Training Course on Big Geospatial Data + AI for Advanced Analytics

Professional Development Training Course Outline

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

Course Introduction

Training Course on Big Geospatial Data + AI for Advanced Analytics delves into the transformative convergence of **Big Geospatial Data** and **Artificial Intelligence (AI)**, empowering professionals with cutting-edge skills for advanced analytics. Participants will explore how to harness vast volumes of location-based information, from satellite imagery to IoT sensor data, and leverage powerful AI algorithms to extract meaningful insights, automate complex processes, and drive data-driven decision-making across diverse sectors. The curriculum emphasizes practical, hands-on application of **GeoAI techniques**, focusing on real-world problem-solving in areas such as urban planning, environmental monitoring, disaster management, and smart infrastructure.

The demand for professionals proficient in **geospatial AI** is rapidly growing as organizations seek to unlock the full potential of their spatial data assets. This course provides a comprehensive pathway to mastering the tools and methodologies required to design, implement, and deploy **AI-powered geospatial solutions**. Through a blend of theoretical foundations and practical exercises, attendees will gain expertise in **machine learning for GIS**, **deep learning for remote sensing**, **spatial data science**, and **cloud-based geospatial analytics platforms**, preparing them to lead innovation in the evolving landscape of location intelligence.

Programme Curriculum

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Course Objectives

1. Understand the core concepts of **GeoAI**, its applications, and the synergistic relationship between **geospatial data** and **AI algorithms**.
2. Acquire proficiency in handling, pre-processing, and managing **large-scale geospatial datasets** from diverse sources like **satellite imagery**, **LiDAR**, and **IoT sensors**.
3. Implement various **machine learning (ML) algorithms** tailored for **geospatial analysis** and pattern recognition.
4. Utilize **deep learning (DL) architectures** such as **Convolutional Neural Networks (CNNs)** for advanced **remote sensing applications**, including **image classification** and **object detection**.
5. Develop and evaluate **predictive models** to forecast spatial trends, identify anomalies, and optimize resource allocation in various **geospatial domains**.
6. Understand techniques for **real-time processing** and analysis of **streaming geospatial data** using **AI-driven tools** for enhanced situational awareness.
7. Gain skills in automating time-consuming **geospatial data processing** and analytical tasks using **AI and scripting languages (Python)**.
8. Create impactful and interactive **geospatial visualizations**, **dashboards**, and maps to effectively communicate **AI-generated insights**.
9. Apply **GeoAI techniques** for **smart city initiatives**, **urban growth modeling**, infrastructure planning, and traffic management.
10. Understand how **AI and geospatial data** contribute to **environmental conservation**, **climate change analysis**, and **disaster risk management**.
11. Master **data fusion techniques** to combine and integrate various **geospatial data sources** for comprehensive **AI analysis**.
12. Explore **ethical considerations**, data privacy, and bias mitigation in the application of **AI to geospatial data**.
13. Learn to deploy and operationalize **AI models** and **geospatial analytics workflows** on **cloud platforms**

Organizational Benefits

- Empower organizations with **data-driven insights** derived from large and complex **geospatial datasets**, leading to more informed and strategic decisions.
- Automate labor-intensive **geospatial analysis tasks** and **data processing workflows** using AI, significantly reducing operational costs and time.

- Develop accurate **predictive models** for various applications, from **urban development forecasting** to **environmental change detection**, enabling proactive planning and risk mitigation.
- Gain a significant edge by leveraging **cutting-edge AI and geospatial technologies** to extract unique insights and develop innovative solutions.
- Facilitate more efficient allocation of resources through precise **geospatial intelligence**, leading to cost savings and improved outcomes in areas like logistics, agriculture, and infrastructure.
- Enable organizations to respond quickly and effectively to dynamic changes and emerging situations by processing and analyzing **geospatial data in real-time**.
- Foster a culture of innovation by equipping teams with the skills to explore new applications of **Big Geospatial Data and AI**, leading to the development of novel products and services.

Target Audience

1. GIS Professionals & Analysts.
2. Data Scientists & Analysts.
3. Urban Planners & Civil Engineers.
4. Environmental Scientists & Researchers.
5. Remote Sensing Specialists.
6. Disaster Management & Humanitarian Aid Professionals.
7. IT & Software Developers.
8. Project Managers & Decision-Makers.

Course Outline

Module 1: Introduction to Big Geospatial Data and AI

- Understanding Big Geospatial Data.
- Introduction to Artificial Intelligence.
- The Convergence of Geo and AI
- Key GeoAI Applications.
- Tools and Ecosystem Overview
- **Case Study**: Analyzing **Twitter data** with **geotags** to map public sentiment during a major event, illustrating the volume and velocity of big geospatial data.

