Geospatial Analytics Training Course

Professional Development Training Course Outline

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

Course Introduction

Geospatial Analytics Training Course is engineered to bridge the gap between raw geographic data and actionable intelligence by leveraging cutting-edge tools like GIS Remote Sensing, and Spatial Data Science. Participants will dive deep into vector and raster data processing, coordinate reference systems, and spatial topology, equipping them with the core competencies required to manipulate complex datasets. By mastering these foundational concepts, attendees will unlock the ability to decode spatial patterns, model geographic phenomena, and address multifaceted environmental and urban challenges.

Moving beyond traditional mapping, this curriculum embraces the future of the discipline by integrating GeoAI , cloud-native computing, and automated workflows. Through hands-on mastery of industry-standard tools including ArcGIS Pro, QGIS, Google Earth Engine (GEE), and spatial Python libraries learners will transition from basic data visualization to advanced predictive modeling. The training emphasizes scalable cloud infrastructure and big data architectures, ensuring that participants can efficiently ingest, process, and analyze petabyte-scale spatial datasets. Ultimately, this course empowers professionals to deliver high-impact, data-driven solutions that optimize resource allocation, enhance climate resilience, and drive sustainable development.

Programme Curriculum

Geospatial Analytics Training Course

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Course Duration

10 Days

Course Objectives

- Master Spatial Data Infrastructures.
- Implement Advanced GeoAI Workflows.
- Leverage Cloud-Native Geospatial Computations
- Develop Interactive Geo-Visualizations.
- Execute Complex Network Analysis.
- Conduct High-Resolution Remote Sensing Analysis.
- Apply Spatial Econometrics and Statistics.
- Automate GIS Pipelines.
- Integrate Real-Time IoT Spatial Streams.
- Address Climate Change and Resiliency.
- Optimize Urban and Smart City Planning.
- Ensure Data Quality and Geodesy Accuracy
- Harness Open-Source Geospatial Tech Stacks

Target Audience

1. GIS Analysts and Specialists
2. Urban and Regional Planners.
3. Environmental Scientists and Ecologists
4. Data Scientists and Business Analysts
5. Civil Engineers and Asset Managers
6. Disaster Risk and Humanitarian Response Managers.
7. Precision Agriculture Consultants.
8. Supply Chain and Logistics Strategists

Course Modules

Module 1: Foundations of GIS and Spatial Data Architectures

- Introduction to Vector (Points, Lines, Polygons) and Raster models.
- Deep dive into Coordinate Reference Systems (CRS), datums, and projections.
- Understanding spatial topology, geometry validity, and data cleaning techniques.
- Working with spatial file formats: GeoJSON, Shapefiles, GeoPackage, and Cloud Optimized GeoTIFFs (COG).

- Hands-on environment setup with open-source QGIS and commercial ArcGIS Pro.
- *Case Study:* Resolving alignment and projection overlap errors across five legacy municipal datasets to build a unified tax assessment map.

Module 2: Spatial Database Management with PostGIS

- Introduction to relational databases and object-relational spatial extensions.
- Writing fundamental spatial SQL queries using ST Contains, ST Within, and ST Distance.
- Creating and optimizing spatial indices for accelerated querying.
- Executing complex spatial joins and data aggregations within PostgreSQL.
- Connecting PostGIS backends securely to desktop GIS clients and web applications.
- *Case Study:* Querying a database of 100,000 national retail outlets to find all competitor locations within a 5-kilometer buffer zone of proposed new sites in under 50 milliseconds.

Module 3: Scripting and Automation with Spatial Python

- Introduction to the Python spatial ecosystem: Anaconda, Jupyter Notebooks, and IDEs.
- Vector data manipulation using Data Frames.
- Geometric operations and spatial predicates with Shapely.
- File I/O operations for massive datasets using Fiona and Pyogrio.
- Automating repetitive desktop GIS workflows via Python scripting (ArcPy and PyQGIS).
- *Case Study:* Scripting a daily automated pipeline that intersects high-voltage powerline vector buffers with regional vegetation growth shapefiles to flag high-risk zones.

