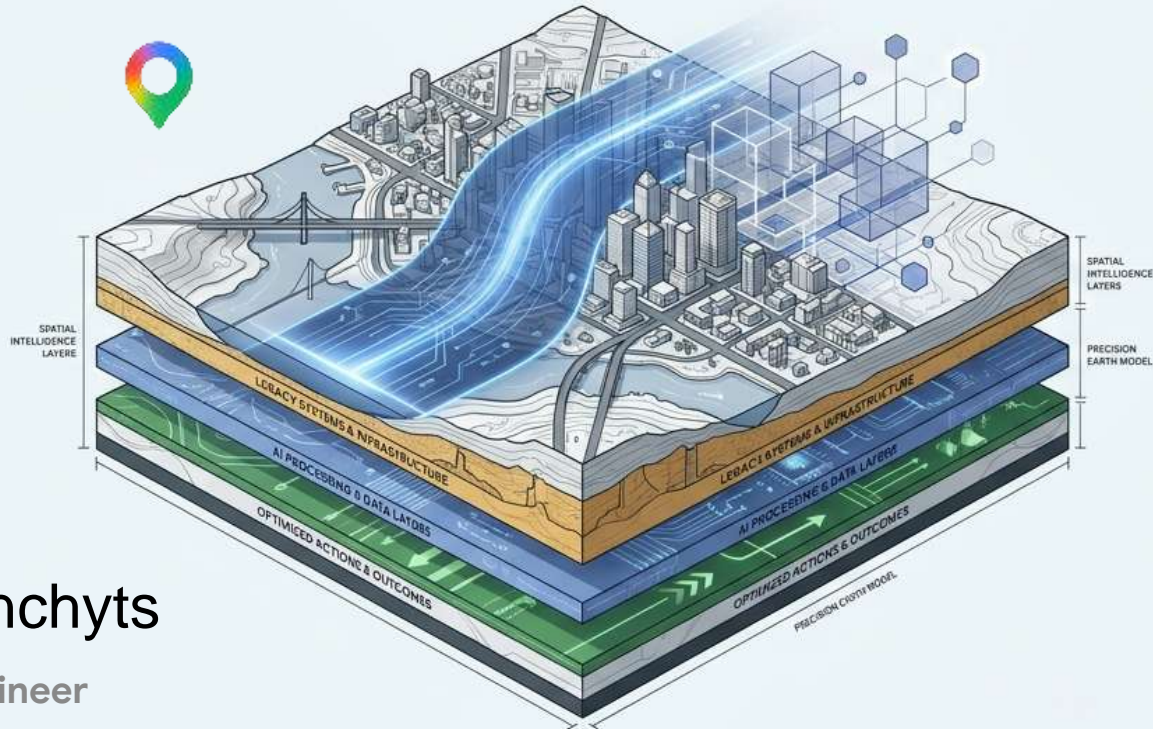


The Sentient Map

From Earth Observation to Enterprise Action with Google GeoAI



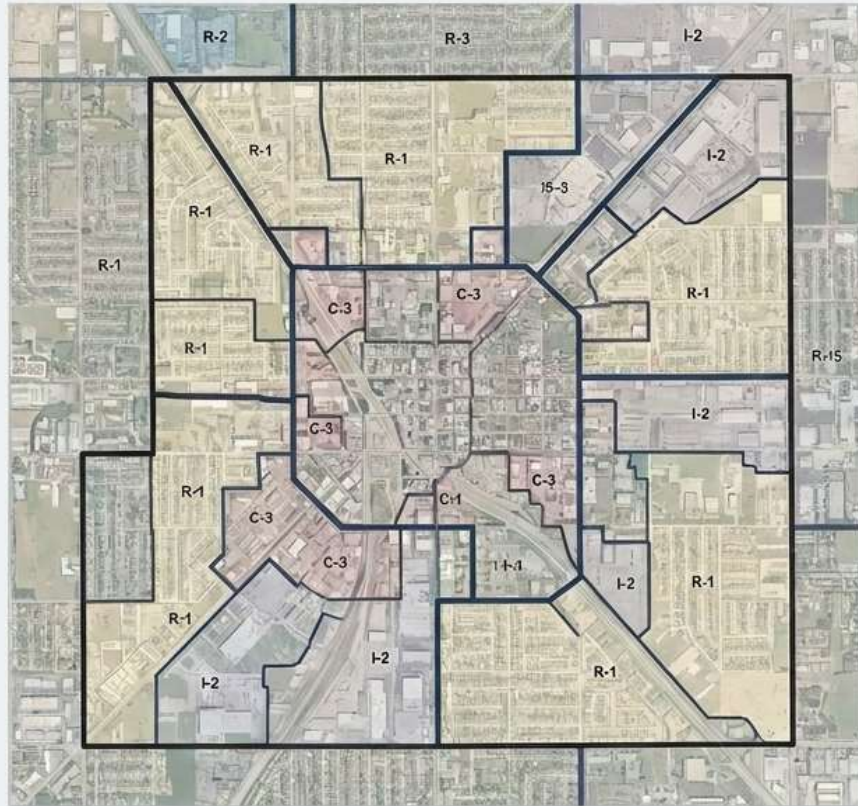
Gennadii Donchyts

Staff Customer Engineer
Google



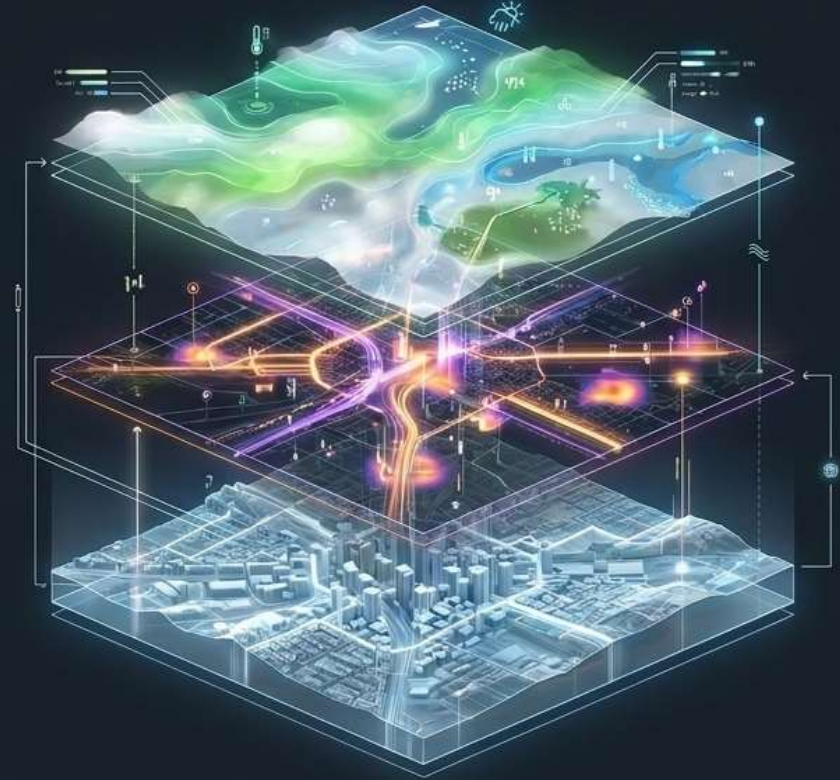
The Past: Static Snapshots

Traditional GIS is a portrait of the past, limited by slow processing and manual updates.

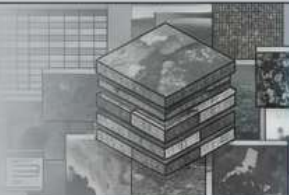

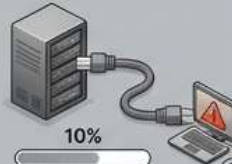







The Future: Dynamic Intelligence

The world changes faster than our databases. We need a planetary nervous system that understands dynamics in real-time.



