5-Days Short Term Course
on
"Application of Machine and Deep Learning in Engineering Problems"
Financially Sponsored by
TEQIP-III and Technically supported by SCOPE

April 09-13, 2020
Organized By
Department of Instrumentation and Control Engineering

Dr. B. R. Ambedkar National Institute of Technology Jalandhar, Punjab

About NIT Jalandhar

Dr. B. R Ambedkar National Institute of Technology Jalandhar was established in the year 1987 as Regional Engineering College and was given the status of National Institute of Technology by the Government of India on October 17, 2002 under the aegis of Ministry of Human Resource Development, New Delhi. As an Institute of National Importance, it imparts high quality technical education in Engineering, Technology and Science to produce competent technical manpower for the country. The institute offers Bachelor of Technology (B.Tech.) programme in nine disciplines of Engineering and Technology along with the research programmes leading to Master of Technology (M.Tech.) and Doctor of Philosophy (Ph.D). As per the survey conducted by NIRF, DQ-CMR best technical school survey and India Today-MDRA Best Colleges Ranking in the year 2018, the institute was ranked 74th, 18th and 22nd respectively, amongst all engineering institutions, including IITs in the country.

About Department of Instrumentation and Control Engineering

The Department of Instrumentation and Control Engineering commenced its Bachelor of Technology (B. Tech.) degree programme in 1990, M Tech (Full Time) degree programme in Control & Instrumentation Engineering w.e.f. July, 2006 and M Tech (Part-Time) Programme w.e.f. July, 2010. The Ph.D. Programme has also been offered since 2005 in various disciplines of Instrumentation and Control Engineering. This department has 15 regular faculties. Research in the department is at the leading-edge of technological innovations and encompasses all major areas of Instrumentation and Control Engineering. The department has unique research facilities that enable leading-edge research in many areas such as Computer Vision, Process Optimization, Renewable Energy, Robotics and Automation, Process Control, Biomedical Instrumentation, Sensors and Wireless Networking, IOT and Intelligent Control Systems. These facilities provide an excellent opportunity for graduate students and research scholars to be trained and gain valuable experience. The department is consolidating its efforts to promote industrial research and consultancy in relevant areas. The department has supervised more than 15 Ph.D Thesis and having the present strength of more than 20 research scholars. Also, the department has credit of more than 10 patent as well as more than 200 research article in highly reputed journals with high impact factor such as Renewable and Sustainable Energy Reviews (10.556) in last five years.

Objectives of the Course

The objectives of this course are two-fold-
(i) To provide a mathematical understanding of various Machine learning classification, detection, tracking and optimization methods.
(ii) To make participants familiar with commonly used tools and models for Machine learning classification, detection, tracking and optimization tools through hands-on-sessions.
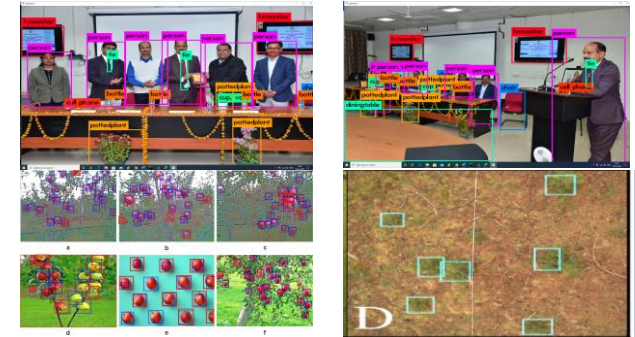
Course Contents:
- Introduction to Machine Learning, Deep Learning, Soft computing, and Optimization Techniques
- Basics of AI & Introduction to ANN
- Linear Regression
- Decision Trees
- Support Vector Machine
- Image Processing with Opencv
- Deep Learning Networks: Introduction to Tensor Flow

- Convolutional Neural Networks and its Application to Classification, Detection and Tracking Problems
- Machine Learning Model Optimization
- Introduction to Optimization techniques
- Novel meta-heuristic algorithms, machine learning and advance computing
- Multiobjective optimization, Scheduling and planning
- Hands-on Experience

Resource Person

Prof. Durga Toshniwal, IIT Roorkee
Prof. Rajeev Kumar, JNU, New-Delhi
Prof. T. V. Vijay Kumar, JNU, New-Delhi
Prof. Subramanian Balasundaram, JNU, New-Delhi
Dr Manojkumar Ramteke, IIT Delhi
Dr. Arnav Bhavsar, IIT Mandi
Dr. Dileep A. D., IIT Mandi
Dr. Partha P. Roy, IIT Roorkee

General Information

- The course is open to Industry professionals, Faculty, research scholars and students from recognized Engineering colleges.

