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

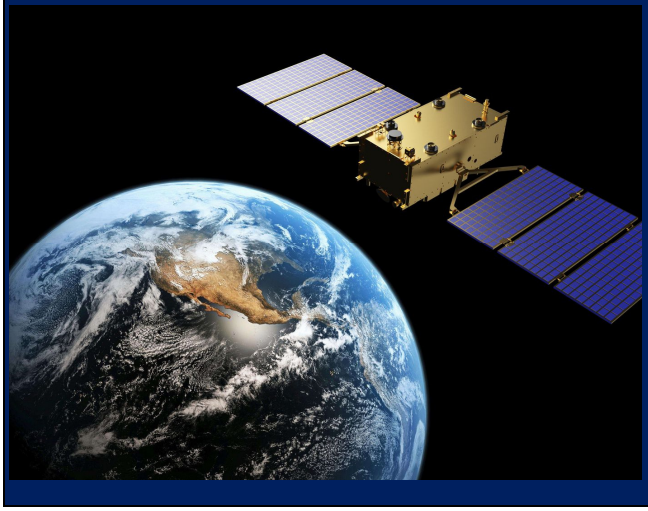
REGISTRATION LINK

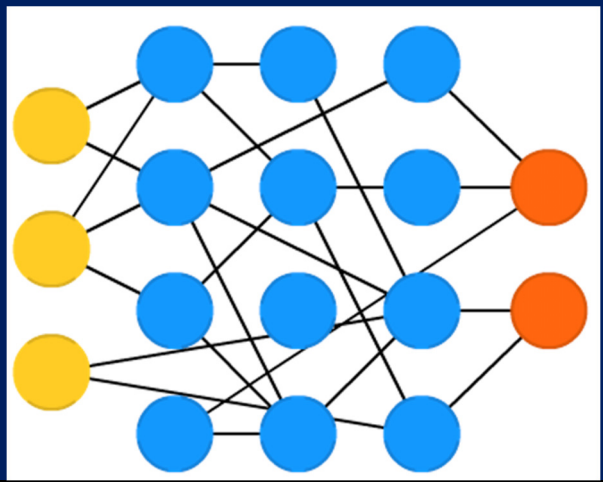
https://forms.gle/ttNTqpgZUUEYCSNa6

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 oblique 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

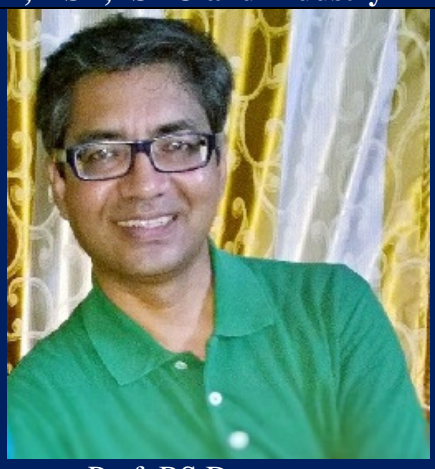
The primary objectives of the course are as follows:

- 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 Dayasagar,
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,
IIST, Trivandrum, Kerala

Prof. Biplab Banerjee,
IIT Mumbai

Prof. Saroj S. Meher,
ISI, Bangalore

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

Prof. Alok Bhardwaj
IIT Roorkee

Prof. Uttam Kumar
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 Surathakl

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: 5th 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: 6th 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: 7th July 2021, Wednesday

Lecture 5 (**9:30am to 11:00am**) : By Dr. Anil Kumar, Scientist-SG, 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: 8th 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, IIST, Trivandrum, Kerala
Atmospheric Correction of Satellite data using Python

Day 5: 9th 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: 12th 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: 13th July 2021, Tuesday

Lecture 8 (**9:30am to 11:00am**) : By Dr. Rama Rao, IIST, Trivandrum, Kerala
3D LiDAR point cloud analysis using ML for Agriculture applications

Lecture 9 (**11:00am to 12:30pm**) : By Prof. BS Dayasagar, ISI Bangalore
Mathematical Morphology in Geoscience, Remote Sensing and Geospatial Data Science

Day 8: 14th 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: 15th 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 S. Meher, ISI, Bangalore
Domain Adaptation based Interpretable for classification model for Remote Sensing Images

Day 10: 16th 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(3thYear))
- 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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Course Coordinators

1. Dr. Shyam Lal,
Vice Chair, IEEE GRSS Bangalore Section,
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shyam.mtec@gmail.com

(For any inquiry, contact the course coordinator)

2. Dr. Aparna P., IEEE GRSS Member
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3. Dr. Ramesh H , IEEE GRSS Member
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Email: hramesh@nitk.ac.in;ramesh.hgowda@gmail.com