CONCEPT

GeoAI for Land Surveying: Point Cloud Classification and AI Feature Extraction

19 – 23 July 2027
London - Central London four-star



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Introduction:

GeoAI for land surveying promises faster mapping, yet many survey and mapping teams still classify point clouds and digitise footprints by hand, or accept AI outputs without checking them against accuracy requirements. The result is slow delivery, inconsistent layers and deliverables that fail client QA. This Core Concept course gives surveyors and mapping staff a vendor-neutral method to prepare labelled geodata, train and apply point cloud classification and imagery feature extraction models, detect change between epochs and prove output accuracy. Participants produce a GeoAI Mapping Pipeline and QA Plan for a case survey project.

Course Objectives:

- Map where GeoAI adds value across the capture, processing, extraction and delivery stages of survey and mapping projects
- Build labelled training datasets for point clouds and imagery with class schemas and spatially separated validation blocks
- Classify lidar and photogrammetric point clouds into ground, building, vegetation and utility classes using machine learning and deep learning models
- Extract building footprints, roads and parcel boundaries from aerial and satellite imagery and regularise them into clean vector features
- Assess AI outputs with per-class metrics and positional accuracy checkpoints, and detect change between survey epochs
- Deliver AI-derived layers into GIS and CAD deliverables under a documented QA plan, compute plan and geodata licensing terms

Target Audience:

- Land and engineering surveyors who process lidar and drone data into topographic and cadastral deliverables
- GIS analysts who maintain base map layers and need faster feature capture from imagery
- Photogrammetry and mapping engineers who produce orthoimagery, surface models and classified point clouds
- Survey data processing teams responsible for point cloud editing, tiling and checks before delivery
- Mapping project leads who specify, check and accept AI-assisted outputs from staff or subcontractors

Course Outline:

Day 1: GeoAI in the Survey and Mapping Workflow

- GeoAI Value Map Across Capture, Processing, Extraction and Delivery Stages
- Geospatial Data Types: Orthoimagery, Airborne Lidar, Drone Photogrammetric Point Clouds and Vector Layers
- Machine Learning Versus Deep Learning Task Types: Classification, Object Detection and Semantic Segmentation
- LAS Point Attributes: Intensity, Return Number, RGB and Classification Codes
- Mapping Workflow Readiness Audit: Manual Bottlenecks and Automation Candidates

Day 2: Training Data, Labelling and Model Families for Geodata

- Label Schema Design for Ground, Building, Vegetation, Utility Pole and Wire Classes
- Annotation Methods for Point Clouds and Imagery Tiles: Manual, Semi-Automatic and Active Learning
- Training, Validation and Test Splits by Geographic Block to Avoid Spatial Leakage
- Feature-Based Classifiers: Random Forest on Geometric Point Descriptors
- Point-Based, Voxel-Based and Image Segmentation Network Families Compared

Day 3: Point Cloud Classification and Imagery Feature Extraction

- Ground Filtering and Digital Terrain Model Generation from Classified Returns
- Building, Vegetation and Power Line Classification Workflow on Lidar Tiles
- Building Footprint and Road Centreline Extraction from Orthoimagery
- Parcel Boundary Detection and Vectorisation for Cadastral Base Mapping
- Raster-to-Vector Regularisation: Simplifying, Squaring and Snapping Extracted Features

Day 4: Change Detection, Accuracy Assessment and Output Risk

- Multi-Epoch Point Cloud and Imagery Change Detection for Map Revision
- Per-Class Precision, Recall, F1 Score and Intersection over Union Metrics
- Positional Accuracy Testing Against ASPRS Positional Accuracy Standards with Checkpoint RMSE
- Failure Cases: Class Imbalance, Domain Shift, Shadows, Occlusion and Dense Canopy
- Compute, Storage and Licensing Controls: GPU Sizing, Tiling and Geodata Usage Rights

Day 5: GeoAI Mapping Pipeline Case Build and QA Plan

- Case Survey Project Data Pack: Lidar Tiles, Orthoimagery, Control Points and Client Specification
- Case Pipeline Run: Point Cloud Classification and Feature Extraction on the Project Area
- Case Delivery: Exporting Classified Layers to GIS Geodatabase and CAD Drawing Templates
- Case QA Plan: Checkpoint Sampling, Acceptance Thresholds and Human Review Loop
- GeoAI Mapping Pipeline and QA Plan Presentation and Peer Challenge

Skills You Will Gain:

- Point Cloud Semantic Segmentation
- Geospatial Training Data Labelling
- Building Footprint Extraction
- Feature Regularisation and Vectorisation
- Multi-Epoch Change Detection
- Classification Accuracy Metrics
- Checkpoint-Based Positional Accuracy Testing
- GeoAI Pipeline Design

Why Attend This Course:

- Leave with a GeoAI Mapping Pipeline and QA Plan for a case survey project, ready to adapt to live contracts
- Cut manual point cloud editing and digitising time by automating repeatable classification and extraction tasks
- Defend AI-derived map layers to clients with per-class metrics, checkpoint results and a documented human review loop
- Compare GeoAI practice with surveyors, GIS analysts and mapping engineers from utility, infrastructure, municipal and consultancy work

Conclusion:

AI in surveying pays off only when training data, models and accuracy checks form one controlled pipeline. The course moves from the place of GeoAI in the mapping workflow and geospatial data types, through labelling and model families, to point cloud classification and imagery feature extraction, then change detection, accuracy testing, failure cases and compute and licensing controls. The final day builds a GeoAI Mapping Pipeline and QA Plan for a case survey project, with outputs delivered into GIS and CAD formats.