The Paradigm Shift in Planetary Analysis

	Traditional GIS	The GeoAI Era
Primary Data Form	Raw Pixels & Siloed Tables (Heavy, disjointed) 	Mathematical Embeddings & Vectors (16x more efficient to store, 10x faster to analyze) 
Typical Workflow	Moving petabytes of data to local machines 	In-Place Cloud Queries (BigQuery) with Bring-Your-Own-Imagery (BYOI) 
Primary Interface	Complex, specialized geospatial dashboards 	Natural Language Geospatial Reasoning Agents 
Temporal Perspective	Static snapshots of the past 	Continuous temporal pulses and predictive forecasting 

Deep Sight / Macro

Aerial, Satellite, and
AlphaEarth Foundations

Human Pulse / Meso

Places & Population
Dynamics Insights

Ground-Level / Micro

Roads & Street View
Insights



**The Brain: The Geospatial
Reasoning Agent**
(Powered by Gemini)

ALPHA EARTH: THE "VIRTUAL SATELLITE" FOUNDATION



Summarizes Earth's Surface Dynamics

Fills in data gaps from clouds or sensor limitations to provide a continuous "temporal pulse" of the planet.



Synthesizes Multi-Source Data

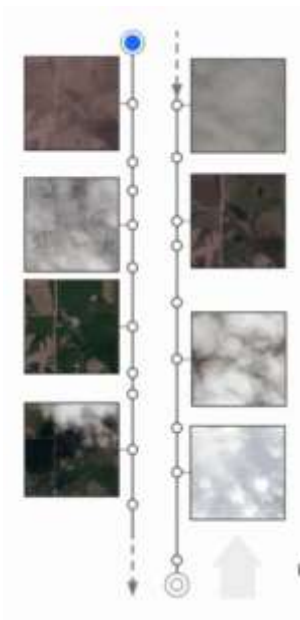
Fuses optical satellite imagery, radar, and climate simulations for comprehensive macro-level analysis.



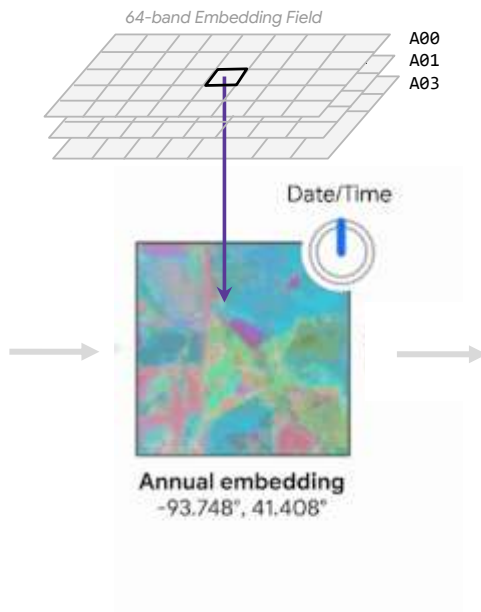
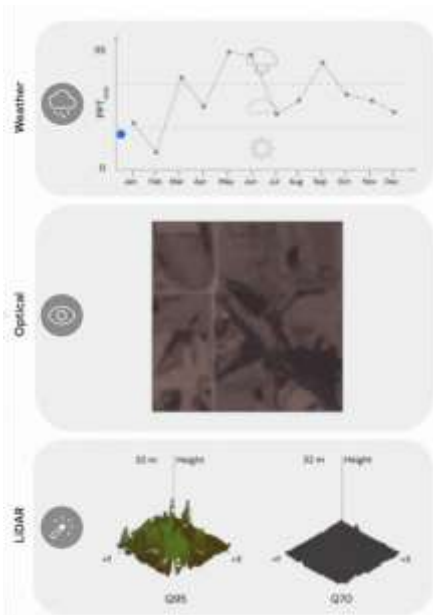
Foundation for Global Embeddings

Delivers 10-meter resolution, annual embeddings (e.g., 64-dimensional) to power downstream geospatial applications.