- Only limited seats (40) are available in this course. The registration fee for all participants is INR 1000/- to be submitted in form of DD in favor of "The Director NIT Jalandhar" payable at Jalandhar. The duly signed application form along with payment details should reach to **vermaop@nitj.ac.in** latest by **05.04.2020.**

- Accommodation can also be arranged on request at 'Guest House of Mega Hostel' on twin sharing basis at @ Rs. 300/- per day per person.

Contact Person:
1. **Mr. Himanshu Gupta (Research Scholar-9919509201)**
2. **Mr. Saurav Kumar (M.Tech Scholar-8349135553)**

- NO REGISTRATION FEE / Demand Draft will be refunded after the registration of the course.

- No Travelling Allowance will be paid by the Academy.

Patron
Prof. L. K. Awasthi, Director, NIT Jalandhar

Guest of Honor(s)
Prof. Rajeev Kumar, School of Computer & Systems Sciences, JNU New-Delhi
Dr. S. K. Mishra, Registrar, NIT Jalandhar

Co-Patrons
Dr. Rajesh Singla, Head of Department, ICE
Prof. Dilbag Singh, Head of Department, EE

Chief-Convener
Dr. K.S. Nagla
Associate Professor, Department of ICE

Convener
Dr. Om Prakash Verma
Assistant Professor, Department of ICE

Coordinator(s)
Dr. Afzal Sikander
Dr. Amit Kumar Singh
Assistant Professor(s), Department of ICE

Departmental Advisory Committee

- Prof. A. K. Jain
- Dr. S.K Pahuja
- Dr. Roop Pahuja
- Dr. S Tiwari
- Er. N Singh
- Dr. Karan Veer

- Dr. Sathiya S
- Dr. Karan Jain
- Dr. Ravi Verma
- Dr. K. Chandra
- Dr. V. Sharma
- Dr. Harimurugan

Application Form for
Short Term Course (STC)
on
"Application of Machine and Deep Learning in Engineering Problems"
April 09-13, 2020

1. Name: Ms./Mr./Dr. ....
(In Block Letters)

2. Designation: ....

3. Age (Years): ....

4a. Complete Residential Address: ....

....
Email:**...................................** Mobile: ....

4b. Complete Official Mailing Address: ....

....
Email:**...................................** Mobile: ....

5. Academic Qualification (Degree onwards): ....

6. Specialization: ....

7. Teaching Experience in Years (if): ....

8. Payment Details:...

Date:............

Signature of applicant

Important Note:

1. This application form should reach the office latest by **05.04.2020**
2. Application without Payment details will not be entertained.
3. Please note that 100% attendance is compulsory in the course.

SPONSORSHIP CERTIFICATE

The applicant is hereby sponsored and will be permitted to attend the course, if selected.

Date: ***Signature with Seal***
                          Sponsoring Authority
                          (Principal / Director/ HoD)

Tentative Course Schedule
Day-1, 09/04/2020, Thursday

S.N	Name of Expert	Topic Covered	Date and Time
	INAUGURAL SESSION **Patron** Prof. L. K. Awasthi, Director, NIT Jalandhar **Guest of Honor(s)** Prof. Rajeev Kumar, School of Computer & Systems Sciences, JNU New-Delhi Dr. S. K. Mishra, Registrar, NIT Jalandhar **Co-Patrons** Dr. Rajesh Singla, Head of Department, ICE Prof. Dilbag Singh, Head of Department, EE **Chief-Convener** Dr. K.S. Nagla, Associate Professor **Convener** Dr. Om Prakash Verma **Coordinator(s)** Dr. Afzal Sikander Dr. Amit Kumar Singh **Organizing Committee** Prof. A. K. Jain, Dr. S.K Pahuja, Dr. Roop Pahuja, Dr. S Tiwari, Dr. N Singh, Dr. Karan Veer, Dr. Sathiya S, Dr. Karan Jain, Dr. Ravi Verma, Dr. K. Chandra, Dr. V. Sharma, Dr. Harimurugan	10:00-11:00
	HIGH TEA & GROUP PHOTO	11:00-11:30
1.	Prof. Rajeev Kumar, JNU, New-Delhi	Introduction to Machine and Deep Learning	11:30-13:30
	LUNCH BREAK	13:30-14:30
2.	Prof. Rajeev Kumar, JNU, New-Delhi	Linear Regression • Regression Problem Analysis • Mathematical modelling of Regression Model • Gradient Descent Algorithm • Building simple Univariate Linear Regression Model • Multivariate Regression Model • Best Fit Line and Linear Regression • Regression & Classification Problems • Programming Using python • Programming Process Flow	14:30-16:00
	TEA BREAK	16:00-16:15
3.	Dr. O. P Verma, NIT J	Hands On (Preliminary) - Basics of Python and some programming tips	16:15-17:15

