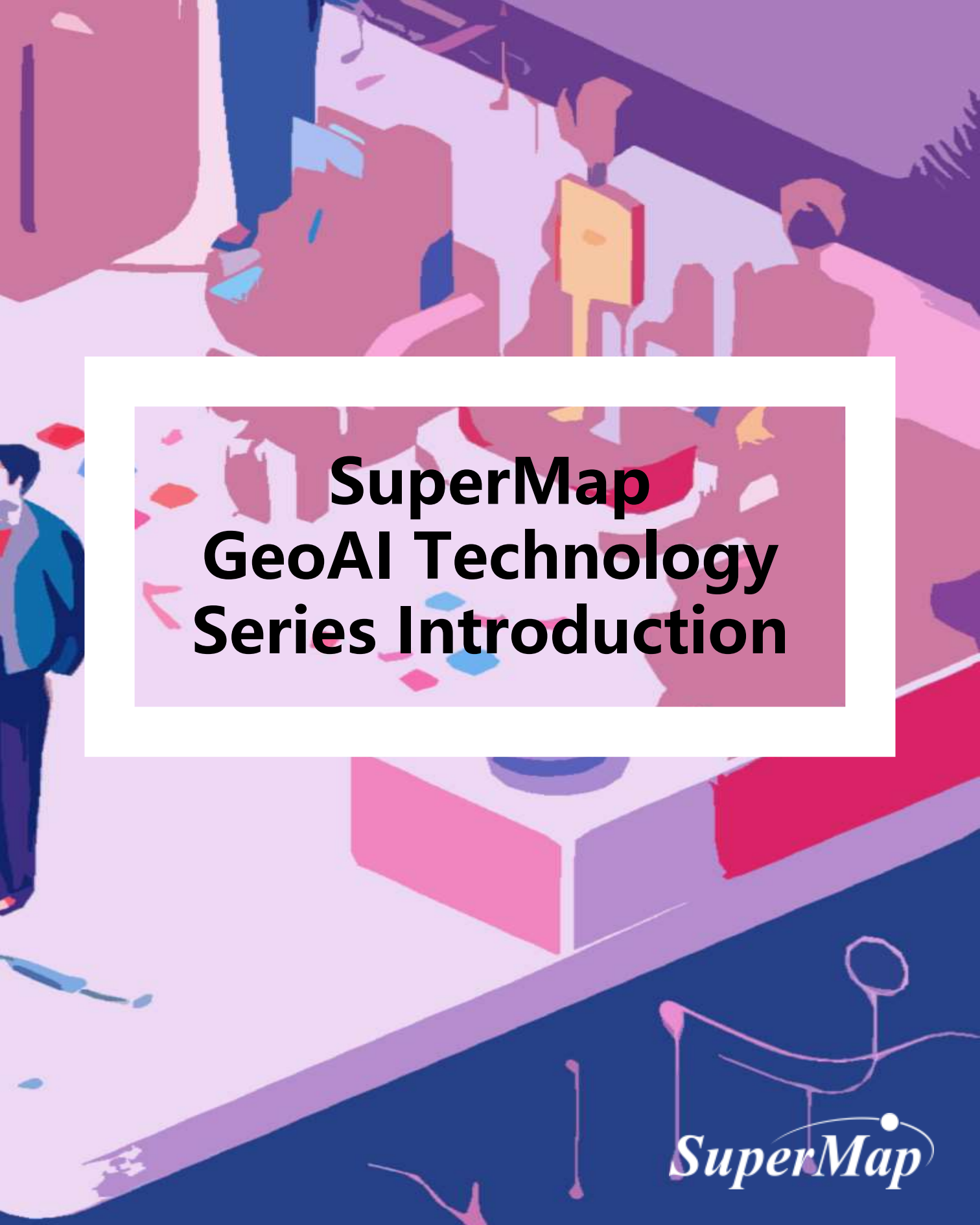


SuperMap GeoAI Technology Series Introduction

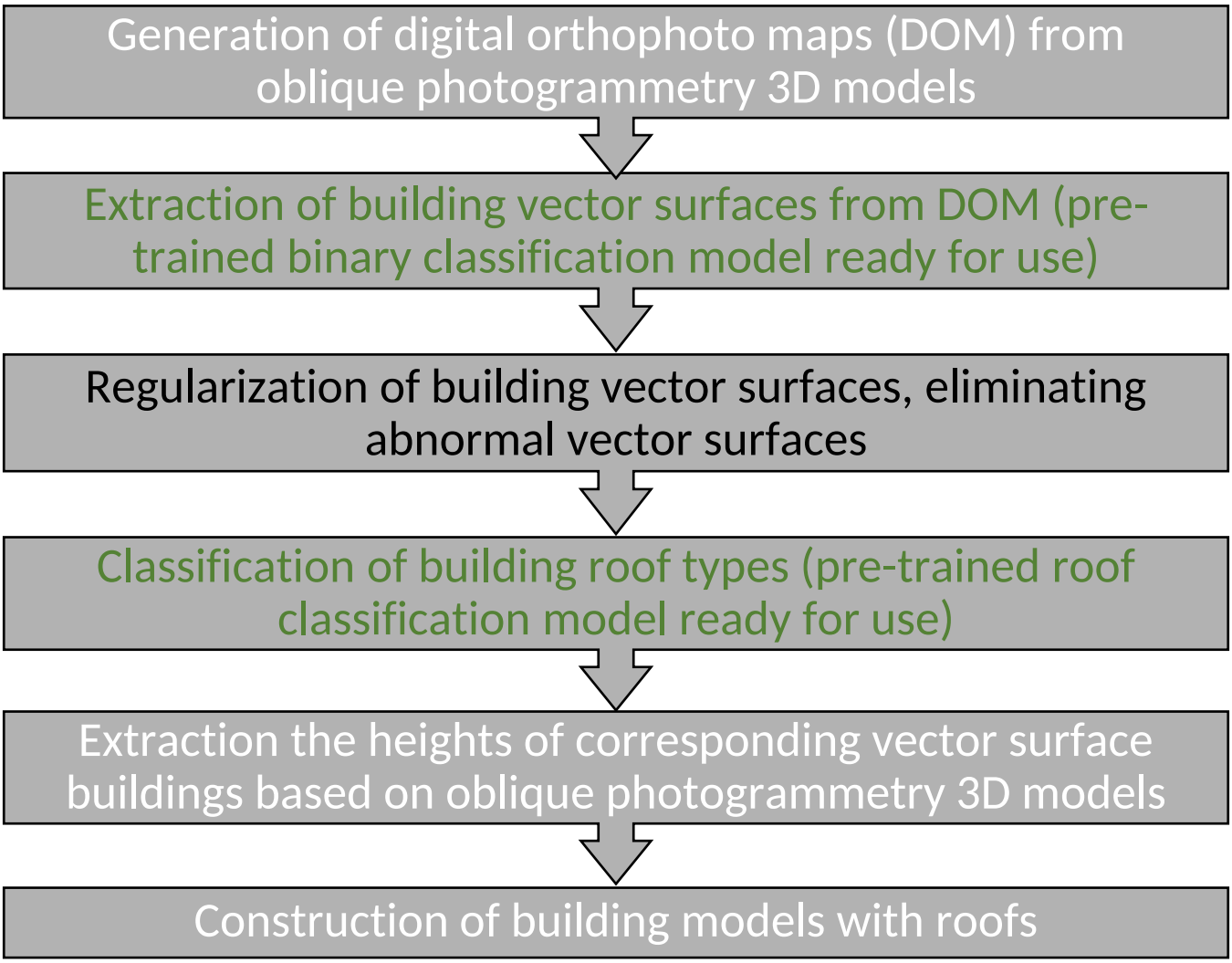
SuperMap

SuperMap

What can SuperMap GeoAI do?

AI 3D Data Processing and Analysis

1. AI-Powered Generation of Individualized Models from Oblique Photogrammetry 3D Models



2. Workflow for Generating Individualized Building Models

- AI Extraction of Building Vector Surfaces

- Regularization of Vector Surfaces

- Extraction of Building Heights

- AI Recognition of Roof Types

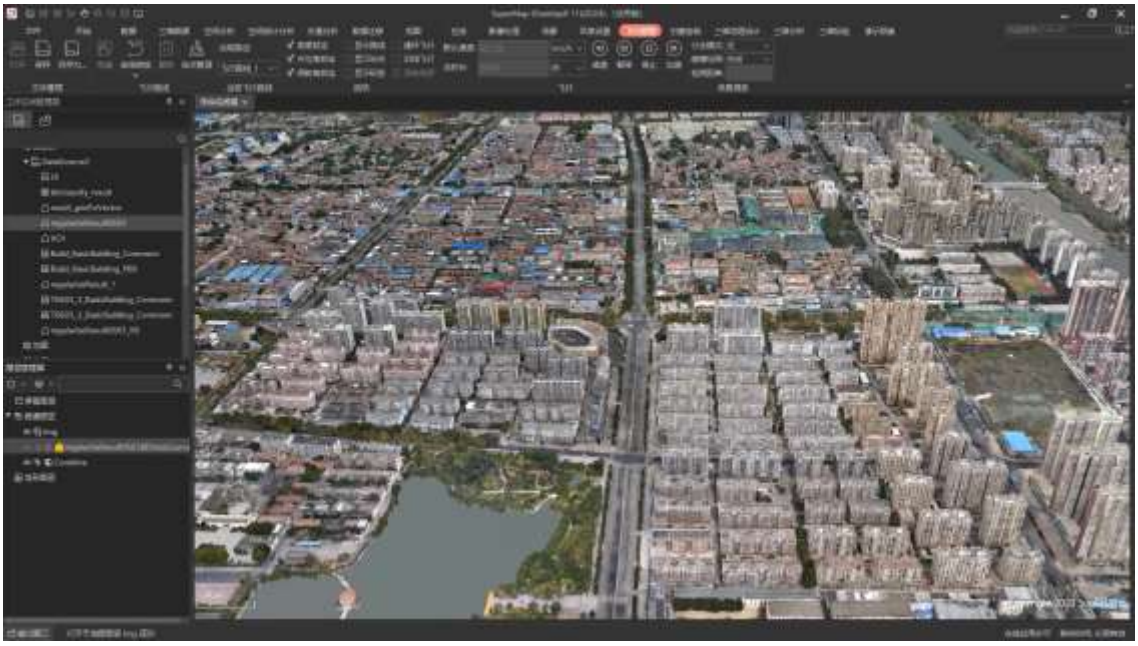
3. Boundary Extraction Effects

SuperMap GIS11i (2024)

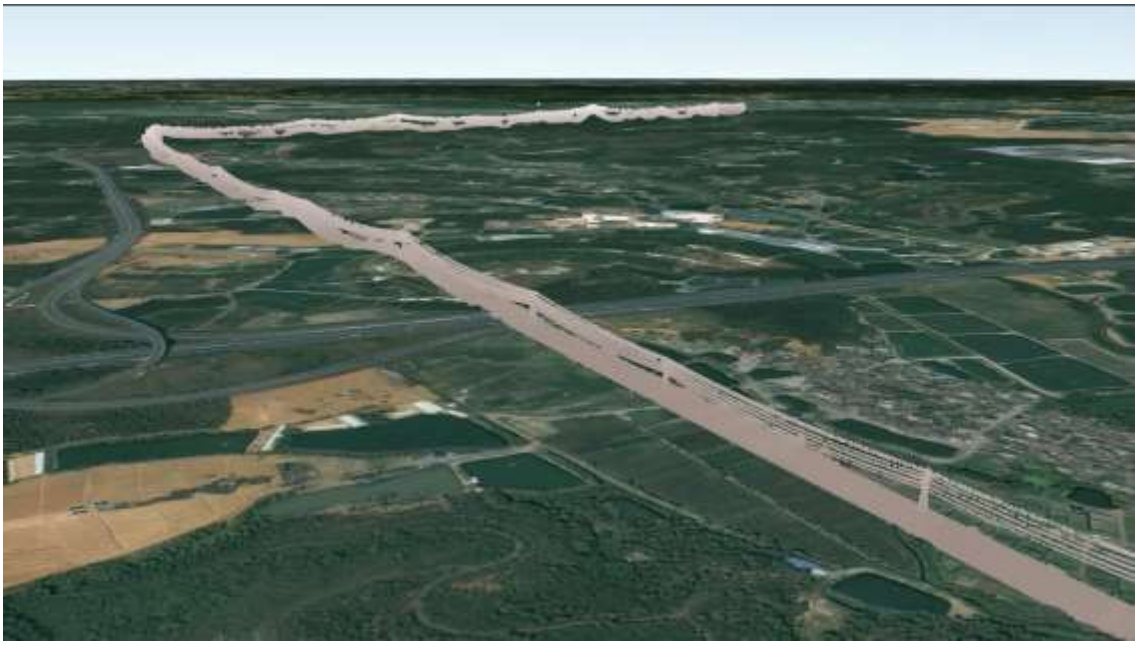
4. Optimization of Model Results Using AI

