Satellite Image Processing for Ecosystem Health Training Course

Professional Development Training Course Outline

Category	Environmental Management and Conservation	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Satellite imagery has emerged as a powerful tool for monitoring and understanding the intricate dynamics of Earth's ecosystems. The vast amount of data collected by Earth Observation satellites provides an unparalleled, global perspective on environmental changes, from land-use patterns and deforestation to water quality and climate change impacts. However, the raw data from these sensors is complex and requires specialized skills to extract meaningful insights. Satellite Image Processing for Ecosystem Health Training Course is designed to equip professionals with the essential knowledge and practical skills in **satellite image processing** and **geospatial analysis** to effectively assess, monitor, and manage ecosystem health. Participants will learn to transform raw data into actionable intelligence, enabling data-driven decision-making for sustainable development and conservation efforts.

This comprehensive training focuses on a hands-on approach, combining theoretical foundations with practical application using industry-standard software and **open-source tools**. We will explore the latest advancements in **remote sensing technology**, including **machine learning** and **cloud-based platforms** like Google Earth Engine, to process and analyze large-scale datasets. By mastering these techniques, participants will be able to perform critical tasks such as **vegetation health monitoring**, **change detection** , and **land cover classification** with a focus on real-world applications for protecting and preserving our planet's vital ecosystems.

Programme Curriculum

Satellite Image Processing for Ecosystem Health Training Course

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Course Duration

5 days

Course Objectives

1. Master fundamental remote sensing principles and geospatial data analysis for environmental applications.
2. Perform advanced satellite image preprocessing including radiometric and atmospheric corrections.
3. Execute multispectral and hyperspectral image analysis for detailed ecosystem assessments.
4. Apply machine learning and deep learning algorithms for automated land cover classification and object detection.
5. Conduct time-series analysis of satellite data to monitor long-term ecological trends and seasonal changes.
6. Assess vegetation health and monitor agricultural productivity using various spectral indices like NDVI and EVI.
7. Map and quantify deforestation, urban sprawl, and land degradation using change detection techniques.
8. Analyze water quality and monitor aquatic ecosystems using satellite-derived data.
9. Integrate and visualize processed satellite imagery within a Geographic Information System (GIS) for comprehensive spatial analysis.
10. Utilize cloud computing platforms like Google Earth Engine (GEE) for large-scale, efficient data processing.
11. Develop automated workflows and scripts using Python for geospatial analysis.
12. Generate compelling geospatial intelligence and professional cartographic products from satellite data.
13. Apply skills to real-world climate change monitoring and disaster management case studies.

Organizational Benefits

- Organizations can leverage actionable insights from satellite data to make informed decisions on resource allocation, policy development, and environmental management.
- Automation of data processing workflows reduces the need for costly and time-consuming manual field surveys.

- Gaining proficiency in cutting-edge geospatial technology positions an organization as a leader in data-driven environmental solutions.
- The ability to monitor and detect environmental changes rapidly allows organizations to proactively address potential ecological threats and manage risks.
- The training promotes a culture of sustainability by providing the tools to measure, monitor, and report on environmental health and conservation efforts.
- Teams will be able to seamlessly integrate satellite data with existing GIS and corporate databases, creating a more holistic view of operations and assets.

Target Audience

1. Environmental Scientists & Conservationists.
2. GIS Analysts & Technicians.
3. Urban Planners & Policy Makers.
4. Agriculturalists & Agronomists.
5. Researchers & Academics.
6. Disaster Management & Emergency Response Personnel
7. Water Resource Managers.
8. Data Scientists & IT Professionals.

Course Outline

Module 1: Introduction to Remote Sensing and Ecosystem Health

- Fundamentals of remote sensing: principles, sensors, and satellite platforms.
- Understanding satellite imagery characteristics: spatial, spectral, temporal, and radiometric resolutions.
- Introduction to ecosystem health indicators measurable from space.
- Overview of the satellite image processing workflow, from data acquisition to final product.
- **Case Study:** Mapping global forest cover change using Landsat data for the past 30 years.

Module 2: Geospatial Data Acquisition and Preprocessing

- Accessing and downloading free and commercial satellite data
- Radiometric and atmospheric correction techniques to remove noise and haze.
- Geometric correction and image registration for accurate spatial alignment.
- Working with different data formats and projections (GeoTIFF, HDF, GCS, PCS).
- **Case Study:** Correcting Landsat 8 imagery over a coastal area to accurately monitor sedimentation.

Module 3: Image Enhancement and Spectral Analysis

- Image enhancement techniques: contrast stretching, histogram equalization, and spatial filtering.
- Creating multispectral band combinations for visual interpretation.
- Calculating spectral indices (NDVI, NDWI, EVI) to quantify vegetation, water, and soil characteristics.
- Introduction to hyperspectral data and its unique applications for ecosystem health.
- **Case Study:** Using NDVI to assess vegetation stress and identify areas of drought in a specific region.

Module 4: Land Cover Classification and Change Detection

- Supervised vs. unsupervised classification methods
- Accuracy assessment: creating a confusion matrix and calculating Kappa coefficient.
- Advanced classification using Random Forests and Support Vector Machines.
- Post-classification change detection to map land-use and land-cover changes over time.

- **Case Study:** Tracking the expansion of an urban area and its impact on surrounding agricultural land over a decade.

Module 5: Water and Coastal Ecosystem Monitoring

- Techniques for mapping and monitoring surface water bodies.
- Satellite-based methods for assessing water quality parameters
- Monitoring coastal erosion and shoreline changes.
- Mapping coral reef and mangrove health from space.
- **Case Study:** Using Sentinel-2 data to detect and track a harmful algal bloom in a lake and its potential impact on local fisheries.

Module 6: Advanced Techniques with Cloud Computing and Python

- Introduction to cloud-based geospatial platforms like Google Earth Engine (GEE).
- Performing large-scale raster analysis and planetary-scale data processing on GEE.
- Introduction to Python libraries for geospatial analysis
- Developing custom scripts for automating complex image processing tasks.
- **Case Study:** Automating a global-scale deforestation alert system using GEE and Python scripts.

Module 7: Spatial Analysis and Integration with GIS

- Integrating processed satellite raster data with vector GIS layers.
- Performing spatial queries and overlay analysis to identify relationships between different datasets.
- Creating high-quality cartographic outputs and data visualizations.
- Developing spatial models to predict and assess ecosystem vulnerability.
- **Case Study:** Combining satellite-derived land-use maps with species habitat data to identify critical conservation areas.

Module 8: Ecosystem Health Applications and Future Trends

- Application of satellite imagery for climate change and carbon stock monitoring.
- Using satellite data for biodiversity mapping and habitat assessment.
- Emerging trends in satellite technology, including AI, drones, and small satellites.
- Ethical considerations and data privacy in Earth Observation.
- **Case Study:** Leveraging high-resolution imagery and AI to count and monitor a specific wildlife population in a protected area.

Training Methodology

This course employs a dynamic and interactive training methodology that balances theoretical knowledge with hands-on practice.

- Instructor-Led Lectures
- Hands-on Software Labs.
- Real-World Case Studies.
- Group Discussions and Q&A.
- Practical Exercises and Assignments.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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