Module 2: Geospatial Data Acquisition and Pre-processing

- Data Sources and Formats
- Geospatial Data Acquisition Techniques
- Data Pre-processing and Cleaning.
- Data Storage and Management.
- Feature Engineering for Geospatial Data
- **Case Study**: Pre-processing **Sentinel-2 satellite imagery** for land cover classification, including atmospheric correction and mosaic creation.

Module 3: Fundamentals of Python for Geospatial Analysis

- Python for Geospatial.
- Geospatial Libraries in Python.
- Basic Spatial Operations.
- Data Visualization with Matplotlib and Folium.
- Introduction to Jupyter Notebooks.

- **Case Study**: Using Python and GeoPandas to analyze demographic data geographically, joining census data with administrative boundaries.

Module 4: Introduction to Machine Learning for Geospatial Data

- ML Fundamentals.
- Scikit-learn for Geospatial.
- Feature Selection and Model Training.
- Model Evaluation Metrics.
- Addressing Spatial Autocorrelation.
- **Case Study**: Predicting housing prices using **geospatial features** (proximity to amenities, public transport) with **regression models**.

Module 5: Deep Learning for Image Classification

- Introduction to Neural Networks.
- Convolutional Neural Networks (CNNs).
- Training CNNs for Image Classification.
- Geo-specific CNN Architectures.
- Interpreting CNN Results.
- **Case Study**: Classifying land use/land cover from **high-resolution satellite imagery** using a pre-trained CNN.

Module 6: Object Detection in Geospatial Imagery

- Object Detection Concepts
- Single-Shot Detectors (YOLO, SSD).
- Region-Proposal Networks (Faster R-CNN).
- Training and Evaluation for Geospatial Objects.
- Applications in GIS
- **Case Study**: Detecting changes in infrastructure (e.g., new buildings, road networks) from **time-series satellite imagery** using **YOLO**.

Module 7: Advanced Deep Learning for Change Detection

- Change Detection Methodologies
- Deep Learning for Bi-temporal Image Analysis.
- Identifying and Quantifying Changes.
- Time-Series Geospatial Data.
- Deployment Considerations.
- **Case Study**: Monitoring **deforestation** in the Amazon rainforest using **Sentinel-1 (SAR) and Sentinel-2 (Optical) imagery** with **deep learning for change detection**.

Module 8: Geospatial Time Series Analysis with AI

- Temporal Dimensions in Geospatial Data.
- Recurrent Neural Networks (RNNs) and LSTMs.
- Forecasting Spatial Phenomena.
- Integrating Time and Space.
- Challenges of Spatio-Temporal Data.
- **Case Study**: Predicting **air quality levels** in urban areas using **time-series sensor data** combined with **meteorological and traffic data** using **LSTMs**.

Module 9: Cloud-Based Geospatial AI Platforms

- Introduction to Cloud GIS
- Google Earth Engine (GEE) for Big Geospatial Data.
- Leveraging Cloud AI Services.
- Scalable Processing with Cloud Computing.
- Cost Optimization and Best Practice.
- **Case Study**: Performing large-scale **land cover mapping** for an entire continent using **Google Earth Engine** and its built-in ML capabilities.

Module 10: Geospatial Data Visualization and Communication

- Advanced Mapping Techniques
- Interactive Web Maps
- Dashboard Development
- Storytelling with Spatial Data
- Ethical Visualization.
- **Case Study**: Developing an **interactive web dashboard** to visualize **traffic congestion patterns** and **AI-predicted hotspots** in a city.

Module 11: AI for Smart Cities and Urban Analytics

- Smart City Concepts.
- Urban Growth Modeling.
- Optimizing Urban Services.
- Crime Prediction and Hotspot Analysis.
- Socio-economic Analysis.
- **Case Study**: Optimizing **emergency vehicle dispatch routes** in a metropolitan area by integrating **real-time traffic data** and **historical accident locations** with **AI-driven routing algorithms**.

Module 12: AI in Environmental Monitoring and Disaster Management

- Climate Change Impact Assessment
- Biodiversity Conservation
- Disaster Risk Assessment
- Emergency Response Optimization.
- Environmental Policy and Planning.
- **Case Study**: Assessing **wildfire risk** by analyzing **vegetation density, weather patterns, and historical fire incidents** using **machine learning models**.

Module 13: Ethics, Privacy, and Bias in GeoAI

- Ethical Considerations in AI.
- Geospatial Data Privacy.
- Bias in AI Models.
- Responsible AI Development
- Legal and Regulatory Landscape.
- **Case Study**: Discussing the ethical implications of using **facial recognition on public CCTV footage** combined with **geospatial tracking** for surveillance in urban areas.

Module 14: Project Development and Deployment

- Project Lifecycle.
- Developing a GeoAI Project.
- 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
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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