Module 4: Raster Analytics and Surface Modeling

- Foundations of raster cell algebra, local, focal, zonal, and global operations.
- Digital Elevation Model (DEM) analysis: deriving slope, aspect, hillshade, and viewsheds.
- Hydrological modeling: watershed delineation, stream order, and flow accumulation.
- Interpolation techniques: Inverse Distance Weighting (IDW), Kriging, and Spline modeling.
- Processing multi-band raster matrices using Python's Rasterio and NumPy.
- *Case Study:* Combining multi-criteria evaluation matrices (slope, soil permeability, land cover) to map flash-flood risk zones across a mountainous watershed.

Module 5: Remote Sensing Principles and Image Processing

- The electromagnetic spectrum, atmospheric correction, and satellite sensor characteristics.
- Working with open satellite constellations: Sentinel-2, Landsat 8/9, and MODIS.
- Calculating spectral indices: NDVI (Vegetation), NDWI (Water), and NBR (Burn Severity).
- Supervised vs. Unsupervised pixel-based image classification workflows.
- Time-series raster analysis for monitoring environmental changes over decades.
- *Case Study:* Processing pre- and post-fire Sentinel-2 imagery to compute the Delta Normalized Burn Ratio (dNBR) for emergency reforestation planning.

Module 6: Cloud-Native Big Spatial Data with Google Earth Engine

- Introduction to JavaScript/Python APIs for cloud-native parallel spatial processing.
- Navigating the Earth Engine Data Catalog (petabytes of climate, imagery, and geophysical data).
- Writing server-side filter, map, and reduce functions to eliminate local hardware constraints.
- Executing pixel-by-pixel trend analysis and long-term environmental charting.
- Exporting large-scale processed imagery products directly to Google Drive or Cloud Storage.

- *Case Study:* Analyzing a 10-year dense time-series of Landsat data across the Amazon basin to detect illegal logging activities within 48 hours of occurrence.

Module 7: Spatial Statistics and Pattern Analysis

- Understanding the First Law of Geography and quantifying spatial randomness.
- Measuring spatial autocorrelation using Global and Local Moran's I metrics.
- Executing Hot Spot Analysis to locate statistically significant clusters.
- Point pattern analysis using Kernel Density Estimation (KDE) techniques.
- Running Geographically Weighted Regression (GWR) to model spatially varying relationships.
- *Case Study:* Analyzing 3 years of municipal emergency dispatch coordinates to pinpoint persistent crime clusters and optimize police patrol route allocation.

Module 8: Network Analysis and Routing Optimization

- Graph theory fundamentals: nodes, edges, weights, and impedance factors.
- Building network topologies from raw road centerline data networks.
- Calculating shortest paths, fastest routes, and service area catchments (isochrones).
- Solving the Vehicle Routing Problem (VRP) with multiple stops and capacity constraints.
- Using pgRouting and Python's NetworkX for programmatic network calculations.
- *Case Study:* Generating 5, 10, and 15-minute drive-time isochrones across an entire metropolitan area to locate blind spots in emergency medical response coverage.

Module 9: Web GIS Architecture and Interactive Dashboards

- Architecture of Web GIS: Tile servers, Map services, Feature services, and Web Map Protocols (WMS/WFS).
- Publishing spatial data web layers using GeoServer or ArcGIS Online.
- Building lightweight, interactive web maps with Python libraries like Folium and Plotly\ Express
- Designing comprehensive operational dashboards using ArcGIS Experience Builder or Streamlit.
- Implementing user interaction features: filtering, querying, and spatial buffering on the web fly.
- *Case Study:* Developing an interactive web map dashboard for a global logistics firm to track vessel positions, port delays, and delivery statuses dynamically.