Day-2, 10/04/2020, Friday

4.	Prof. T. V. Vijay Kumar, JNU, New-Delhi	Introduction to soft computing and AI	9:30 – 11:00
	HIGH TEA		11:00-11:30
5.	Prof. T. V. Vijay Kumar, JNU, New-Delhi	- Supervised & Unsupervised Learning - PEAS Analysis of Problem - Environmental Constraints - CSP – Introduction - Process flow for an AI agent - Various Agent Types	11:30 – 13:00
	LUNCH BREAK		13:30-14:30
6.	Prof. Subramanian Balasundaram, JNU, New-Delhi	Decision Trees - Forming a Decision Tree - Components of Decision Tree - Mathematics of Decision Tree - Decision Tree Evaluation - Random Forest Algorithm - Practical Examples & Case Study	14:00 – 15:30
	TEA BREAK		15:30-15:45
7.	Prof. Subramanian Balasundaram, JNU, New-Delhi	Support Vector Machine - Concept and Working Principle - Mathematical Modelling - Optimization Function Formation - The Kernel Method and Nonlinear Hyper-planes - Programming SVM using Python - Character recognition using SVM - Regression problem using SVM	15:45 – 17:15

Day-3, 11/04/2020, Saturday

8.	Dr. Manoj Ramteke, IITD	- Introduction to Optimization techniques - Novel meta-heuristic algorithms, machine learning and advance computing	9:30 – 11:00
	HIGH TEA		11:00-11:30
9.	Dr. Manoj Ramteke, IITD	Multiobjective optimization, Scheduling and planning	11:30 – 13:00
	LUNCH BREAK		13:30-14:30
10.	Dr. Arnav Bhavsar / Dr. Dileep A. D., IIT Mandi	Convolutional Neural Networks - Introduction to ANN - Sliding Window Algorithm - ANN vs CNN - CNN Architecture - Pooling - Variants of the Basic Convolution Function - Efficient Convolution Algorithms	14:00 – 15:30
	TEA BREAK		15:30-15:45
11.	Dr. Arnav Bhavsar / Dr. Dileep A. D., IIT Mandi	Hands on Experience -I	15:45 – 17:15

Day-4, 12/04/2020, Sunday

12.	Dr. Arnav Bhavsar / Dr. Dileep A. D., IIT Mandi	Image Processing with Opencv • Image Acquisition and manipulation using opencv • Video Processing • Edge Detection • Corner Detection • Face Detection • Image Scaling for ANN • Training ANN with Images • Character Recognition	9:30 – 11:00
	HIGH TEA		11:00-11:30
13.	Dr. Arnav Bhavsar / Dr. Dileep A. D., IIT Mandi	Hands on Experience -II	11:30 – 13:00
	LUNCH BREAK		13:30-14:30
14.	Dr. Partha P. Roy, IIT Roorkee	Deep Learning Networks: Introduction to Tensor Flow • The Programming Model • Data Model • Tensor Board • Introducing Feed Forward Neural Nets • Softmax Classifier • ReLU Classifier • Dropout Optimization • Deep Learning Applications	14:00 – 15:30
	TEA BREAK		15:30-15:45
15.	Dr. Partha P. Roy, IIT Roorkee	Hands on Experience -III	15:45 – 17:15

Day-5, 13/04/2020, Monday

16.	Prof. Durga Toshniwal, IIT Roorkee	Machine Learning Model Optimization	9:30 – 11:00
	Feedback Session		11:00 – 11:15
	VALEDICTORY SESSION (Including Certificate Distribution) **Patron** Prof. L. K. Awasthi, Director, NIT Jalandhar **Guest of Honor(s)** Prof. Durga Toshniwal, Dept. of Computer Science & Engineering, Head - Center for Transportation System CTRANS, IIT Roorkee Dr. Partha P. Roy, Department of Computer Science and Engineering, IIT Roorkee Dr. S. K. Mishra, Registrar, NIT Jalandhar **Co-Patrons** Dr. Rajesh Singla, Head of Department, ICE Prof. Dilbag Singh, Head of Department, EE **Chief-Convener** Dr. K.S. Nagla, Associate Professor **Convener** Dr. Om Prakash Verma **Coordinator(s)** Dr. Afzal Sikander Dr. Amit Kumar Singh **Organizing Committee** Prof. A. K. Jain, Dr. S.K Pahuja, Dr. Roop Pahuja, Dr. S Tiwari, Dr. N Singh, Dr. Karan Veer, Dr. Sathiya S, Dr. Karan Jain, Dr. Ravi Verma, Dr. K. Chandra, Dr. V. Sharma, Dr. Harimurugan		11:15 – 12:30