- Intelligent recognition of house types: automatic recognition of roof types through AI image recognition technology
- Intelligent construction of complex building entities: automatic construction of building entity models based on recognition results

5. AI Oblique Photogrammetry Building Information Extraction

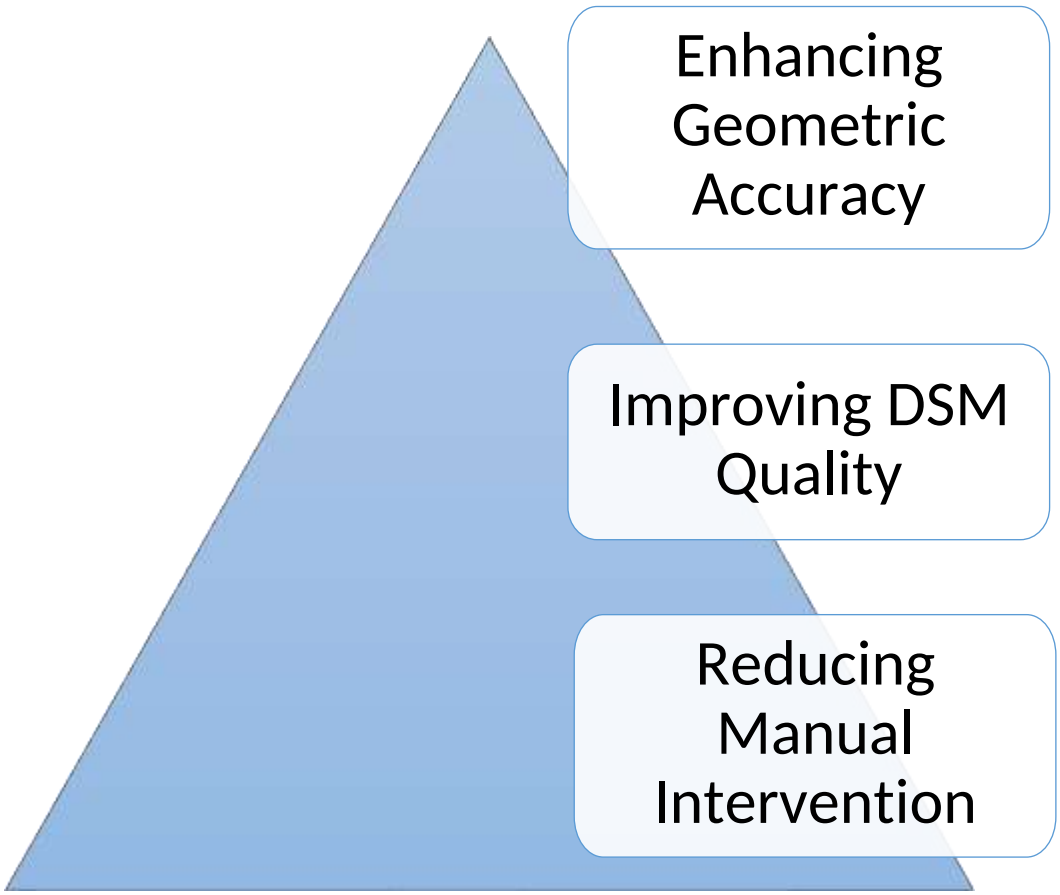


6. AI-based Semantic Segmentation of Power Point Clouds and Instance Segmentation of Power Lines



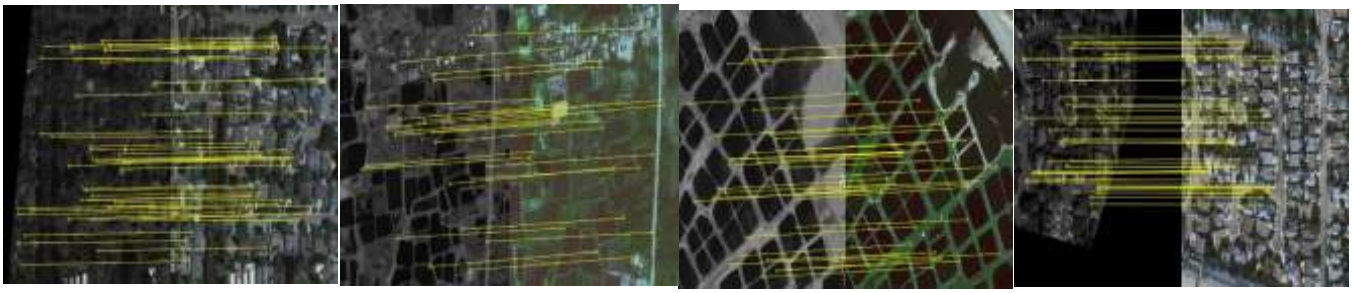
AI Remote Sensing Image Processing

Deep integration with AI technology, providing intelligent processing capabilities

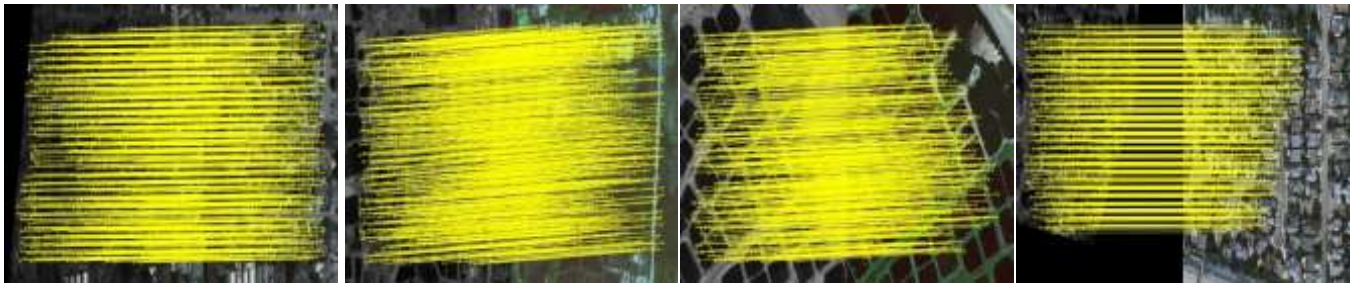


1. AI Image Matching Technology
a. Enhancing Heterogeneous Image Matching Accuracy

- Traditional matching algorithms: Limited number of matching points, lower matching accuracy



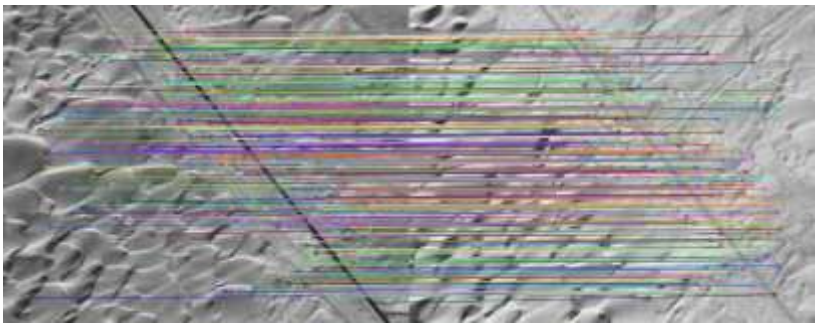
- AI Matching Algorithms: Significant increase in the number of matching points, higher matching accuracy



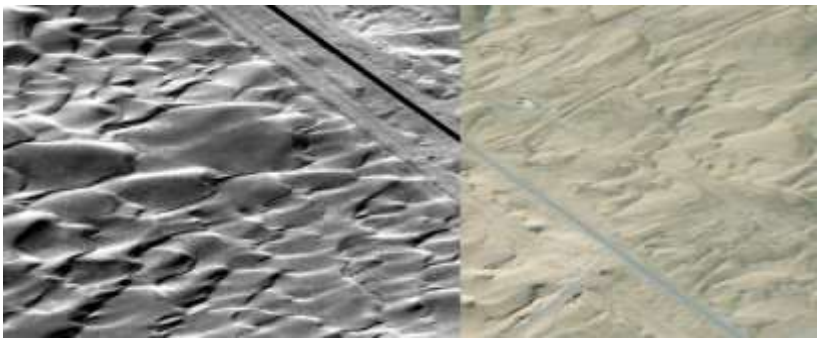
*Compared to traditional algorithms, AI algorithms can address matching challenges such as significant lighting differences, large contrast variations, and non-linear radiation distortions in heterogeneous images, therefore enabling robust matching of heterogeneous images.

1. AI Image Matching Technology
b. Robust Matching of Weak-Texture Images

AI Image Matching Results: Desert



Geometric Correction Effects in Weak-Texture Areas



*The screenshot uses the MOTIF matching algorithm, and during the matching process, a single band of the reference image is used, resulting in a grayscale effect.

2. AI Semantic-Assisted Geometric Processing

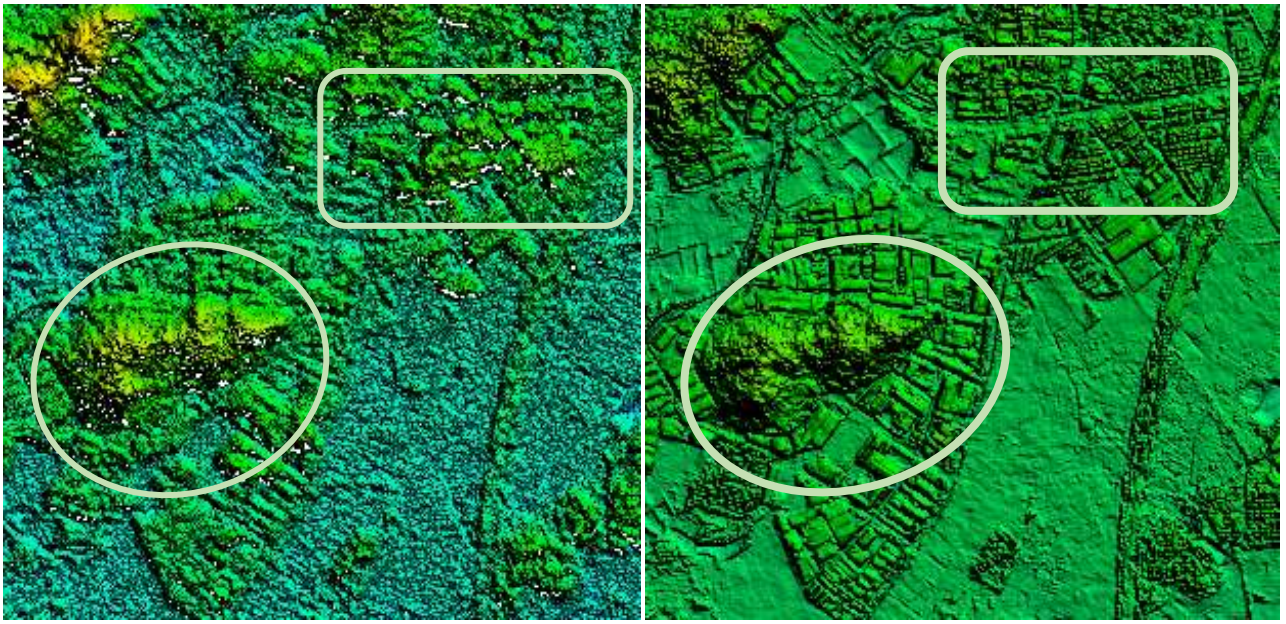
a. Improving Geometric Processing Accuracy

