

**NIT Karnataka** IEEE Student Branch



TWO WEEKS ONLINE SUMMER SCHOOL on MACHINE AND DEEP LEARNING FOR REMOTE SENSING APPLICATIONS July 05-16, 2021

JOINTLY ORGANISED BY IEEE GRSS BANGALORE SECTION, NITK IEEE STUDENT BRANCH, AND DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING, NIT KARNATAKA SURATHKAL

# **REGISTRATION LINK**

https://forms.gle/ttNTqpgZUUEYCSNa6

Last date for registration: June 28, 2021 Notification of selected participants: July 1, 2021

Pre-summer school meeting with selected participants: July 2, 2021 at 5.30pm IST





## **1. Overview of Summer School**

Remote sensing is the collection of data about an object from a distance. Unlike direct sensing which is humanly possible, the geographers use the technique of remote sensing to monitor or measure phenomena found in the lithosphere, biosphere, hydrosphere, and atmosphere of the planet Earth. Remote sensing of the environment by geographers is usually done with the help of mechanical devices known as remote sensors. These gadgets use advanced technology to receive and record information, accurately and efficiently, of an object without any physical contact. Often, these sensors are positioned away from the object of interest by using helicopters, planes, and satellites. Most sensing devices record information about an object by measuring its ability to reflect and transmit electromagnetic energy from its reflecting and radiating surfaces. Remote sensing imagery has many applications in mapping land-use and cover, agriculture, soils mapping, forestry, city planning, archaeological investigations, military observation, and geomorphological surveying, among other uses. For example, foresters use aerial photographs for preparing forest cover maps, locating possible access roads, and measuring quantities of trees harvested. Specialized photography using color infrared film has also been used to detect disease and insect damage in forest trees. The simplest form of remote sensing uses photographic cameras to record information from visible or near infrared wavelengths. In the late 1800s, cameras were positioned above the Earth's surface in balloons or kites to take obligue aerial photographs of the landscape. During World War I, aerial photography played an important role in gathering information about the position and movements of enemy troops. These photographs were often taken from airplanes. After the war, civilian use of aerial photography from airplanes began with the systematic vertical imaging of large areas of Canada, the United States, and Europe. Many of these images were used to construct topographic and other types of reference maps of the natural and human-made features found on the surface of the Earth. Over time, the information gathered by these sensors has become *big data*.

Machine and deep learning tackle the challenges in handling big data. These tools offer many potential applications in the field of remote sensing data processing and analysis. One such potential task is in effective and efficient classification of remotely sensed imagery. The strengths of machine and deep learning methods include the capacity to handle data of high dimensionality and to map classes with very complex characteristics. Nevertheless, implementing a machine and deep learning classification method is not straightforward, and the literature provides conflicting advice regarding many key issues.

The proposed summer school presents tutorials for application of machine and deep learning for remote sensing data. It also highlights many real applications of remote sensing and contains sessions for the participants who may not have a strong background in the field. The purpose of the two weeks online summer school is to provide an intensive understanding of how to use the machine and deep learning algorithms and to equip the participants with software tools for solving the practical problems in the remote sensing domain.

## 2. Key objectives

The primary objectives of the course are as follows:

- Introducing participants to the fundamentals of remote sensing image processing and analysis.
- Building confidence and capability amongst the participants in the application of remote sensing, image processing and analysis using machine and deep learning.
- Providing exposure to practical problems and their solutions, through case studies in the remote sensing applications.
- Enhancing the capability of the participants to identify new applications of remote sensing involving image processing and analysis using machine and deep learning.

# **3. Teaching Faculty for the summer school** Instructors from IITs, NIT, IIIT, IIST, ISRO and Industry



Dr. PG Diwarkar Honorary Distinguished Professor, ISRO-HQ, Bangalore



Prof. BS Daya Sagar, ISI Bangalore



Prof. Avik Bhatacharya, IIT Mumbai



Dr. C. Sudhakar Reddy, Scientist-SG and Head, NRSC(ISRO) Hyderabad



Dr. Anil Kumar, Scientist-SG and Head, IIRS. Dehradun



Prof. Rama Rao Nidamanuri, IIST, Trivandrum, Kerala



Prof. Biplab Banerjee, IIT Mumbai



Prof. Saroj K. Meher, ISI, Bangalore



Er. Nagajothi Kannan, Scientist-SF, RRSC-NRSC (ISRO), Bangalore



Prof. Alok Bhardwaj IIT Roorkee



IIIT Bangalore



Prof. Ramesh H NITK Surathakl



Er. Ujjwal Kumar Gupta, Scientist-SD, SAC (ISRO) Ahmedabad



Mr. Ujaval Gandhi, Founder, Spatial Thoughts, Bangalore



Prof. Jeny Rajan NITK Surathkal



Prof. Deep Vijayasenan, NITK Surathkal



Prof. Shyam Lal, NITK Surathkal

#### **4. Course Details**

4.1 Duration: July 05-16, 2021 (10 days/ 2 weeks)4.2 Schedule of Lectures and Practicals (all timings are in IST time zone)

# Day 1: 5<sup>th</sup> July 2021, Monday

# Inauguration session: 9:00am to 9:30am

Lecture 1 (9:30am to 11:00am) : By Dr. PG Diwakar, ISRO-HQ, Bangalore Introduction and Applications of remote sensing

Lecture 2 (**11:00am to 12:30pm**):By Dr. C.Sudhakar Reddy,Scientist-SG and Head, NRSC(ISRO), Hyderabad Remote Sensing in Ecology and Forestry Applications