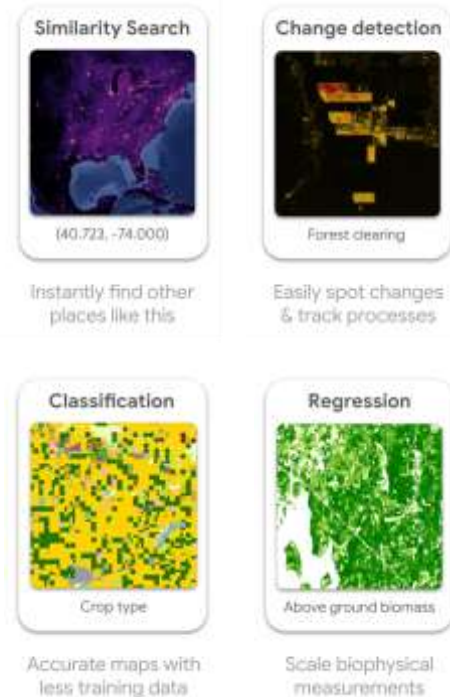
What can you do with the AlphaEarth On-Demand Satellite Embeddings?



Multi-source Earth Observations



6
Embeddings



Tasks

The Data Foundation

MODALITY		RESOLUTION	FRESHNESS	OPTIMAL USE CASE
Sentinel-2		10m	Continuous	Macro-level environmental and agricultural monitoring.
Airbus PNEO		30cm	2023-2025	Rapid, high-res planetary change detection.
Aerial (Google)		7-15cm	2020-2025	High-precision urban tracking and agricultural monitoring.
Street View & Oblique		Ground-level	Continuous	Asset-level condition assessment & 3D context.

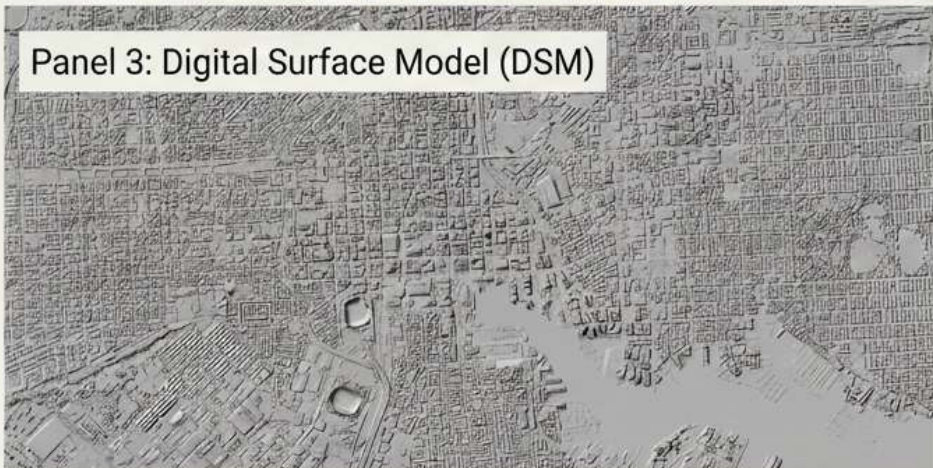
Panel 1: RGB Optical Reality



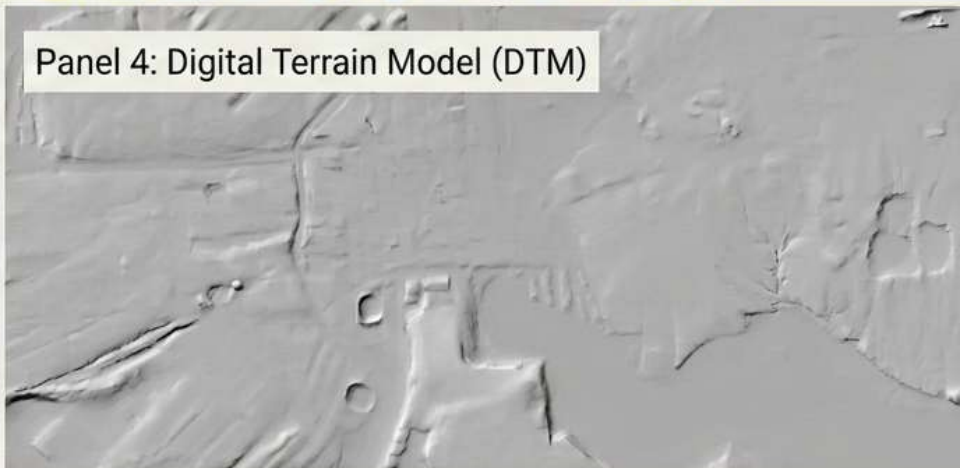
Panel 2: Semantic Clutter Classes



Panel 3: Digital Surface Model (DSM)