Traditional Geometric Processing	AI Semantic-Assisted Geometric Processing

3. AI DSM Algorithm

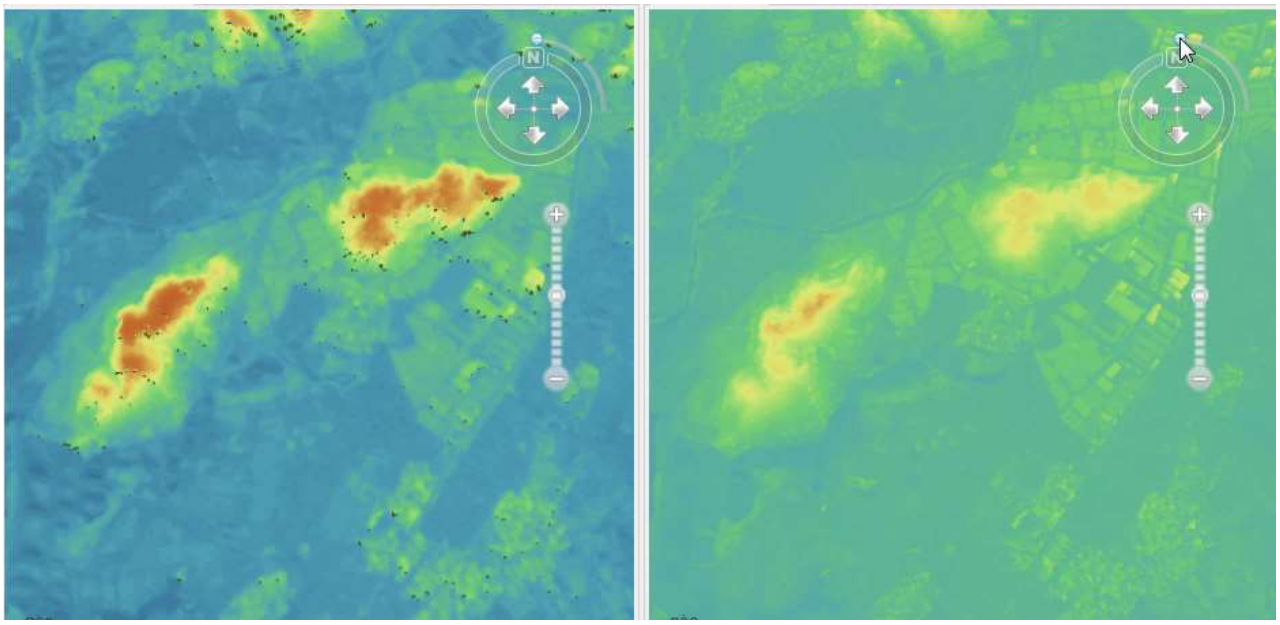
a. Enhancing Integrity and Smoothness in Texture-Deficient Areas

Traditional Algorithms: Presence of holes and noise	AI Algorithms: No holes, better completeness



3. AI DSM Algorithm
b. Improving Surface Smoothness and Feature Recognition

Traditional Methods: Multiple no-value regions	AI Methods: No no-value regions



4. AI Enables Efficient Latte Detection

• Mountain Latte Detection	• Building/Road Latte Detection

Background Knowledge

Two major causes of image latte:
1. DEM Data Errors: Significant deviation from real terrain
2. The object coordinates of adjacent pixels are close yet with large elevation differences

5. AI Automated Cloud Removal in Remote Sensing Images

Original Image

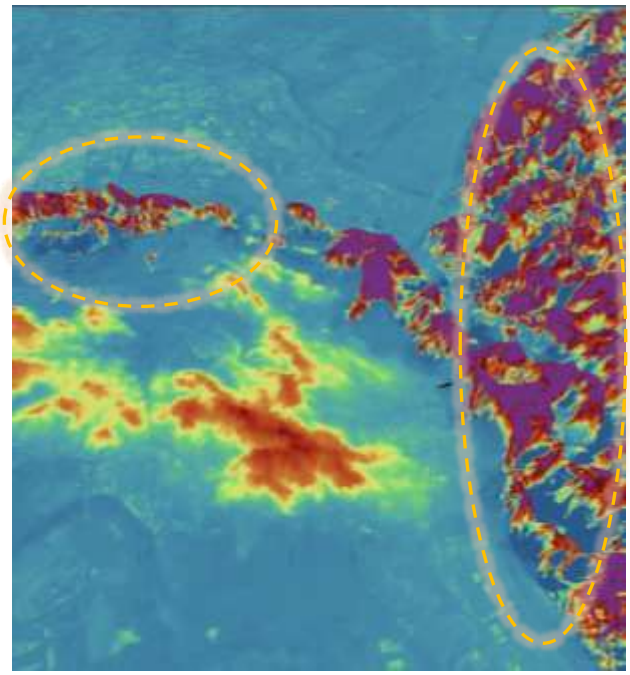
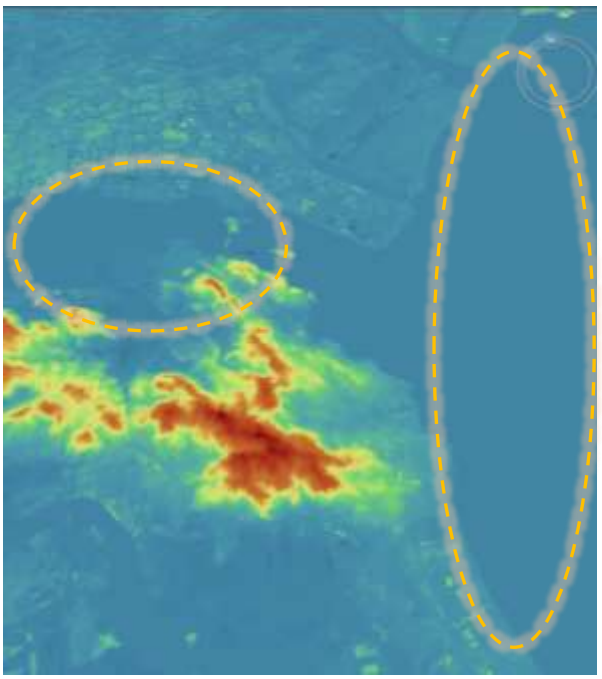
Intelligent Cloud Detection (IoU=0.92)

Replacement Image

Cloud-Free Image

Automatic Filling
Automatic Color Balancing

6. AI Automated Repair of DSM/DEM Water Surfaces

Abnormal Water Elevation Values	Repaired Water Surface Effects
	

Scenario 1

Water Data Provided: Elevation information included in data attributes, realizing automated value assignment

Scenario 2

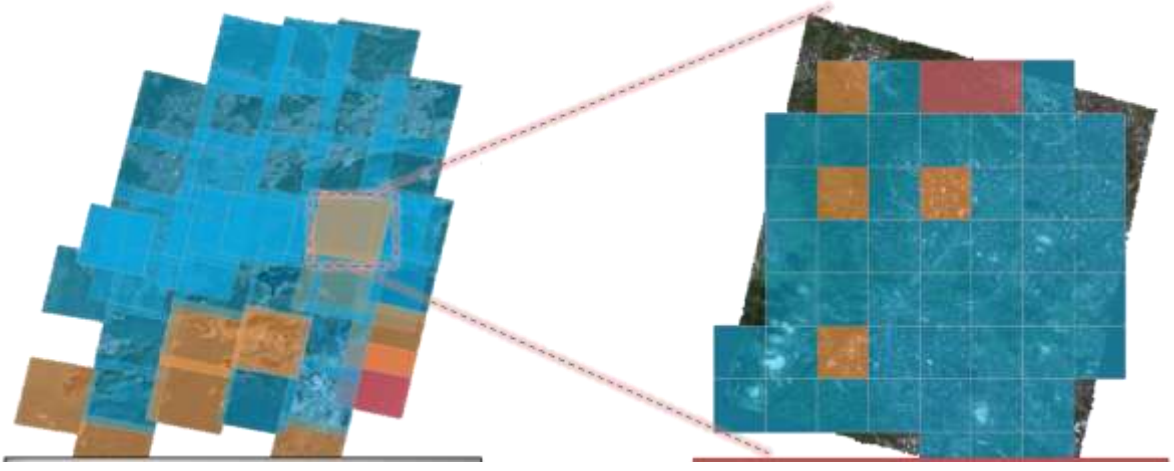
No Water Data Provided:

1. Remote sensing AI extracts water surface from original Images
2. Automated water elevation supplement based on reference DEM
3. Water surface repair through combining Various Information

7. AI-Based Automated Quality Inspection of Orthophotos, Improving Manual Inspection Efficiency and Accuracy

- Hierarchical display of inspection results significantly improve manual inspection efficiency

- AI automated quality inspection of fine grid partition, enhancing inspection accuracy

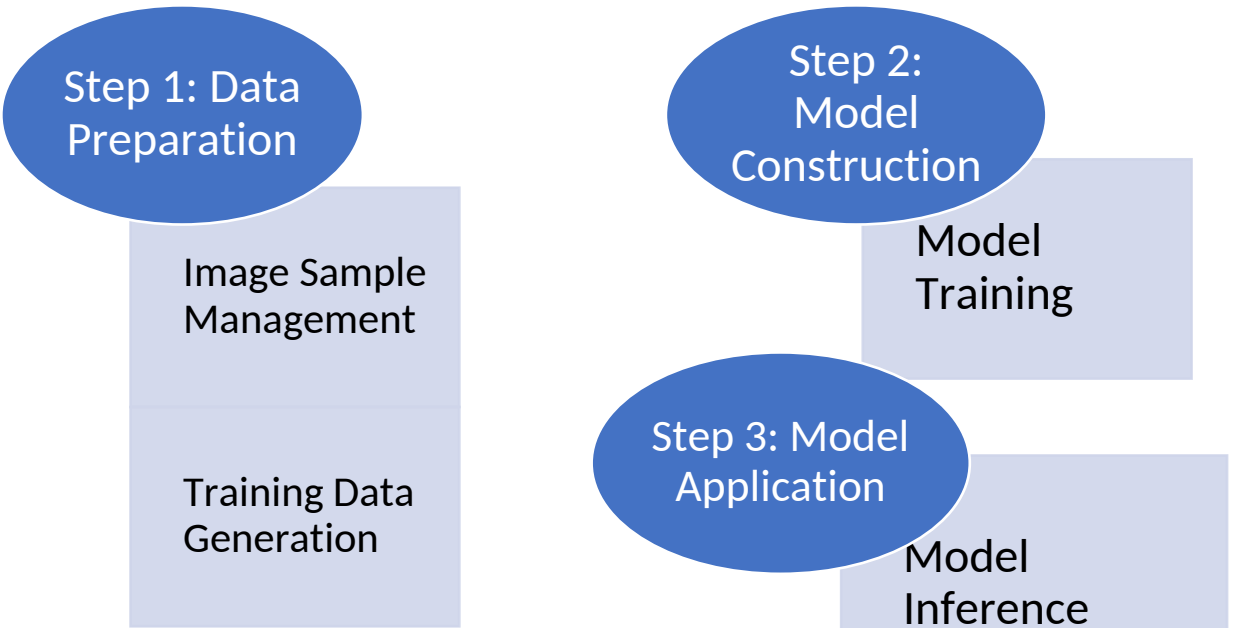


7. AI-Based Automated Quality Inspection of Orthophotos, Improving Manual Inspection Efficiency and Accuracy

- Traditional accuracy reports are general and not intuitive, requiring screen-by-screen scrolling which is time-consuming;
- SuperMap production results not only provide inspection reports but also display errors hierarchically based on their magnitude;
- Users only nees to focus on red/orange point-dense areas to quickly locate high-risk regions, which will improve inspection efficiency;
- For example, in the image in the last page, the traditional methods require 54 screens for scrolling, but now only 5 areas need attention.

AI Remote Sensing Image Interpretation

1. Workflow of Intelligent Remote Sensing Interpretation



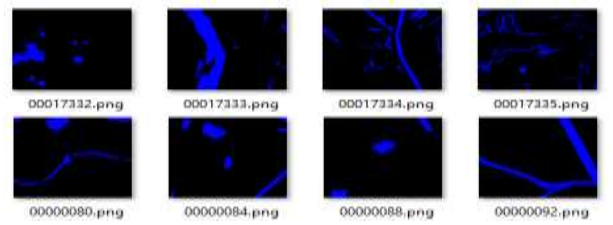
SuperMap supports full-lifecycle AI capabilities for remote sensing

2. "Out-of-the-Box" Pre-Trained Models

SuperMap provides pre-trained models that are ready to use, addressing the problems of limited samples and difficult training.

