V10.0 Release Notes EN

1. **Quality Control**
    a. **New Features**
        i. Airborne quality-control reporting: Added a check point accuracy report to provide a more comprehensive basis for quality assessment.
2. **Preprocessing**
    a. **Improvements**
        i. Redundancy removal: Now supports removing overlapping and redundant points from point clouds acquired over multiple flights or survey epochs.
        ii. Control point report: Added one-click transformation of input data to the control-point coordinate system based on matched control point pairs, simplifying coordinate unification and deliverable verification.
3. **Data Management**
    a. **New Features**
        i. Automatic registration for general point-cloud scenes: Automatically aligns multi-station scan data to a common coordinate system without manual registration.
        ii. Automatic image registration: Automatically registers and aligns image datasets.
        iii. LiBIM-to-CityGML conversion: Added conversion from LiBIM to the industry-standard CityGML format for interoperability with urban-planning, BIM-coordination, and other third-party applications.
        iv. LandXML/J-LandXML format support: Added LandXML and J-LandXML import and export for data exchange with civil-engineering design software.
        v. SIMA format support: Added SIMA import and export for survey data exchange.
    b. **Improvements**
        i. Class selection in multiple tools: More than 20 tools now support processing selected point classes, including denoising, noise filtering, boundary extraction, resampling, point-cloud smoothing, format conversion (ASCII, TIFF, Shape, LAS, E57, LiData, PLY, 3D Tiles, and DXF), and extraction by attribute (elevation, number of returns, intensity, GPS time, extra attributes, and group). This enables precise control over the processing scope and helps prevent accidental removal of important feature data.
        ii. Merge Point Clouds: Added an option to skip TreeID deduplication and reordering when merging datasets, preserving the original TreeIDs from each source for traceability.
        iii. PCV calculation: Results are now written to an extra attribute rather than overwriting intensity values, preserving intensity data for subsequent analysis.
        iv. Point-cloud conversion: Added export support for LAS 1.5, improving compatibility with the latest LAS specification.
4. **Classification**
    a. **New Features**
        i. Classify by Tree Attributes: Added classification using 28 attributes produced by individual-tree segmentation - including tree height, crown width, DBH, ground diameter, crown area, and volume - for fine-grained grouping by species or stand.
    b. **Improvements**
        i. Deep-learning ground-point classification: Improved classification accuracy and reduced the amount of manual editing required.
        ii. Common deep-learning scenarios: Added Ground Point Classification to the common-scenario list for convenient one-click access.
        iii. Classification Editing - Breakline Editing: Streamlined the breakline-editing workflow for greater efficiency.

iv. Road Extraction: Improved extraction quality and accuracy, producing clearer road boundaries and reducing manual cleanup.

5. **Terrain**

a. **Improvements**

i. DEM/DSM processing with multiple input files: Revised the output-generation logic. By default, multiple input files are combined into a single DEM/DSM output. To produce one output per input file, select "Use Batch Processing Mode" in the lower-left corner of the interface.

ii. Contour Generation:

- Added the Continuous Local Weighted Averaging contour-smoothing method, which produces mathematically smooth contours while balancing output quality and computational efficiency.
- Contours can now be removed automatically within breakline-bounded areas, preventing invalid contours from appearing inside buildings.
- Added an option to generate contours only within regions of interest, reducing unnecessary computation.

iii. Section Analysis:

- 2D section point clouds can now be rendered by class, making feature classes easier to distinguish.
- Section lines can now be created, moved, and rotated directly in the 3D viewport without switching to the 2D dialog, making positioning more intuitive.

iv. Class-specific DSM Generation:

- Added separate processing for buildings and vegetation: building-edge sharpening and vegetation-penetration compensation significantly improve overall DSM accuracy.

