		**Prof. Samarendra Dandapat** **Department of EEE** **IIT Guwahati**
	**Dr. Badri N Subudhi** **Department of EE** **IIT Jammu**		**Dr. Sai Dhiraj Amuru** **Principal Research Engineer, WiSig Networks** **Adjunct Assistant Professor** **IIT Hyderabad**
	**Dr. Pallab Maji** **Nvidia, Bangalore, India**		**Dr. S. M. Hiremath** **Department of ECE** **NIT Rourkela**
	**Dr. Himanshu Bhusan Mishra** **Department of ECE** **IIT (ISM) Dhanbad**		**Dr. Deepak Kumar Panda** **Mercedes Benz, Bangalore, India**

About NIT Meghalaya

The National Institute of Technology (NIT) Meghalaya is one among the thirty NITs in India established under the NIT Act 2007 (Amended 2012) of the Parliament of India as Institutes of National Importance with full funding support from the Ministry of Human Resource Development, Government of India. The nearest railway station is Guwahati. From the railway station, one can travel by bus or shared taxi to Shillong. It takes about 3 hours to reach Shillong. After reaching Shillong, one can hire a local taxi to reach the campus at Bijni Complex, Laitumkhrah.

Course Schedule

Dates	10:00 AM to 11:30 AM	11:30 AM to 12:00 PM	12.00 PM to 1.30 PM	1.30 PM to 2:30 PM	2:30 PM to 4.00 PM	4:15 PM to 4:30 PM
15.09.2020 (Tuesday)	Registration and Inauguration	**Break**	**Session 1** Applications of ML algorithms for wireless Communication: An Introduction **Prof. Sarat Kumar Patra** **Director IIIT Vadodara**	**Lunch Break**	**Session 2** ML Applications for Wireless Communications **Prof. Sai Dhiraj Amuru** **IIT Hyderabad**	**Discussion**
16.09.2020 (Wednesday)	**Session 3** Massive MIMO for 5G and Beyond **Dr. Himanshu B. Mishra** **ISM Dhanbad**	**Break**	**Session 4** Introduction to deep learning **Dr. Pallab Maji** **Nvidia, Bangalore, India**	**Lunch Break**	**Session 5** ML algorithms for signal processing, LSTM hands on **Dr. Deepak Kumar Panda** **Mercedes Benz, Bangalore, India**	**Discussion**
17.09.2020 (Thursday)	**Session 6** New Modulation schemes for Next Generation WC **Dr. Himanshu B. Mishra** **ISM Dhanbad**	**Break**	**Session 7** Cardiovascular Signals and Information **Prof. S. Dandapat** **IITG**	**Lunch Break**	**Session 8** Application of deep learning for computer Vision **Prof. B. N. Subudhi** **IIT Jammu**	**Discussion**
18.09.2020 (Friday)	**Session 9** Machine Learning tools for Cardiovascular Signals **Prof. S. Dandapat** **IITG**	**Break**	**Session 10** Hands-on Session on Communication System **Prof. S. M. Hiremath** **NIT Rourkela**	**Lunch Break**	**Session 11** ML for the remotely sensed image analysis **Prof. B. N. Subudhi** **IIT Jammu**	**Discussion**
19.09.2020 (Saturday)	**Session 12** Deep dive into the network **Dr. Pallab Maji** **Nvidia, Bangalore, India**	**Break**	**Session 13** Adversial Learning for Signal Processing **Dr. Deepak Kumar Panda** **Mercedes Benz, Bangalore, India**	**Lunch Break**	**Session 14** Hands-on Session on Real Case Studies in Communication **Prof. S. M. Hiremath** **NIT Rourkela**	**Valediction & Feedback**