Abundant Computational Resources

Large-Scale Base Training Data



Pre-Trained Models
High Precision and Efficiency
Large-Scale Base Training Data

3. Traditional AI Remote Sensing Interpretation:

Pre-trained models are ready to use, with new additions such as forest and thick cloud detection

Urban Water Bodies

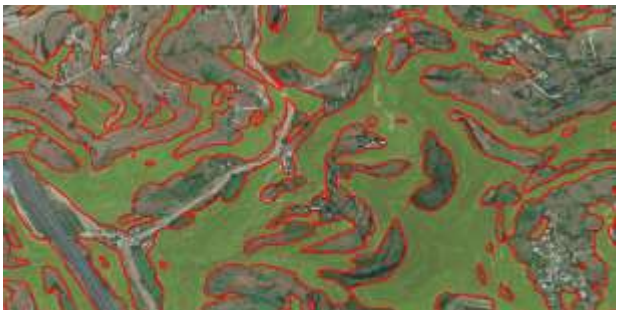
Farmland

Aircraft

Urban Buildings

Greenhouses

Ships



Forest *new*

Thick Clouds *new*

*In the field of intelligent remote sensing interpretation, SuperMap continues to expand its pre-trained models for typical features. In the 2024 version, new pre-trained models for forest and thick cloud detection have been added, ready for immediate use.

Based on trained AI models, clouds of varying sizes and reflectance intensities can be accurately extracted, with an overall pixel accuracy of up to 97.62%.

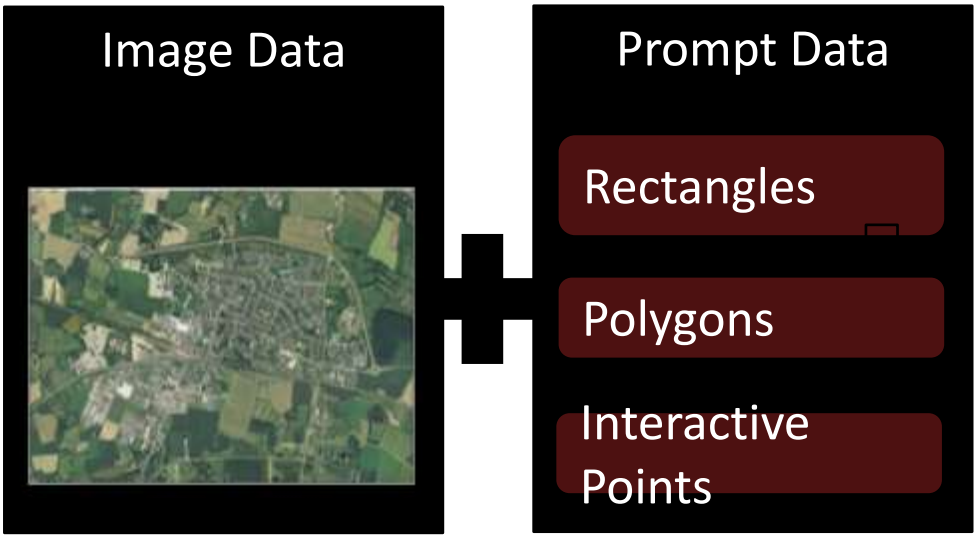
4. Large Models Empowering AI Remote Sensing Interpretation

1) Expanding the SAM (Segment Anything Model) to enhance intelligent remote sensing interpretation capabilities

- **Geospatial SAM： G-SAM**

Input：

Geospatial Data



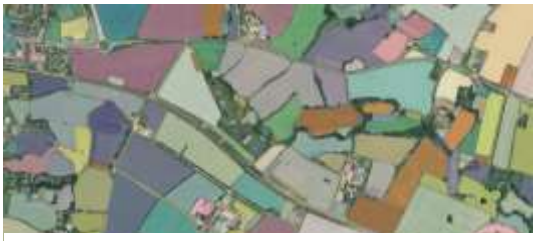
Output：

Remote Sensir.g

Interpretation Results

Rectangle-Based Prompts

Polygon-Based Prompts



Interactive Prompts

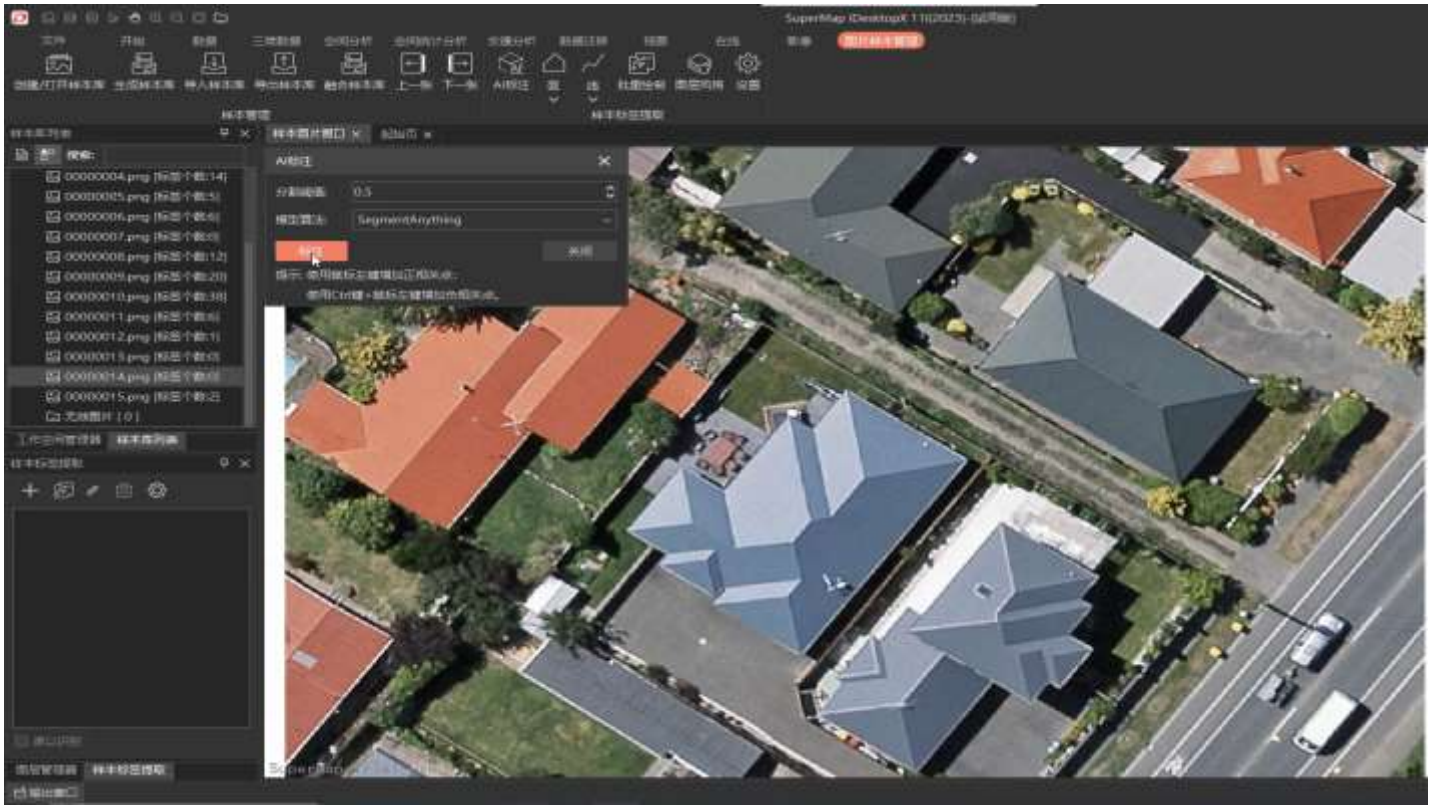
2) G-SAM Polygon Prompt Segmentation

Original Image

Prompt Data (Farmland Interpretation Results)

Farmland Parcel Segmentation Results

3) G-SAM Polygon Prompt Segmentation



4) SAM is Not Specialized Enough; Professional Remote Sensing Interpretation Models are Needed

SuperMap remote sensing interpretation base model (LIM) can be fine-tuned with various downstream task networks to create large models suitable for different remote sensing tasks.
The ground object classification large model supports the extraction of typical objects such as buildings, roads, and water bodies. Compared to traditional models, classification accuracy is significantly improved, and interpretation results are more refined.

Feature 1: Self-Supervised Learning

Feature 2: Hundreds of Millions of Parameters

Feature 3: Specialized for Remote Sensing Interpretation

5) SuperMap LIM : SuperMap Remote Sensing Interpretation Large Model

Upstream: Self-Supervised Training

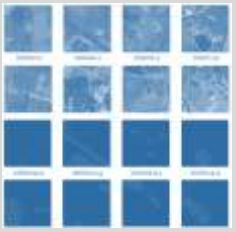
Massive unlabeled images

Network of hundreds of millions of parameters

Image Interpretation Base Model

Downstream: Training or Fine-Tuning

Task-specific networks



Labeled samples

Pre-Trained Ground Object Classification Large Model (SuperMap LIM LU-CLS)

Buildings, Roads, Water Bodies, Farmland, Forest, Grassland, Bare Land, Others

6) Remote sensing interpretation large models provide more accurate ground object classification

Original Images

Traditional Model Inference Results

Remote Sensing Interpretation Large Model Inference Results

6) Remote sensing interpretation large models provide more accurate ground object classification

Original Images

Traditional Model Inference Results

Remote Sensing Interpretation Large Model Inference Results

SuperMap

SuperMap Geospatial AI Product System

SuperMap Platform Software Adopting Geospatial AI

SuperMap iServer & iDesktopX

- update Remote Sensing Image Processing
- update Remote Sensing Image Interpretation
- Spatial Analysis
- new AI Automated 3D Model Construction
- Image/Video Analysis

SuperMap ImageX Pro/Ent.

- update Remote Sensing Image Interpretation
- update Remote Sensing Image Processing

