Training Course on Geospatial AI and Satellite Imagery Analysis

Professional Development Training Course Outline

Category	Data Science	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The convergence of **Geospatial Artificial Intelligence (GeoAI)** and **Satellite Imagery Analysis** is revolutionizing how we perceive, understand, and interact with our planet. This dynamic field, integrating **machine learning**, **deep learning**, and **computer vision** with **Geographic Information Systems (GIS)** and **remote sensing**, unlocks unprecedented insights from vast spatial datasets. From **environmental monitoring** and **disaster management** to **urban planning** and **precision agriculture**, GeoAI empowers data-driven decision-making, transforming industries and addressing critical global challenges with enhanced **accuracy**, **efficiency**, and **scalability**.

Training Course on Geospatial AI & Satellite Imagery Analysis provides a comprehensive dive into the cutting-edge methodologies and practical applications of GeoAI and satellite imagery analysis. Participants will gain hands-on expertise in leveraging **AI algorithms** to process, interpret, and extract actionable intelligence from high-resolution **satellite data**. By mastering advanced techniques in **spatial data science**, attendees will be equipped to develop innovative solutions for complex real-world problems, fostering **predictive analytics**, **automated feature extraction**, and **real-time geospatial insights** across diverse sectors.

Programme Curriculum

Training Course on Geospatial AI & Satellite Imagery Analysis

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Course Objectives

1. Comprehend the core principles of **Geospatial AI**, **Machine Learning (ML)**, and **Deep Learning (DL)** in the context of spatial data.
2. Understand various **satellite imagery types**, acquisition methods, and **remote sensing** principles.
3. Develop skills in **geospatial data preprocessing**, cleaning, and preparation for AI model integration.
4. Apply diverse **ML and DL algorithms** (e.g., CNNs, RNNs, GANs) to analyze **geospatial datasets**.
5. Learn techniques for **automated feature extraction** and object detection from satellite imagery.
6. Execute **land cover classification** and **change detection** using advanced GeoAI methods.
7. Build and evaluate **predictive models** for various spatial phenomena, including **risk assessment** and **trend forecasting**.
8. Gain proficiency in **cloud-based geospatial platforms** like Google Earth Engine for scalable analysis.
9. Leverage GeoAI for **environmental monitoring**, climate change assessment, and natural resource management.
10. Implement GeoAI for **urban planning**, smart city initiatives, and infrastructure monitoring.
11. Apply satellite imagery and AI for **disaster management**, damage assessment, and early warning systems.
12. Create compelling and informative **geospatial data visualizations** from AI-driven insights.
13. Address the **ethical considerations** and challenges associated with deploying AI in spatial data analysis.

Organizational Benefits

- Achieve superior, data-driven decisions through advanced spatial intelligence.
- Automate complex geospatial analysis workflows, saving time and resources.
- Optimize resource allocation and reduce operational costs through predictive insights.
- Improve **disaster preparedness** and **risk assessment** capabilities.
- Leverage cutting-edge technology for innovation and market leadership.
- Optimize **natural resource management**, urban development, and agricultural practices.
- Utilize cloud-based platforms for high-performance processing of big geospatial data.
- Foster the creation of innovative location-aware products and services.

Target Audience

- GIS Professionals & Analysts
- Remote Sensing Specialists
- Data Scientists & Machine Learning Engineers

- Environmental Scientists & Researchers
- Urban Planners & Civil Engineers
- Agricultural Scientists & Agronomists
- Disaster Management Professionals
- Anyone interested in applying AI to spatial data

Course Outline

Module 1: Introduction to Geospatial AI and Remote Sensing

- Defining GeoAI: Intersection of GIS, AI, and Remote Sensing.
- Overview of Remote Sensing: Sensors, Platforms (Satellite, Aerial, Drone).
- Types of Satellite Imagery: Optical, Radar, Multispectral, Hyperspectral.
- Key Concepts: Pixels, Resolution (Spatial, Spectral, Temporal, Radiometric).
- **Case Study:** Tracking global deforestation using historical Landsat imagery and basic change detection.

Module 2: Fundamentals of Machine Learning for Spatial Data

- Introduction to Machine Learning: Supervised, Unsupervised, Reinforcement Learning.
- Common ML Algorithms: Regression, Classification (Decision Trees, Random Forests, SVMs).
- Feature Engineering for Geospatial Data.
- Model Training, Validation, and Evaluation Metrics.
- **Case Study:** Classifying land use/land cover in a city using Sentinel-2 imagery and a Random Forest classifier.

Module 3: Deep Learning Architectures for Remote Sensing Imagery

- Introduction to Neural Networks and Deep Learning.
- Convolutional Neural Networks (CNNs): Architecture and Applications in Image Analysis.
- Recurrent Neural Networks (RNNs) for Time-Series Spatial Data.
- Generative Adversarial Networks (GANs) for Geospatial Data Generation.
- **Case Study:** Identifying building footprints from high-resolution satellite imagery using a U-Net architecture.

Module 4: Geospatial Data Acquisition and Preprocessing

- Accessing Satellite Data: Open-source repositories (e.g., ESA, NASA, USGS).
- Data Formats: GeoTIFF, NetCDF, HDF, Shapefiles.
- Image Rectification, Orthorectification, and Atmospheric Correction.
- Radiometric and Geometric Corrections.
- **Case Study:** Preprocessing a raw satellite image scene, including atmospheric correction and projection to a common CRS, for subsequent analysis.

