



India Space Academy

Winter Training & Internship — 2026-2027 —

Remote Sensing and GIS From Satellite Data to Machine Learning



India Space Academy



"From Satellite Data to Machine Learning: Winter Internship on Remote Sensing and Geospatial Analysis Using Python"

Programme Objective

The objective of this Winter Training and Internship Programme is to provide participants with foundational to intermediate knowledge of Remote Sensing, GIS, Python programming, and Machine Learning for geospatial analysis through practical and workflow-oriented training. During the 15-day lecture and hands-on phase, participants will learn satellite data handling, raster preprocessing, spectral-index calculation, feature preparation, data visualisation, and basic supervised and unsupervised machine-learning techniques, including Random Forest and K-means clustering. This will be followed by a 30-day guided project phase in which participants will apply these skills to real-world applications in agriculture, forestry, environmental monitoring, urban studies, and disaster management. Upon completion, participants will be able to prepare remote-sensing datasets, develop and evaluate introductory machine-learning models, interpret their outputs, and produce meaningful prediction maps.

Mode: Online

Duration: 45 Days: 15 Days of Lectures and Hands-on Training, followed by 30 Days of Guided Project Work

Session Duration: 2 Hours per Day: Live Lecture and Hands-on Practice

Platform: Zoom

Course Coordinator: Miss Alisha Sinha, Scientist, India Space Academy

Pre-requisite: Participants are not required to have prior experience in machine learning, Python programming or advanced remote-sensing analysis. However, a basic familiarity with computers and a strong motivation to learn and apply geospatial technologies are desirable



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Day	Topic	Hands-on component
1	Introduction to Remote Sensing Data for Machine Learning	Understanding satellite bands, pixels, raster data and spatial resolution
2	Python Fundamentals for Geospatial Data	Variables, lists, conditions, loops and functions
3	Working with Geospatial Libraries in Python	Introduction to NumPy, Pandas, Matplotlib, GeoPandas and Rasterio
4	Reading and Visualizing Satellite Images	Opening raster bands, checking metadata and displaying satellite images
5	Raster Preprocessing for Machine Learning	Clipping, resampling, reprojection, NoData handling and raster alignment
6	Feature Generation from Satellite Data	Calculating NDVI, NDWI, NDBI and other predictor variables
7	Preparing Training Data	Creating sample points, extracting raster values and assigning target classes
8	Introduction to Machine Learning	Features, labels, training data, classification, regression and clustering
9	Data Preparation for ML Models	Cleaning data, handling missing values and train-test splitting
10	Supervised Classification	Implementing a Random Forest classifier using satellite variables
11	Unsupervised Classification	Applying K-means clustering to multispectral satellite data
12	Model Evaluation and Accuracy Assessment	Confusion matrix, accuracy, precision, recall and F1-score
13	Model Interpretation and Feature Importance	Understanding important satellite bands and environmental variables
14	Prediction Mapping and GIS Integration	Converting ML predictions into a classified raster and displaying it in QGIS
15	Complete ML Workflow and Project Orientation	Data → preprocessing → features → model → evaluation → prediction map

Projects

- Vegetation and Non-Vegetation Classification Using Random Forest
- Waterbody Extraction Using Satellite Indices and Machine Learning
- Built-Up Area Classification Using Sentinel-2 Data
- Unsupervised LULC Classification Using K-Means
- Comparison of NDVI Thresholding and Random Forest Classification



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