

Open-Source GeoAI & Spatial Intelligence

Duration: 5 Days

Note: All demonstrations will be conducted using the open-source tools.

Module 1: Open Geospatial Data Ecosystem & Spatial Intelligence

- Understanding Modern Geospatial Data Ecosystems
 - Open Geospatial Consortium (OGC) Standards
 - Working with OpenStreetMap (OSM) Data
 - Satellite Data Sources: Sentinel, Landsat & MODIS
 - Spatial Data Quality & Validation
 - Coordinate Systems & Spatial Accuracy
 - Geospatial Data Discovery & Catalogs
 - Spatial Metadata & Data Governance
 - Hands-on: Acquiring & Exploring Open Geospatial Datasets
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Module 2: Advanced Remote Sensing & Raster Analytics

- Raster Data Fundamentals
 - Multi-band Satellite Imagery Analysis
 - Spectral Indices (NDVI, NDWI, NDBI)
 - Terrain & Elevation Analysis using DEM Data
 - Time-series Satellite Data Analysis
 - Land Surface Temperature Analysis
 - Flood, Vegetation & Urban Change Detection
 - Raster Analytics using QGIS & GDAL
 - Cloud-Optimized GeoTIFF (COG) Concepts
 - Hands-on: Environmental & Urban Analytics using Satellite Data
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Module 3: GeoAI, Computer Vision & Spatial Machine Learning

- Introduction to GeoAI Concepts
- Spatial Feature Engineering
- Spatial Clustering & Hotspot Detection
- Geospatial Classification Models
- Geospatial Computer Vision Fundamentals
- Object Detection in Satellite Imagery using YOLO
- Image Segmentation for Spatial Analysis
- Deep Learning for Land Cover Prediction
- Spatial Anomaly Detection

- AI-assisted Geospatial Decision Intelligence
 - Hands-on: GeoAI & Geospatial Computer Vision Workflows
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Module 4: Spatial Databases & Geospatial Data Engineering

- Spatial SQL using PostGIS
 - Managing Large Geospatial Datasets
 - Spatial Indexing & Query Optimization
 - Vector & Raster Data Pipelines
 - Geospatial Data Transformation using GDAL/OGR
 - GeoParquet & Cloud-Native Geospatial Formats
 - DuckDB for Spatial Analytics
 - Real-time Spatial Data Streams
 - Apache Sedona Fundamentals
 - Distributed Spatial Data Processing Concepts
 - Hands-on: Spatial Database & Data Engineering Workflows
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Module 5: Spatial Graph Analytics & Mobility Intelligence

- Introduction to Spatial Network Analysis
 - Graph-based Geospatial Relationships
 - Route Optimization Concepts
 - Road Network Analysis using OpenStreetMap
 - Mobility & Transportation Analytics
 - Supply Chain Geospatial Intelligence
 - Accessibility & Catchment Area Analysis
 - Spatial Connectivity Modeling
 - Urban Mobility Intelligence Workflows
 - Hands-on: Spatial Graph Analytics using Open-Source Tools
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Module 6: AI-Powered Spatial Visualization & Decision Intelligence

- AI-assisted Spatial Visualization Concepts
 - Interactive Geospatial Dashboards using Streamlit
 - Spatial Visualization using Kepler.gl
 - Interactive Mapping using Folium
 - LLM-assisted Spatial Querying & Insights
 - Generative AI for Geospatial Reporting
 - AI-assisted Map Interpretation
 - Spatial Storytelling & Decision Intelligence
 - Responsible AI in Geospatial Systems
 - Hands-on: AI-Powered Spatial Dashboard Development
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Module 7: Smart Cities, IoT & Real-Time Spatial Systems

- Introduction to Smart City GIS Concepts
- IoT & Sensor-based Spatial Systems
- Real-time Spatial Monitoring Architectures
- Spatial Analytics for Urban Intelligence
- Environmental Monitoring using Geospatial Data
- Real-time Mobility & Asset Tracking Concepts
- Geospatial Digital Twin Fundamentals
- Open-source Tools for Smart Spatial Systems
- Spatial Event Processing Concepts
- Hands-on: Smart City Spatial Analytics Workflows