Module 5: Cloud-Based Geospatial Platforms (Google Earth Engine)

- Introduction to Google Earth Engine (GEE) API and platform.
- Accessing and filtering vast geospatial datasets in GEE.
- Performing basic image processing and analysis in GEE.
- Leveraging GEE for scalable GeoAI workflows.
- **Case Study:** Analyzing long-term vegetation health trends (NDVI) over a large agricultural region using GEE's time-series capabilities.

Module 6: Image Classification and Land Cover Mapping

- Supervised Image Classification: Training data collection and labeling.
- Pixel-based vs. Object-based Image Analysis (OBIA).
- Advanced Classification Techniques: Support Vector Machines, Neural Networks.
- Accuracy Assessment: Confusion Matrices, Kappa Coefficient, F1-score.
- **Case Study:** Creating a detailed land cover map of a national park, distinguishing forests, water bodies, urban areas, and bare land.

Module 7: Change Detection and Time-Series Analysis

- Methods for Change Detection: Image differencing, post-classification comparison.
- Techniques for Multi-temporal Analysis: Tasseled Cap, Principal Component Analysis.
- Detecting subtle changes over time.
- Analyzing spatio-temporal patterns with RNNs.
- **Case Study:** Monitoring urban sprawl and expansion over two decades in a rapidly developing city using multi-temporal satellite imagery.

Module 8: Object Detection and Semantic Segmentation

- Deep Learning for Object Detection: YOLO, Faster R-CNN.
- Semantic Segmentation: U-Net, DeepLab.
- Instance Segmentation for individual object identification.
- Training custom models for specific object types.
- **Case Study:** Automatically detecting and counting vehicles or ships in port areas from high-resolution satellite images.

Module 9: Geospatial AI in Precision Agriculture

- Crop Health Monitoring: NDVI, EVI, and other vegetation indices.
- Yield Prediction using satellite data and AI.
- Disease and Pest Detection from imagery.
- Optimizing irrigation and fertilizer application.
- **Case Study:** Using drone and satellite imagery combined with AI to identify stress in crops (e.g., nitrogen deficiency) in a large farm, enabling targeted intervention.

Module 10: Environmental Monitoring and Conservation

- Monitoring Deforestation and Forest Degradation.
- Water Quality Assessment from Satellite Imagery.
- Tracking Glacier Melt and Sea Ice Dynamics.
- Biodiversity Monitoring and Habitat Mapping.
- **Case Study:** Assessing the impact of a recent wildfire on vegetation recovery and land cover change in a protected area using satellite imagery and GeoAI.

Module 11: Geospatial AI for Urban Planning and Smart Cities

- Urban Growth Analysis and Prediction.
- Infrastructure Mapping and Asset Management.
- Traffic Congestion Analysis and Optimization.
- Air Quality Monitoring and Urban Heat Island Detection.

- **Case Study:** Identifying informal settlements and assessing urban density in rapidly growing cities to inform infrastructure planning and service delivery.

Module 12: Disaster Management and Humanitarian Applications

- Damage Assessment after Natural Disasters (Floods, Earthquakes, Hurricanes).
- Rapid Mapping for Emergency Response.
- Population Displacement Tracking.
- Predictive Modeling for Hazard Assessment.
- **Case Study:** Utilizing pre- and post-disaster satellite imagery and AI to quickly assess building damage in a flood-affected region to guide humanitarian aid.

Module 13: Geospatial Big Data and Scalable Architectures

- Handling Large-Scale Geospatial Datasets.
- Parallel Processing and Distributed Computing for GeoAI.
- Leveraging Cloud Computing (AWS, Azure) for Spatial Analysis.
- Data Storage and Management Strategies for Big GeoData.
- **Case Study:** Processing a continental-scale dataset of satellite images for land use classification using distributed computing frameworks.

Module 14: Integrating GeoAI with GIS Workflows

- Connecting AI Models with GIS Software (e.g., ArcGIS Pro, QGIS).
- Automating GIS Tasks with AI.
- Developing Custom GeoAI Tools and Scripts.
- Building Interactive Geospatial Dashboards for AI Results.
- **Case Study:** Developing an automated pipeline to update a city's road network layer in a GIS based on newly acquired satellite imagery.

Module 15: Future Trends and Ethical Considerations in GeoAI

- Emerging Trends: Geospatial Digital Twins, Explainable AI (XAI) in GeoAI.
- AI Ethics and Bias in Spatial Data.
- Data Privacy and Security in Geospatial Applications.
- Career Opportunities and Industry Outlook.
- **Case Study:** Discussing the ethical implications of using satellite imagery and facial recognition AI in public spaces for surveillance and privacy concerns.

Training Methodology

This course adopts a highly interactive and hands-on training methodology, designed to ensure practical skill acquisition and deep conceptual understanding.

- **Lectures & Discussions:** Engaging theoretical sessions covering core concepts, algorithms, and advanced architectures.
- **Live Coding Demonstrations:** Step-by-step implementation of GANs using Python with popular deep learning frameworks (TensorFlow 2.x and Keras, or PyTorch).
- **Hands-on Labs & Exercises:** Practical coding sessions where participants build, train, and experiment with various GAN models on real datasets.
- **Case Study Analysis:** In-depth examination of real-world GAN applications across diverse industries, highlighting success stories and challenges.

- **Project-Based Learning:** A significant portion of the course will be dedicated to a capstone project, allowing participants to apply learned concepts to a practical problem.
- **Interactive Q&A:** Continuous opportunities for questions and discussions to clarify doubts and foster a collaborative learning environment.
- **Peer-to-Peer Learning:** Encouraging participants to share insights and troubleshoot problems together.

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	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

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