Module 10: GeoAI – Machine Learning for Spatial Data

- Preparing spatial feature arrays for integration into traditional Scikit-Learn machine learning workflows.
- Addressing the spatial autocorrelation bias via spatial cross-validation techniques.
- Applying Random Forests, Support Vector Machines (SVM), and XGBoost to spatial predictive modeling.
- Object-based image analysis (OBIA) versus traditional pixel-based classification techniques.
- Deploying spatial clustering algorithms like Spatial DBSCAN ($HDBSCAN$).
- *Case Study:* Combining proximity variables (distance to subways, parks, schools) with property historical data in an XGBoost model to predict property valuations citywide.

Module 11: LiDAR and 3D Spatial Analytics

- Introduction to Light Detection and Ranging (LiDAR) physics and point cloud classification.
- Processing .LAS / .LAZ files to generate Digital Terrain Models (DTM) and Digital Surface Models (DSM).
- Extracting building footprints, heights, and vegetation canopy metrics from 3D point clouds.
- Working with 3D mesh models, multipatches, and line-of-sight urban visibility analyses.

- Integrating BIM (Building Information Modeling) datasets into a unified 3D GIS ecosystem.
- *Case Study:* **Urban Solar Energy Potential Mapping:** Processing city-wide airborne LiDAR point clouds to compute solar radiation potential per square meter for every building rooftop.

Module 12: Spatiotemporal Analysis and Moving Objects

- Characteristics of space-time data structures and NetCDF/HDF5 multi-dimensional file formats.
- Building Space-Time Cubes to analyze trends across geography and time simultaneously.
- Processing GPS telemetry tracks and trajectories of moving assets.
- Calculating velocity, acceleration, turn angles, and anomalies in movement behavior.
- Predicting future asset positions based on historical spatiotemporal patterns.
- *Case Study:* Analyzing AIS (Automatic Identification System) vessel telemetry tracks over time to flag anomalous circular patterns indicating illegal transshipment at sea.

Module 13: Precision Agriculture and UAV Image Analytics

- Drone (UAV) flight planning parameters, photogrammetry fundamentals, and image stitching.
- Generating orthomosaics, 3D point clouds, and digital surface models from drone imagery.
- Calculating high-resolution indices for crop vigor, water stress, and nitrogen deficiencies.
- Zoning fields into localized management zones for variable-rate fertilizer application.
- Automated plant counting and weed identification using high-resolution drone orthophotos.
- *Case Study:* Stitching multispectral drone imagery taken over a 50-hectare vineyard to generate targeted variable-rate irrigation maps based on localized crop water stress.

Module 14: Geo-Demographics and Location Intelligence for Business

- Integrating census tract data, purchasing power metrics, and demographic layers.
- Executing Location-Allocation models to determine the optimal placement of physical facilities.
- Analyzing trade areas using Huff’s Gravity Model and drive-time polygons.
- Conducting competitive cannibalization analysis for existing brick-and-mortar networks.
- Using mobility/foot-traffic data to analyze consumer visit patterns across physical storefronts.
- *Case Study:* Utilizing Huff's Model and smartphone foot-traffic data layers to select three new supermarket locations that minimize cannibalization of existing stores.

Module 15: Spatial Data Quality, Governance, and Ethics

- Identifying and correcting topological errors: overlaps, sliver polygons, and unclosed dangles.
- Implementing strict spatial metadata standards (ISO 19115 / FGDC).
- Understanding privacy implications in geospatial tech: obfuscation, geofencing ethics, and differential privacy.
- Managing enterprise-wide multi-user geodatabase versioning and conflict resolution.
- Optimizing license compliance and open-source data attribution rules (OSM ODbL).
- *Case Study:* Auditing, anonymizing sensitive endangered species nesting coordinates, and restructuring a massive regional agency geodatabase for a public open-data portal release.

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.

- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

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
23 Nov 2026	04 Dec 2026	Physical	$9,000

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

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