6. **Forestry**

a. **New Features**

i. General Individual Tree Segmentation: Uses a single deep-learning model to process point clouds from all sensor platforms, including airborne, terrestrial, and handheld systems, eliminating the need to select a sensor-specific tool.

ii. Tree Species Identification: Added five identification methods for different data sources and application scenarios:

- Species identification from individual-tree point-cloud morphology
- Species identification from point clouds and panoramic images
- Species identification from orthophotos
- Custom species identification: Train a local model on project-specific species samples using individual-tree point clouds or panoramic images
- LLM-based species identification, available as a standalone method or as assistance for low-confidence results

iii. Extract Individual Tree Crown Outlines: Automatically generates vector crown outlines for direct use in GIS analysis and mapping.

iv. Carbon Sink Estimation: Uses individual-tree age and current carbon stock to project carbon stock over the next N years, supporting carbon trading and carbon-sink project planning.

b. **Improvements**

i. Automatic Multi-source Data Registration: Upgraded the forestry registration algorithm to work without individual-tree segmentation, preventing segmentation errors from propagating into registration and improving accuracy.

ii. Forest Tending Planning and Management (upgraded from Thinning Analysis):

- Provides multiple management strategies, including target-tree management and

thinning from above (crown thinning)

- Supports custom development of rule engines for defining thinning-plan selection criteria
- Supports custom development of work-plan design components
- Exports dynamic HTML reports and PDF reports

iii. Individual Tree Attribute Statistics: Added ground diameter, circumference at breast height, crown eccentricity, individual-tree outline, crown-to-height ratio, height-to-diameter ratio, form, lean angle, and species. Stem-curvature calculations have also been improved, with multiple methods available to accommodate national and regional standards. Individual-tree attribute files are now generated in TreeDB format for workflow-based processing and parameter tracking; use Convert to CSV when CSV output is required.

iv. Unified Tree Species Library: Merged the Tree Model Library and Biomass Library into a species-centric library, simplifying management.

v. Individual Tree Point Cloud Editing:

- Added an edit list for creating a queue of trees to review, processing them one by one, and tracking progress.
- Approved individual trees can now be shown or hidden globally, simplifying review and management of segmentation results.

7. Photo

a. **New Features**

i. DSM Generation from Image Projects: Added direct DSM generation from Image Projects, improving photogrammetric output accuracy and enabling one-click generation without point-cloud input.

ii. Semantic Feature Extraction: Added interactive feature recognition from natural-language descriptions. Users can identify arbitrary features across a range of scenes without manually drawing bounding boxes. For responsive operation, GPU Compute Capability 8.0 or later is required (NVIDIA GeForce RTX 30 Series or later); GPUs below 8.0 may perform slowly.

b. **Improvements**

i. SFM Algorithm Upgrade: Increased the number of images that can be processed on the same hardware and added support for very large image sets. SFM requires GPU Compute Capability 7.5 or later (NVIDIA GeForce RTX 20 Series or later); 6 GB or more of VRAM is recommended.

ii. DOM Generation: Improved color consistency, reduced seams, and increased overall output quality.

iii. DOM Editing: Added SAM-based interactive selection of editing regions. Intelligent segmentation enables users to quickly select areas for editing, improving selection efficiency and boundary accuracy. This feature supports only DOMs generated by orthorectification; DOMs generated in Pixel Mode are not supported.

8. Spectral

a. **New Features**

i. Automatic Multispectral Band Compositing: Automatically corrects inter-band misalignment and registers and fuses single-band images into a spatially aligned multispectral image, improving downstream analysis accuracy.

9. Distributed Computing

a. **Improvements**

i. Distributed Image SFM: Revised the processing architecture. Instead of distributing data copies to individual compute nodes, all nodes now process data from a common shared path, streamlining the workflow.