SuperMap iPortal

- new Geospatial Intelligence Assistant SuperMap Copilot

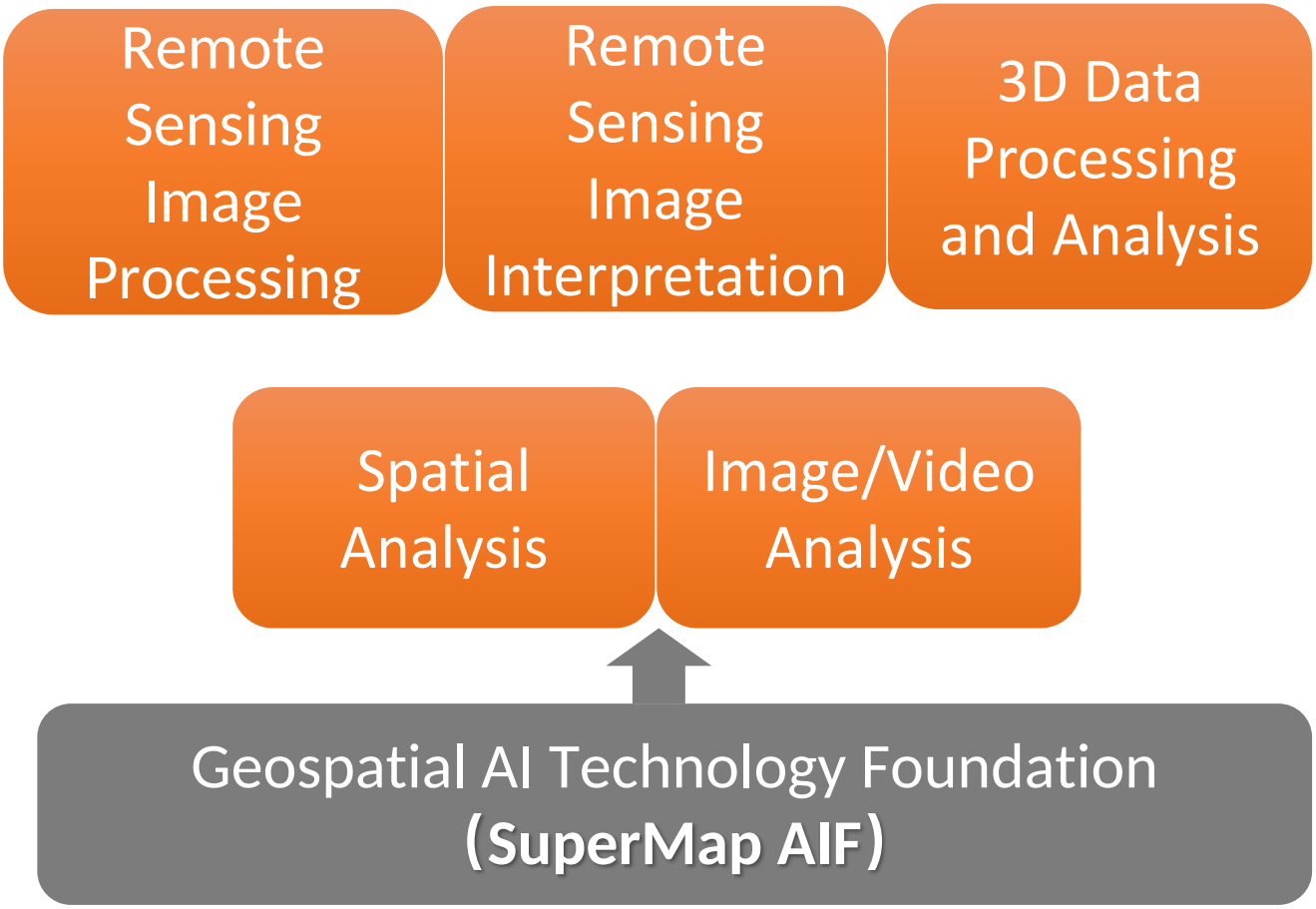
SuperMap iMobile

- AI Attribute Collection
- AI Indoor Mapping

SuperMap

SuperMap iServer & iDesktopX

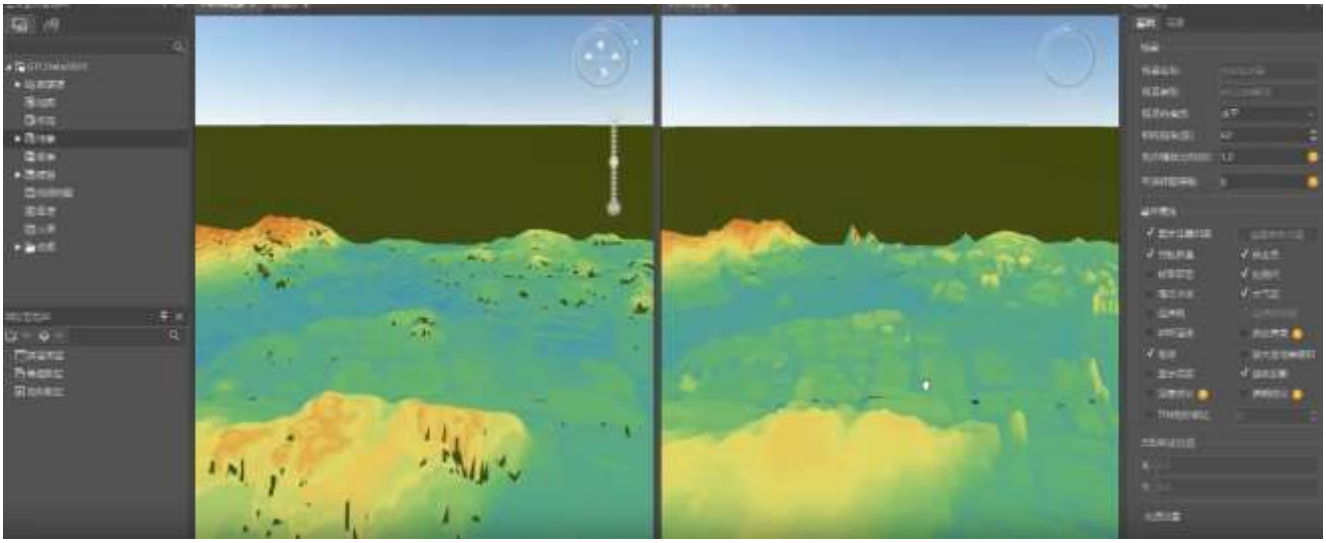
Geospatial AI Empowers GIS Services Across All Functions



1. AI-Based Remote Sensing Image Processing: Improved Accuracy and Efficiency

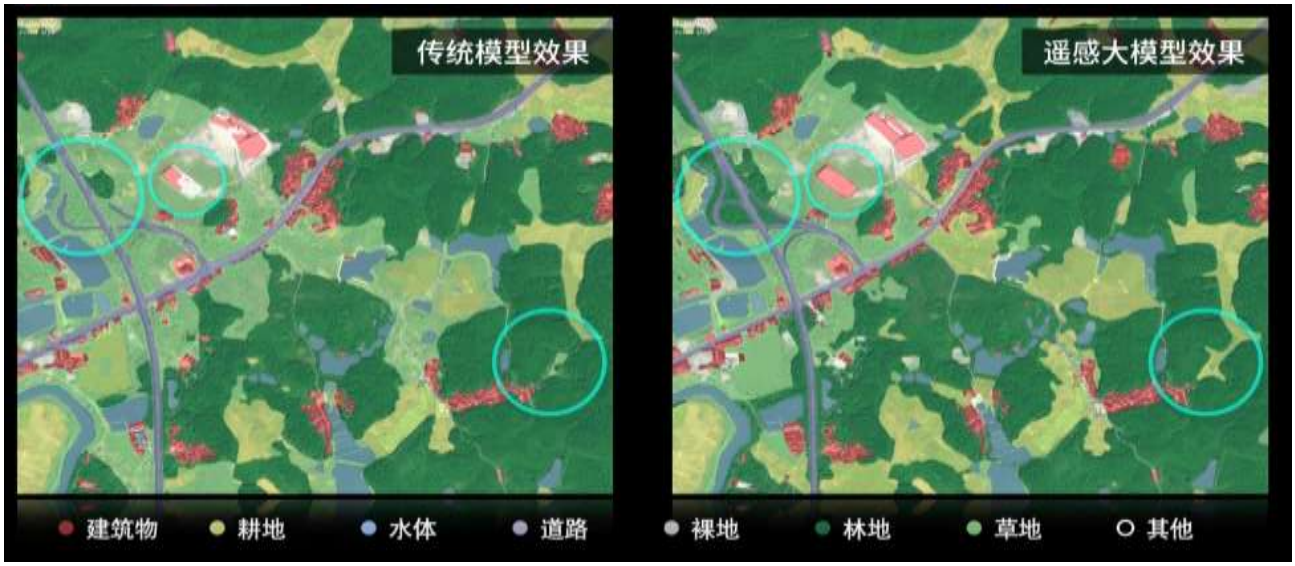
a. AI Semantic-Based Correction Accuracy Enhancement

b. AI High-Quality DSM/DEM Data Production



2. AI-Based Remote Sensing Interpretation Model: Superior Interpretation Results

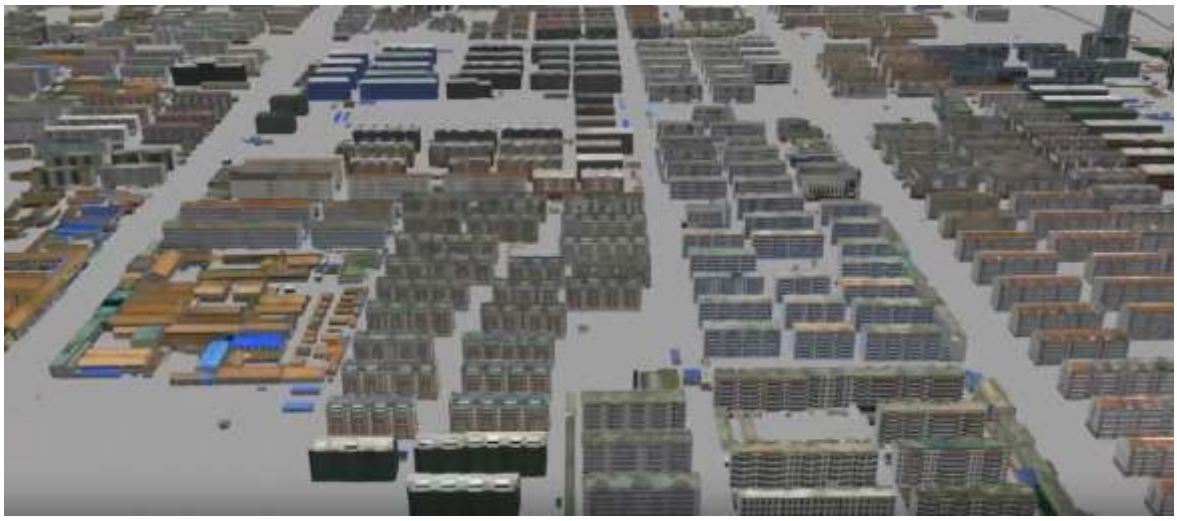
a. Remote Sensing Interpretation Model: Enhanced Feature Classification



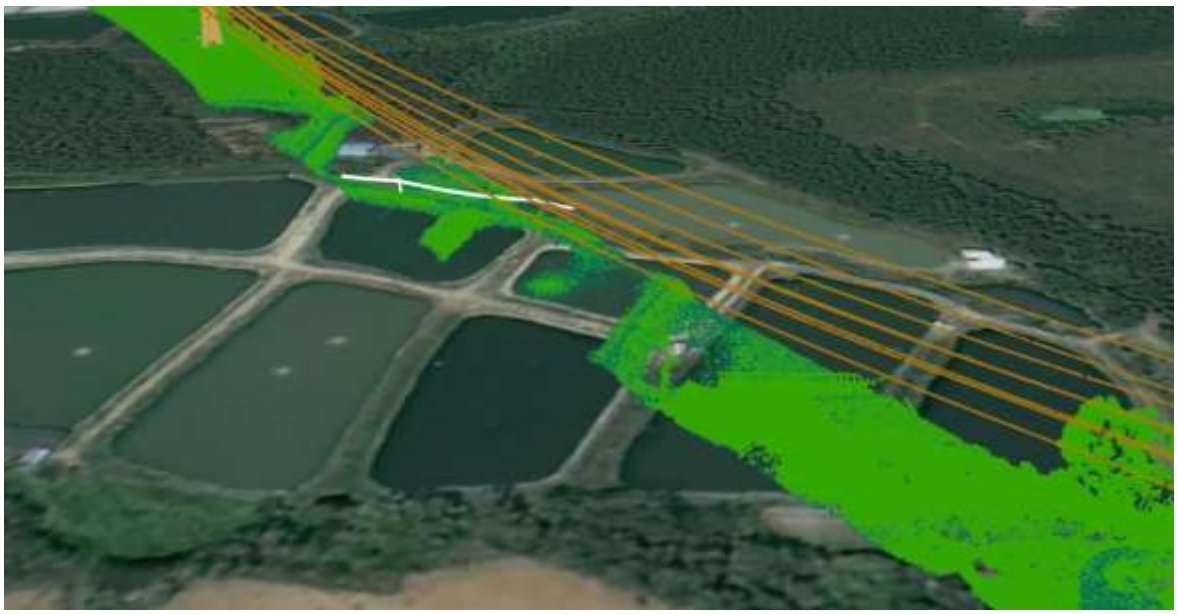
b. Supporting Multiple Pre-Trained Model Algorithms for Extracting Urban Farmland, Water Bodies, Forests, Thick Clouds, etc.