## Day 2: 6<sup>th</sup> July 2021, Tuesday

- Lecture 3 (9:30am to 11:00am): By Er. Nagajothi Kannan, Scientist-SG, RRSC-NRSC(ISRO), Bangalore Fundamental of Image processing concepts for remote Sensing
- Lecture 4 (**11:00am to 12:30pm**) : By Dr. Jeny Rajan, NITK Surathkal Introduction and Mathematical understanding of ANN

# Day 3: 7<sup>th</sup> July 2021, Wednesday

- Lecture 5 (9:30am to 11:00am) : By Dr. Anil Kumar, Scientist-SG and Head, IIRS. Dehradun Theoretical Aspects of Deep Learning in Geospatial Technology
- Lecture 6 (**11:00am to 12:30pm**) : By Dr. Avik Bhatacharya, IIT Mumbai Machine Learning for SAR Data Analysis

## Day 4: 8<sup>th</sup> July 2021, Thursday

- Practical 1 (9:30am to 11:00am) ) : By Ujjwal Kumar Gupta, Scientist-SD, SAC (ISRO) Ahmedabad Geospatial data Processing and Analysis with Python and GDAL
- Practical 2 (**11:00am to 12:30pm**) : By Dr. Rama Rao Nidamanuri, IIST, Trivandrum, Kerala Atmospheric Correction of Satellite data using Python

## Day 5: 9<sup>th</sup> July 2021, Friday

- Lecture 5 (9:30am to 11:00am) : By Dr. Deep Vijayasenan, NITK Surathkal Introduction and Mathematical understanding of 2D CNN
- Lecture 6 (**11:00am to 12:30pm**) : By Dr. Uttam Kumar, IIIT Bangalore Machine Learning for Data Processing in Earth Sciences

## Day 6: 12<sup>th</sup> July 2021, Monday

- Lecture 7 (9:30am to 11:00am): By Dr. Biplab Banerjee, IIT Mumbai Deep Learning Architecture for remote sensing Applications
- Practical 3 (**11:00am to 12:30pm**) : By Dr. Biplab Banerjee, IIT Mumbai Machine Learning for remote sensing Application

# Day 7: 13<sup>th</sup> July 2021, Tuesday

- Lecture 8 (9:30am to 11:00am) : By Dr. Rama Rao Nidamanuri, IIST, Trivandrum, Kerala 3D LiDAR point cloud analysis using ML for Agriculture applications
- Lecture 9 (**11:00am to 12:30pm**) : By Prof. B S Daya Sagar, ISI Bangalore Mathematical Morphology in Geoscience, Remote Sensing and Geospatial Data Science

## Day 8: 14<sup>th</sup> July 2021, Wednesday

- Practical 4 (9:30am to 11:00am) : By Dr. Shyam Lal, NITK, Surathkal 2D CNN for Land Cover Segmentation of Satellite Images using Python
- Lecture 10 (11:00am to 12:30 pm) : By Dr. Alok Bhardwaj, IIT Roorkee Application of AI in Disaster Response using Remote Sensing

# Day 9: 15<sup>th</sup> July 2021, Thursday

Practical 5 (**9:30am to 11:00am**): By Dr. Ramesh H, NITK, Surathkal QGIS with Remote Sensing Applications

Lecture 11 (**11:00 am to 12:30pm**) : By Prof. Saroj K. Meher, ISI, Bangalore Domain Adaptation based Interpretable for classification model for Remote Sensing Images

#### Day 10: 16<sup>th</sup> July 2021, Friday

Practical 6 (9:30am to 11:00am) : By Dr. Shyam Lal, NITK, Surathkal 2D CNN for Classification of Remote Sensing Images using Python

Practical 7 (**11:00am to 12:30pm**) : By Mr. Ujaval Gandhi, Founder, Spatial Thoughts, Bangalore Machine Learning and Deep Learning using Google Earth Engine

## Valedictory Session: 12:30 to 1:00pm

#### 5. Who can attend

- Students at all levels (Ph.D/M.Tech/MSc/B.Tech(3<sup>th</sup>Year))
- Faculty members from academic institutions.
- Engineers and researchers from Industry organizations including R&D laboratories

#### 6. Registration Fee: NIL

#### **Important Note:**

- 1. Preferences will be given to IEEE GRSS, and IEEE members.
- 2. E-certificate will be issued to those participants whose attendance is minimum 80%

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#### **Important dates:**

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#### **Course Coordinators**

1. Dr. Shyam Lal, Vice Chair, IEEE GRSS Bangalore Section, Assistant Professor, Department of Electronics and Communication Engineering. National Institute of Technology Karnataka, Surathkal, Mangaluru-575025 (Karnataka), India Tel: +91-824-2473522 Mob. : +91-9741072082 (WhatsApp) Email(s): shyamfec@nitk.edu.in; shyam.mtec@gmail.com

(For any inquiry, contact the course coordinator)

#### 2. Dr. Aparna P., IEEE GRSS Member

Assistant Professor, Department of Electronics and Communication Engineering. National Institute of Technology Karnataka, Surathkal, Mangaluru-575025 (Karnataka), India Email: p.aparnadinesh@nitk.edu.in; p.aparnadinesh@gmail.com

#### 3. Dr. Ramesh H, IEEE GRSS Member

Associate Professor, Department of Water Resources and Ocean Engineering, National Institute of Technology Karnataka, Surathkal, Mangaluru-575025 (Karnataka), India Email: hramesh@nitk.ac.in;ramesh.hgowda@gmail.com