10. **Platform**
    a. **New Features**
        i. 3D Gaussian Splatting (3DGS) Rendering: Added rendering of .ply and .splat datasets for photorealistic 3D scenes.
        - 3DGS rendering is now integrated into the standard 3D window rather than a separate window.
        ii. Panoramic Image Management: The catalog tree now supports browsing, previewing, and organizing panoramic images.
        - Added import support for LiGrip projects.
        iii. Model Builder Enhancements: Expanded visual workflow orchestration, script reuse, and custom-tool integration.
        - Workflows can now be exported as Python scripts and opened as scripts, simplifying debugging, custom development, and automated deployment.
        - Added a multi-file input control, allowing multiple files to be configured and passed between workflow nodes for batch processing.
        - Expanded the set of tools available to Model Builder to more than 260 across point-cloud, terrain, forestry, image-processing, and other workflows.
        - Custom tools and custom-trained classification tools can now be added to Model Builder and connected with built-in tools, integrating custom algorithms into standard production workflows.
        iv. Batch Processing Mode: Most individual tools now support batch processing, with independent parameters for each dataset group.
        v. Workflow Mode: Added seven modes: All Modules; Data Preparation and Quality Assurance; Surveying and Mapping Production; Forest Resource Inventory; Mining Engineering and Safety; Spectral Interpretation and Analysis; and User-defined. These modes organize features by business scenario. User-defined modes can be created, shared, and loaded.
    b. **Improvements**
        i. Class-based Rendering: A single point class can now be rendered by elevation, RGB, intensity, TreeID, or other attributes for multidimensional analysis within the class.
        ii. Attribute Table Editing: Added options to hide and freeze columns, improving navigation of tables with many fields.
        - Tree species values can now be edited in TreeDB and CSV datasets, simplifying batch updates and management.
        iii. Skybox: Added user-configurable skybox backgrounds, with two built-in themes and support for custom panoramic images.
        iv. Project Files: Added bookmarks when saving a project, making it easier to mark items during deliverable review and return to them for later edits.
        v. Roaming:
        - Added one-click roaming with automatic generation of a preset path
        - Added viewpoint and path editing
        - Roaming sessions can now be recorded directly and saved as local video files
11. **AI Assistant**
    a. **New Features**
        i. AI Assistant: Added a built-in agent client that can invoke tools through natural-language conversations to process data or provide assistance.
        - Conversational assistance with tool usage and troubleshooting
        - Supports invoking more than 300 tools and workflows, including platform operations (such as loading data and rendering by attribute), individual tools,

processing workflows, and custom-developed tools

- Supports building custom tools through conversations
- Supported tools are identified by an icon
- Requires an internet connection; different model services are used in mainland China and overseas regions
- Includes a three-month free trial. Continued use after the trial requires the purchase of credits

12. SDK / Custom Tool Development

a. **New Features**

i. Python Script Editor: Added a built-in Python editor with LLM-assisted code annotation and checks. Scripts can be run directly in the editor to call the SDK.

ii. UI Editor: Added a wizard-based UI builder that generates custom-tool interfaces from parameter descriptions without requiring UI code.

iii. Python APIs: More than 260 tools expose Python APIs for point-cloud processing, forestry analysis, terrain generation, and other modules, enabling scripted workflow automation.

iv. TreeDB and Point Cloud Data APIs: Added TreeDB and point-cloud data-structure APIs for direct create, read, update, and delete (CRUD) operations in Python, supporting custom forestry-analysis and point-cloud-processing tools.

v. Model Builder Integration: Custom-developed tools can be used in Model Builder and connected by drag and drop to create data-processing workflows.

vi. Agent Skill Integration: Developers can edit an Agent Skill so that the AI Assistant knows when to invoke a custom tool.

vii. Conversational Custom Tool Creation: Custom tools can be built through natural-language conversations with the AI Assistant, without manually configuring the UI or parameters.

viii. Custom Tool Management: Custom tools can be imported, exported for sharing, and removed, allowing development results to be shared with teams or the community.

ix. Custom Development Demos:

- DBH estimation
- Conversion between TreeDB and CSV
- Custom development of the forest-tending rule engine and work-plan designer

13. Licensing

a. **New Features**

i. LiCloud Account-based Activation: Trial licenses can now be activated by signing in with a LiCloud account, without manually entering an authorization code. Full licenses continue to use authorization codes.

14. Tool Adjustments

a. **New Tool Groups**

i. Data Registration: Added this group to Data Management. It contains Automatic Point Cloud Registration, Automatic Image Registration, and Interactive Data Registration.

ii. Terrestrial Forestry - Segmentation: Contains General Individual Tree Segmentation, Trunk-based Individual Tree Segmentation, and Seed Point-based Individual Tree Segmentation.

iii. Terrestrial Forestry - Tree Attributes: Contains Individual Tree Attribute Statistics, Tree Species Identification, Extract Individual Tree Crown Outlines, View Azimuth and Distance, Biomass Estimation, Custom Tree Species Identification Training, and Tree Species Library.

iv. Airborne Forestry - Tree Attributes: Contains Individual Tree Attribute Statistics, Extract Individual Tree Crown Outlines, View Azimuth and Distance, and Tree Species Library.