3. AI-Based 3D Data Processing and Analysis: Significantly Improved Efficiency

a. Performance Optimization for Oblique Photogrammetry 3D Models: Lightweight Improvement of Over 50%

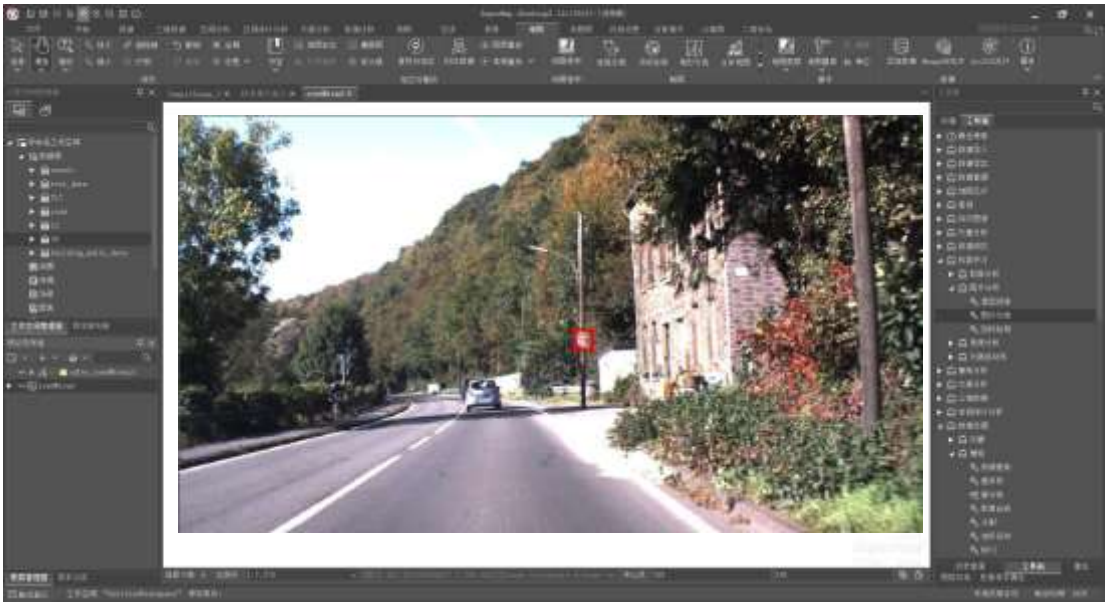


b. AI-Powered Semantic Segmentation of Power Point Clouds and Instance Segmentation of Power Lines

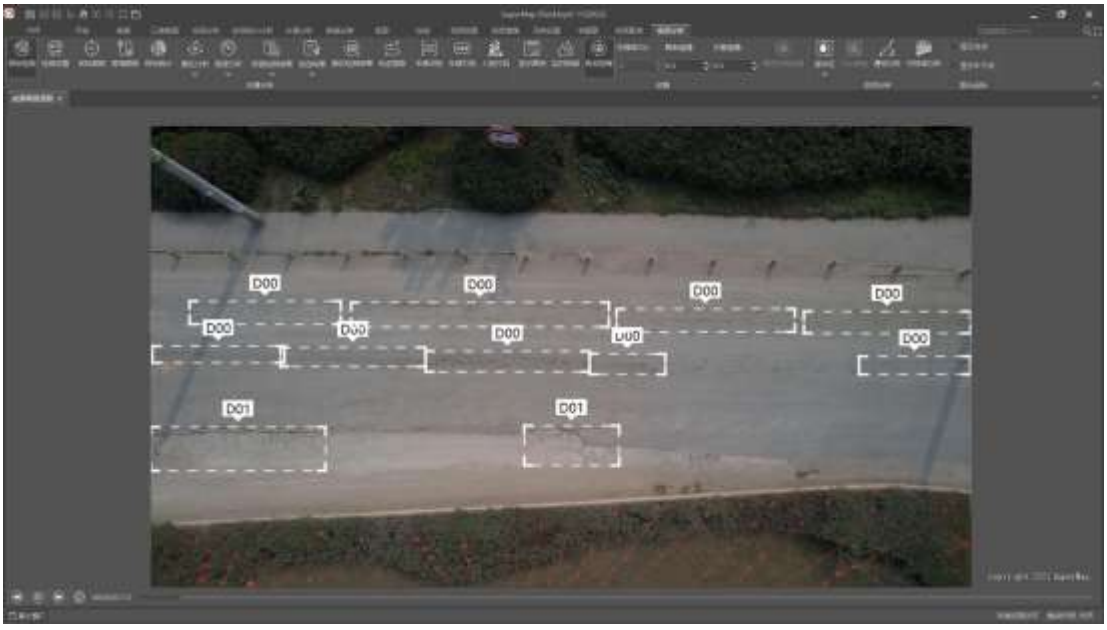


4. AI-Based Image/Video Analysis: Significant Labor Savings

a. Image Target Detection

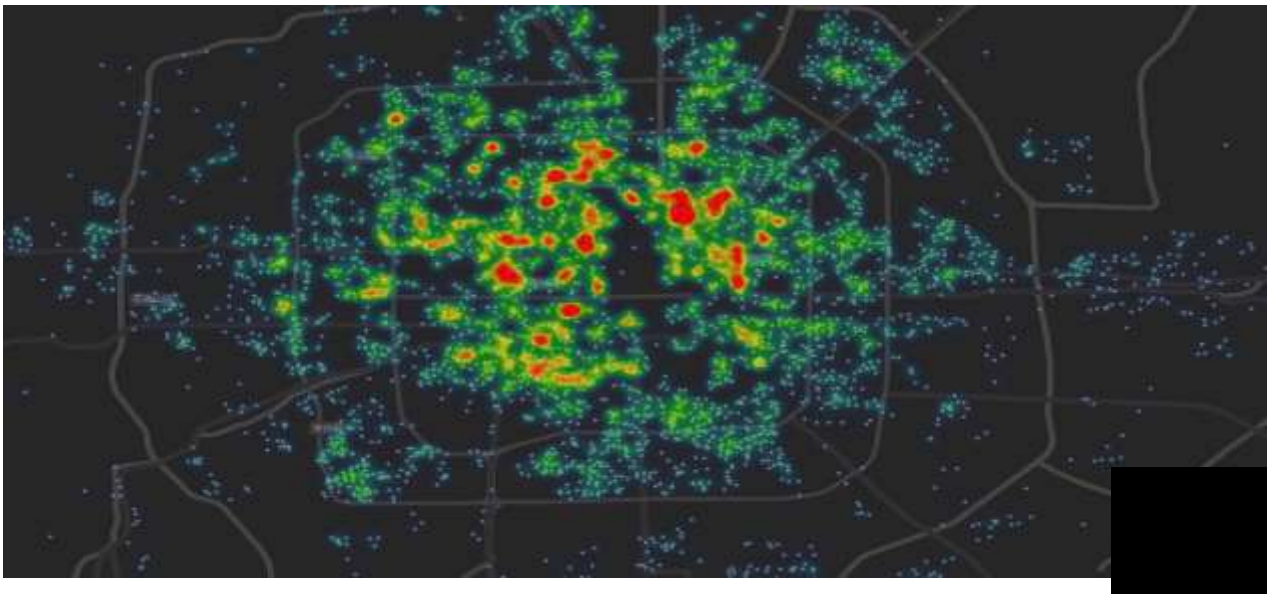


b. Video Target Detection (Damaged Road Surface Detection Model)

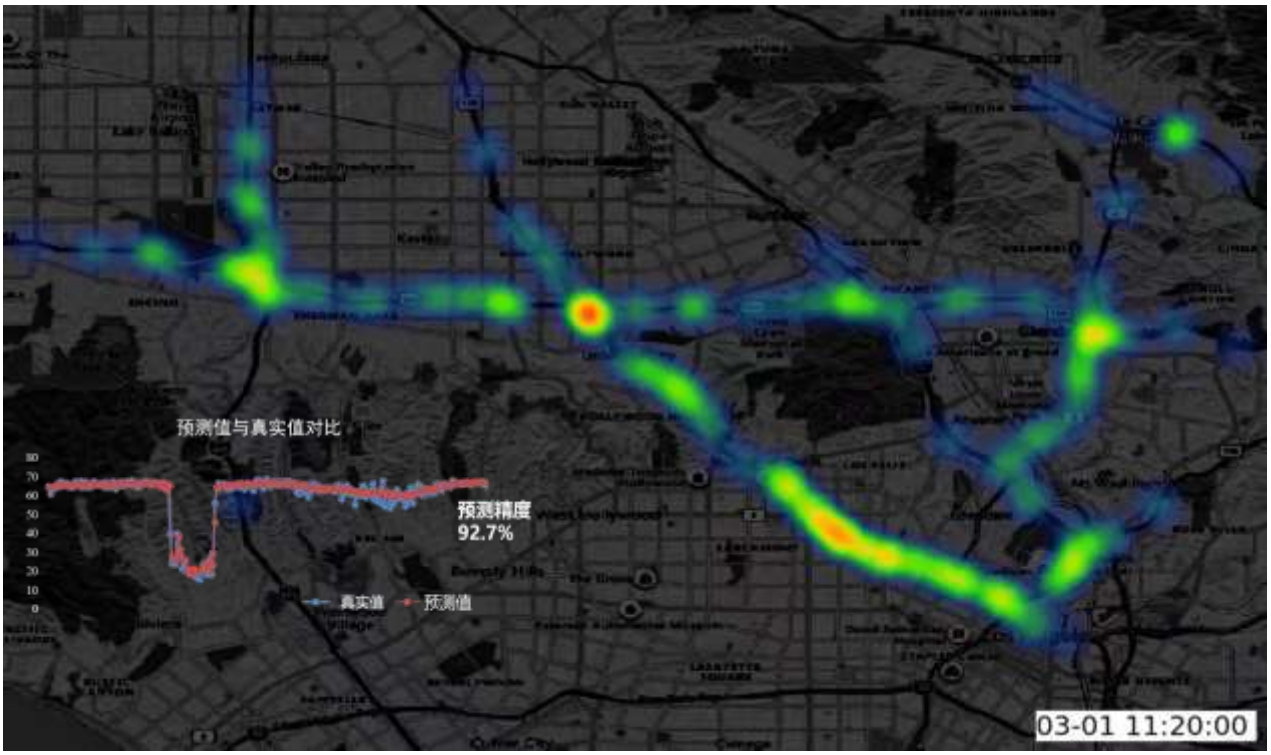


5. AI-Based Spatial Analysis: Empowering Efficient Decision-Making

a. Real Estate Prices Estimation Based on Forest Regression Infrastructure Distribution



b. Traffic Flow Prediction Based on Graph Neural Networks



6. SuperMap iServer Full-Process AI Services

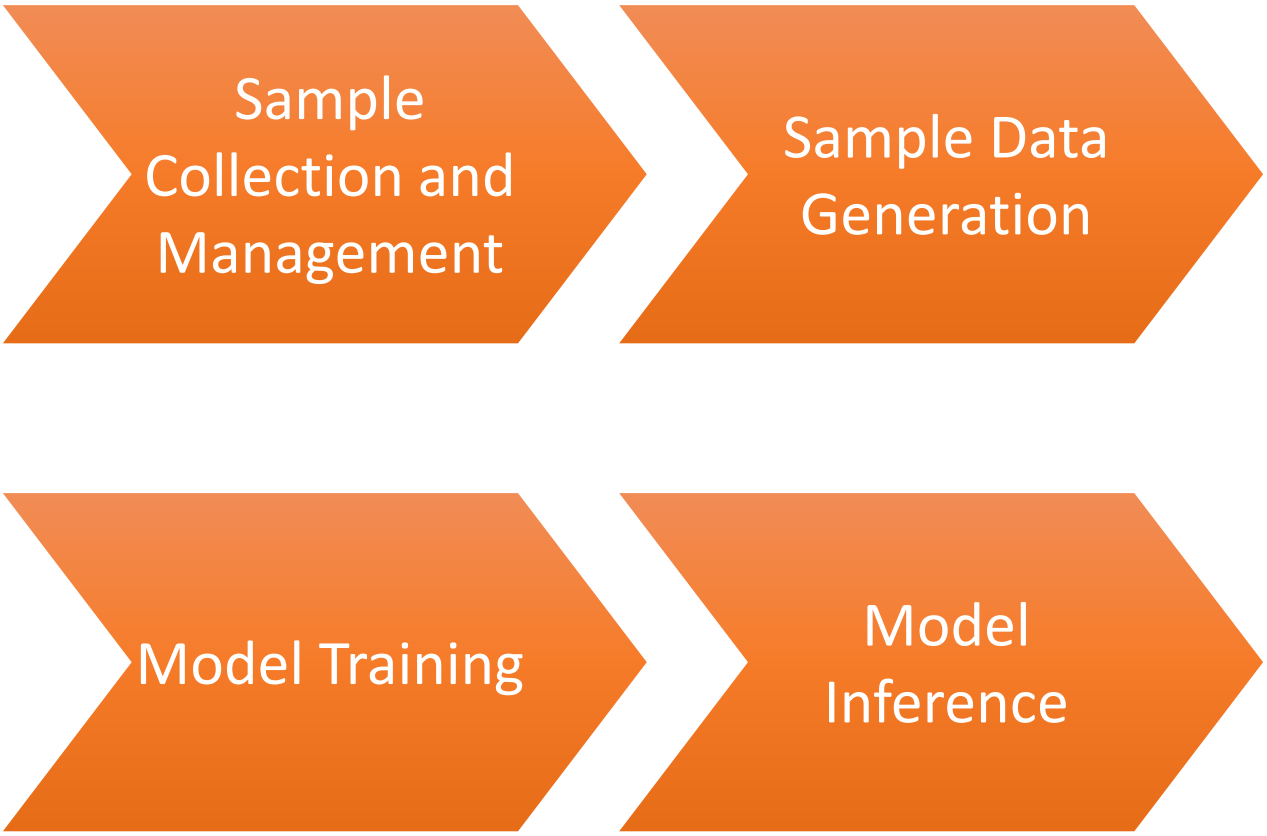
Machine Learning Services

- Provides Various Operators: Based on Forest Classification, Binary Classification, Decision Trees, Density Clustering, Naive Bayes, Target Detection, Object Extraction, Generalized Linear Regression...

a. Binary Classification Operator Results

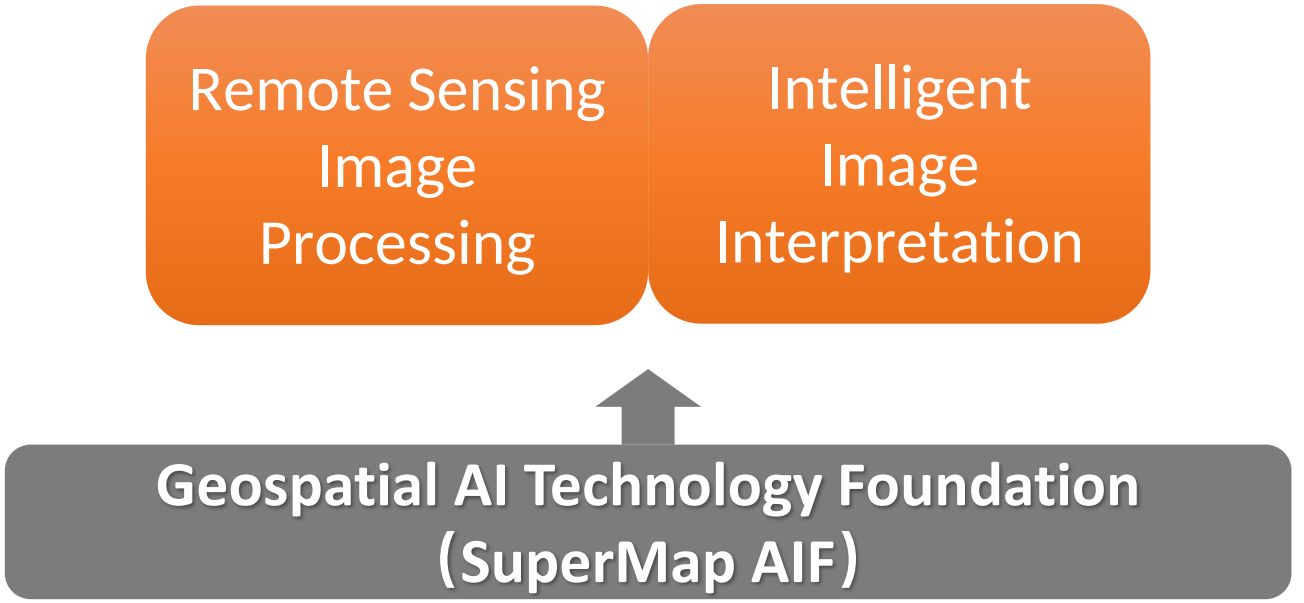
b. Target Detection Operator Results

7. SuperMap iDesktopX Full-Process Machine Learning Solutions



SuperMap ImageX Pro/Ent.

Geospatial AI Empowers Remote Sensing Image Processing



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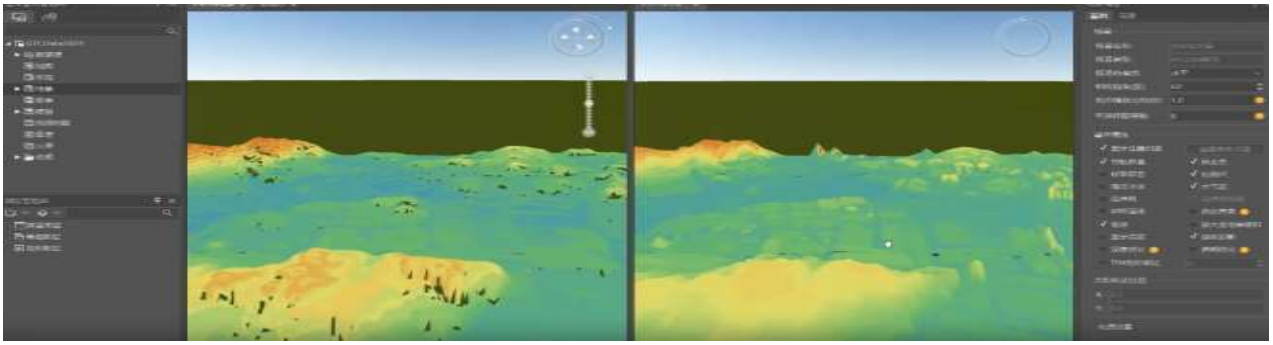
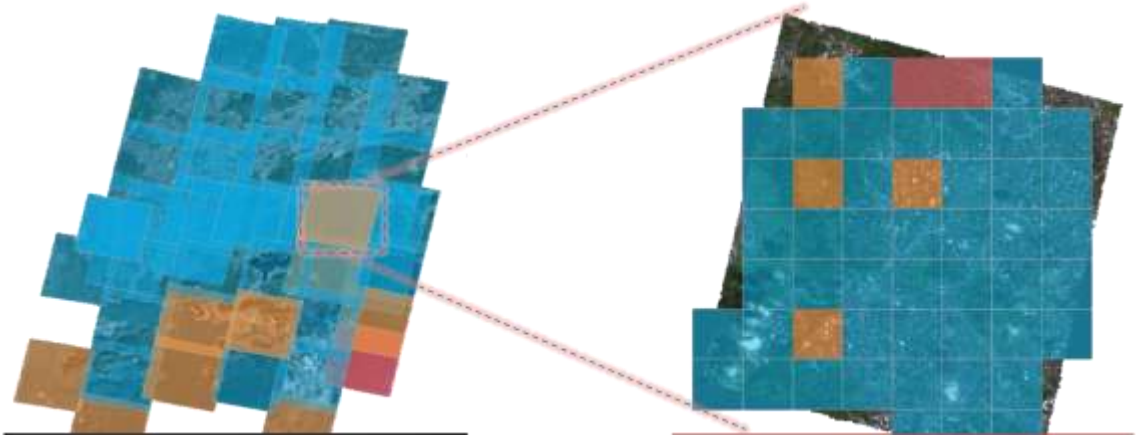


c. Fine Grid Partition AI Automated Quality Inspection: Improved Inspection Accuracy



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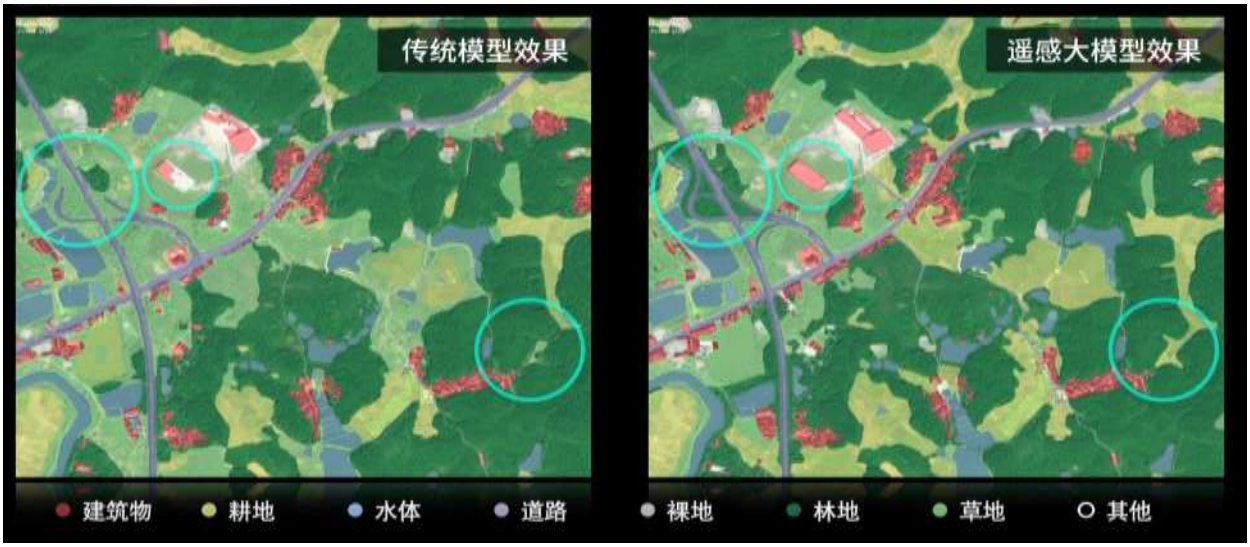
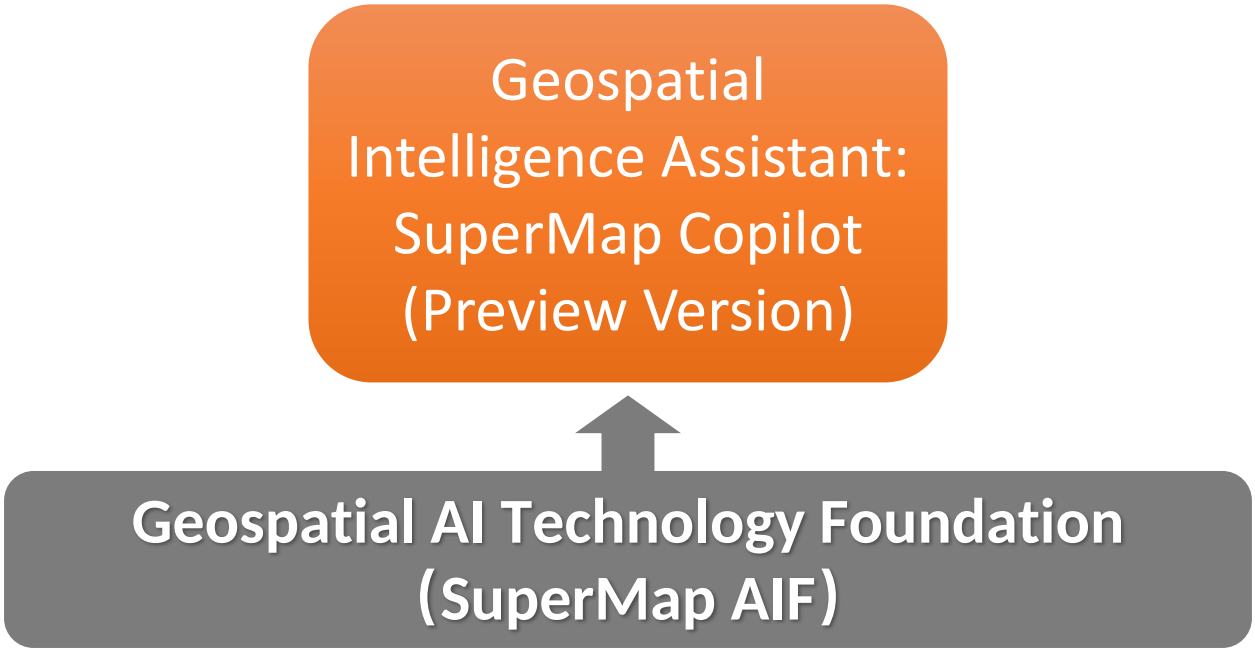