v. Terrestrial Forestry - Thematic Analysis: Contains Change Detection Analysis, Individual Tree Report, Standing Tree Volume Analysis, and Forest Tending Planning.

vi. Airborne Forestry - Thematic Analysis: Contains Change Detection Analysis.

vii. Terrestrial Forestry - Registration: Contains Automatic Forestry Registration and Match Tree Locations.

b. **Renamed Tools**

i. Data Registration -> Interactive Data Registration: Moved to the Data Registration group and renamed; functionality is unchanged.

ii. Convert LiData to LiData -> Convert LiData Version

iii. Classify Ground Points -> Classify Ground Points by PTD

iv. Classify Ground Points by Deep Learning -> Classify Ground Points by DL

v. Classify by Deep Learning -> Classify by DL

vi. Point-cloud format-conversion tools: Added the prefix "Point Cloud" to improve recognition and invocation by AI Assistant.

- Convert to ASCII -> Convert Point Cloud to ASCII
- Convert to TIFF -> Convert Point Cloud to TIFF
- Convert to Shape -> Convert Point Cloud to Shape
- Convert to DXF -> Convert Point Cloud to DXF
- Convert to LAS -> Convert Point Cloud to LAS
- Convert to E57 -> Convert Point Cloud to E57
- Convert to PLY -> Convert Point Cloud to PLY
- Convert to 3D Tiles -> Convert Point Cloud to 3D Tiles
- Convert to LandXML -> Convert Point Cloud to LandXML
- Convert to LiData -> Convert Point Cloud to LiData

vii. Divide Groups -> Divide Image Groups

viii. Merge Groups -> Merge Image Groups

ix. Defogging -> Image Defogging

x. Align -> Image Alignment

xi. Orthomosaic -> Generate DOM by Orthorectification

xii. Export Project -> Export Image Project

xiii. New Project -> Create Image Project

xiv. Savitzky Golay -> Savitzky-Golay Filter

xv. Composite Bands -> Composite Raster Bands

xvi. Subdivision -> Point Cloud Subdivision

xvii. Subsampling -> Point Cloud Subsampling

c. **Split Tools**

i. Extract Color from Image was split into:

- Extract Color from Oblique Image Project
- Extract Color from Orthophoto

ii. The DEM generation tool was split into:

- Generate DEM: Generates a DEM
- Generate Tiled DEM: Generates a DEM for each map sheet

iii. The DSM generation tool was split into:

- Generate DSM: Generates a DSM

- Generate Tiled DSM: Generates a DSM for each map sheet
- Reason for split: Enables AI Assistant and Model Builder to distinguish between the tools and invoke the appropriate one.

iv. DOM generation in the Terrain module was split and reorganized as follows:

- Generate DOM by Pixel Mode: Generates a DOM in Pixel Mode, retaining the pixel-based processing method from the previous Terrain module.
- Generate DOM by Orthorectification: Generates a DOM through orthorectification and is available only in the Photogrammetry module.

d. **Moved Tools**

i. Tunnel Point Cloud Classification: Moved to the Mining module for better functional grouping.

ii. Result Sharing: Moved to Display Options on the ribbon.

iii. Distributed Computing: Moved to the Home tab.

e. **Removed Tools**

i. Tunnel Point Cloud Extraction: Removed. Use Tunnel Point Cloud Classification instead.

ii. Forestry Registration: Removed. Use the upgraded Automatic Multi-source Data Registration algorithm instead.

iii. Terrestrial Forestry Individual Tree Segmentation: Removed. Use Trunk-based Individual Tree Segmentation or General Individual Tree Segmentation instead.

iv. Batch Processing Entry: Removed the Batch Processing entry from the tool area on the right side of the tab bar. The Batch Processing entry remains available on the File view. This change only removes a duplicate entry and does not affect batch-processing functionality.

v. Help Entry: Removed the Help entry from the tool area on the right side of the tab bar. Help remains available from the drop-down menu in the global tool area on the right. This change only streamlines the entry-point layout and does not affect access to Help content.

Version Compatibility Notes

- This release moves, removes, and splits several tools. See Tool Adjustments above for replacement tools and workflows.
- SDK APIs follow semantic versioning. Version 1 (v1) APIs will remain backward-compatible throughout the V10.x release series.