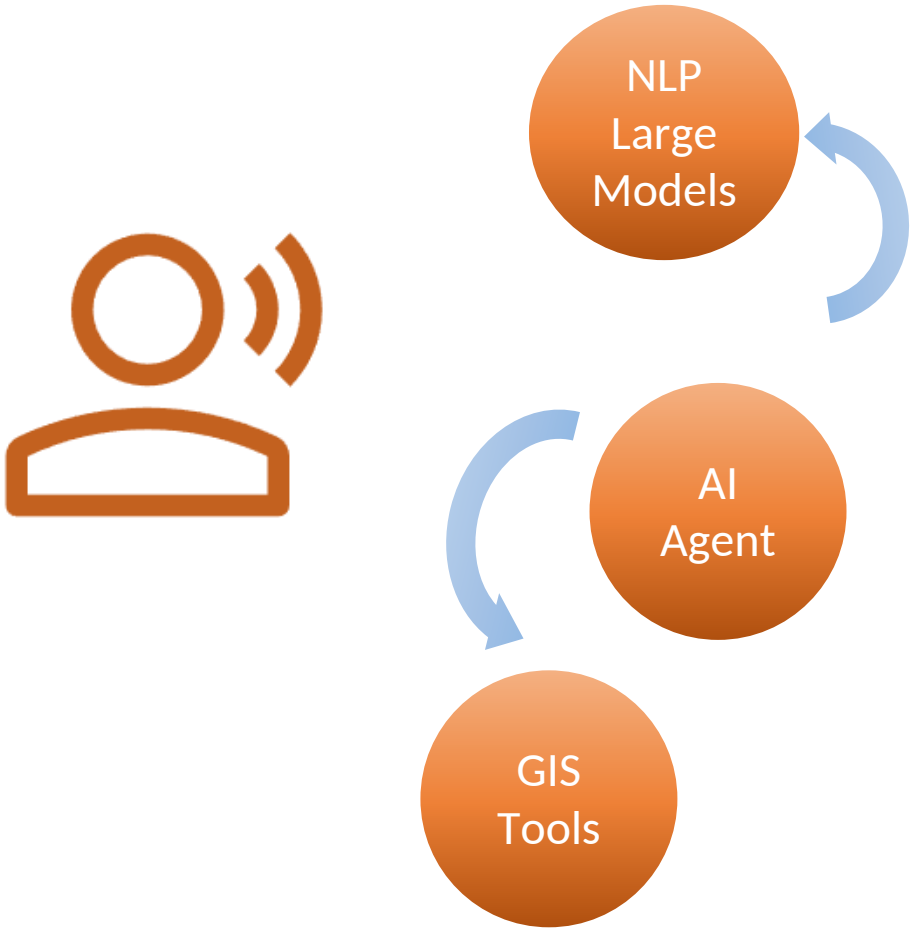
b. Supports Multiple Pre-Trained Model Algorithms for Extracting Urban Farmland, Water Bodies, Forests, Thick Clouds, etc.

SuperMap iPortal

1. Geospatial Intelligence Assistant Enhances Portal User Experience



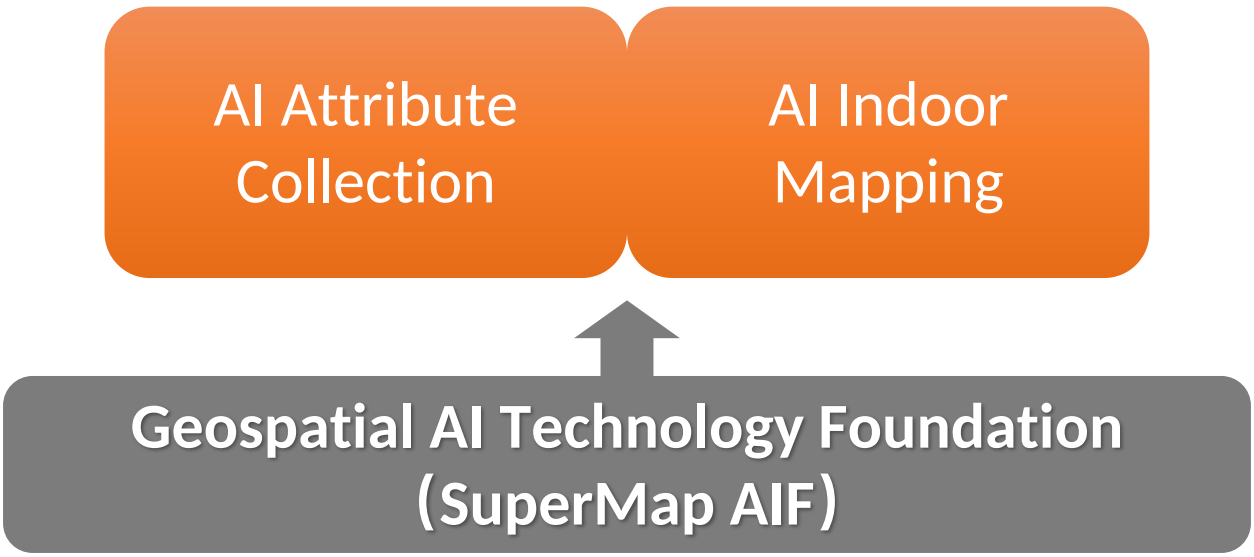
2. Geospatial Intelligence Assistant: SuperMap Copilot (Preview Version)



- Supports Conversational Portal Resource Retrieval: Recognizes and Executes Retrieval Requests Based on Keywords, Tags, Resource Types, etc.
- Supports Conversational Data Analysis: Recognizes and Executes Statistical Analysis Requests (Count, Sum, Max, Min, Average, Median) and Spatial Analysis Requests (Overlay Analysis).
- Supports Conversational Data Visualization: Recognizes and Executes Requests for Statistical Charts (Pie Charts, Bar Charts, Radar Charts, Line Charts) and Map Generation (Basic Maps, Single-Value Thematic Maps, Segmented Thematic Maps, Heatmaps), with Support for Secondary Editing via Controls.
- Supports Conversational Portal Management: For Admin Users, Recognizes and Executes User Account Management and Portal Resource Management Requests.
- Supports Admin Management Tool Directory (via APIs): Configurable/Addable Internal or Third-Party APIs.

SuperMap iMobile

1. AI Mobile Efficient Data Collection and Mapping

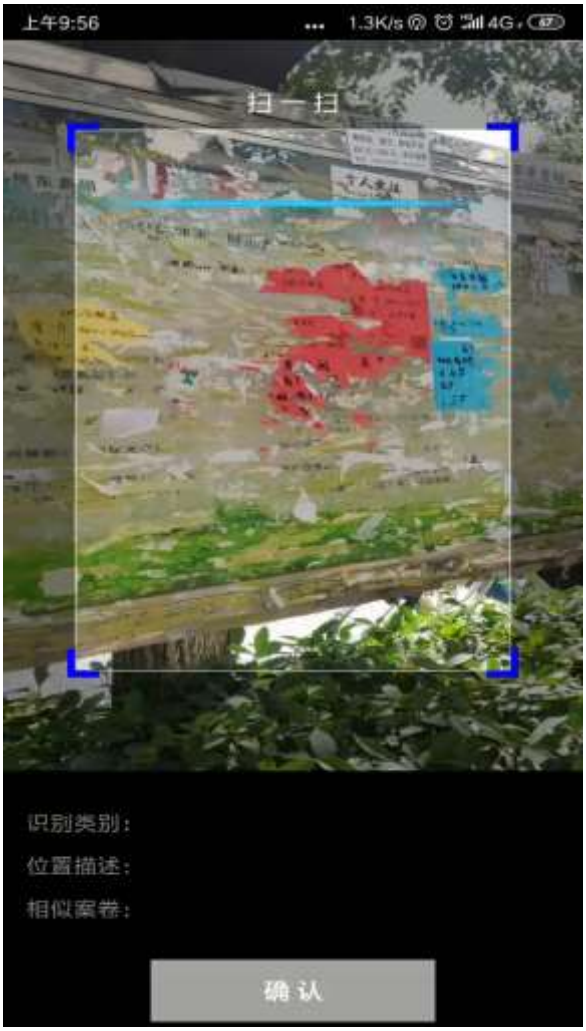


2. AI-Based Attribute Data Collection

AI Attribute Collection

In our digital city management system, we often need to record illegal cases or issues, which requires manually entering a lot of information on mobile devices. Can AI help improve efficiency? The answer is yes.

Damaged Roads



Flyers

For example, if there is an illegally parked car, we can take a photo, and the system will automatically recognize its features: a black car with a blue license plate, filling in the details without manual input.

It can also identify flyers, and random material piles, which are then located and uploaded. This will significantly improve data collection efficiency.

Random Material Piles

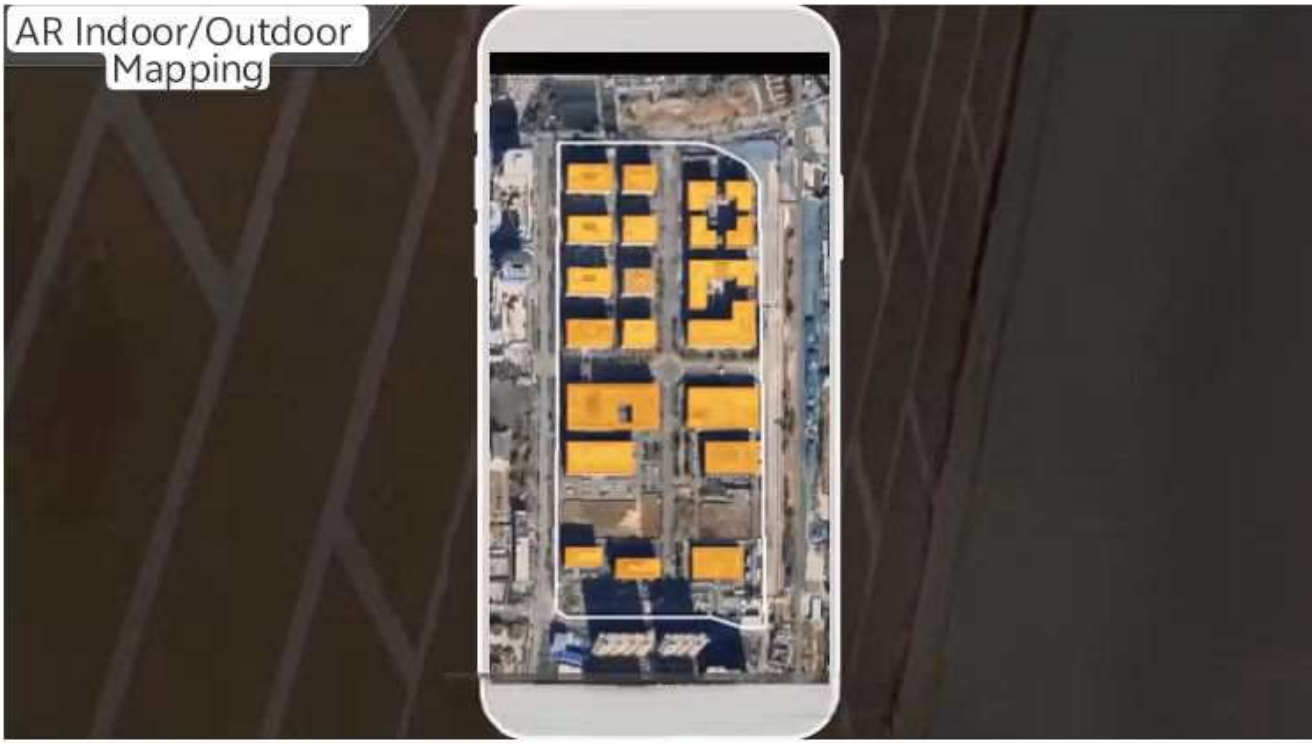
Trash Bins

Indoor Convenient Mapping with Low Precision Requirements

We can use this to create a mapping app based on visual-inertial fusion AI + AR mapping, video comprehension, and virtual elements.

Let's take a look inside this mall: we use this app to mark points on the floor, and then we can measure the mall's exhibition stands.

By walking around like this, we can map out the indoor space. We tested it and found that its accuracy can reach 1%, meaning that over 100 meters, the error is just a few tens of centimeters. If we add a few control points for frequency difference correction, the accuracy is acceptable for certain mapping applications.




Thanks for reading!
SuperMap