Panel 4: Digital Terrain Model (DTM)



Foundational Layers for Geospatial AI. Raw imagery is converted into semantic classes and physical elevation models, creating a structured, multi-layered foundation critical for advanced AI analysis and interpretation.

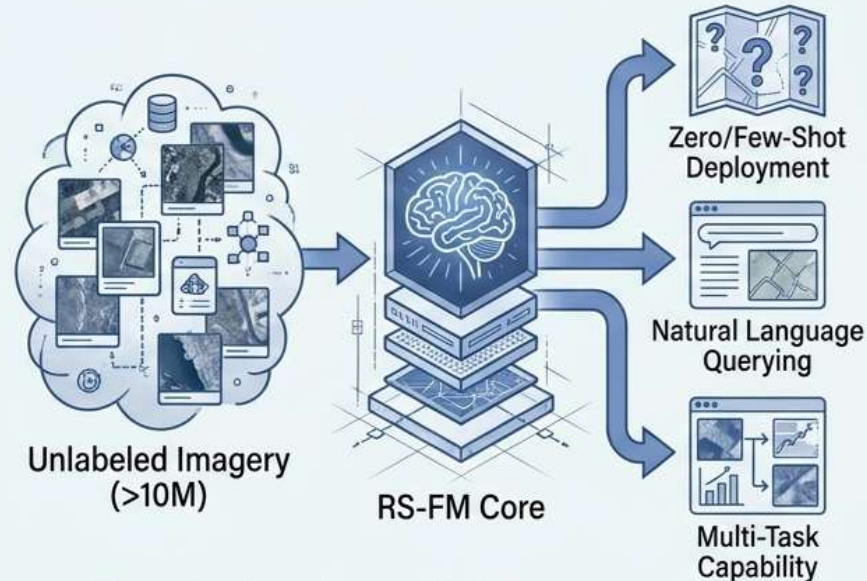
The Paradigm Shift: Legacy vs. Foundation Models

Legacy Supervised Approach



- Requires massive labeled datasets
- Highly specific, brittle deployment
- Slow time-to-market

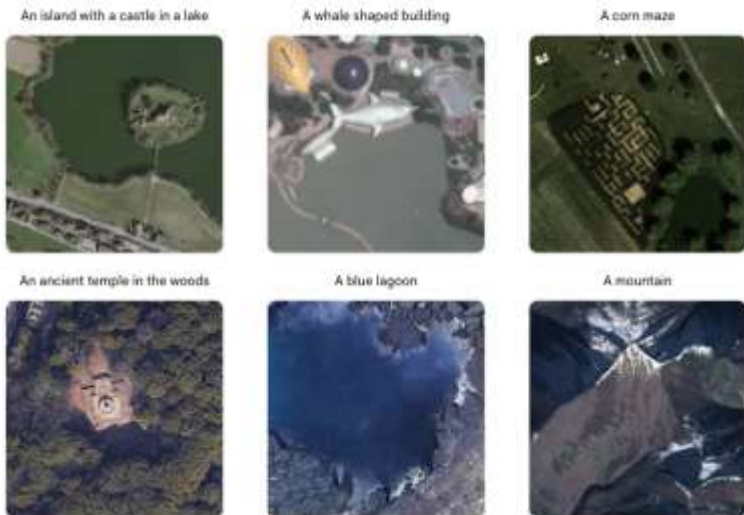
RS-Foundation Model Architecture



- Pre-trained spatial context
- Zero-shot text-based queries
- Dramatically faster deployment

RS-VLMs can fundamentally change geospatial analysts workflows by finding objects, events or scenes of interest across the Earth by just asking

Zero-shot open vocabulary **image/scene retrieval** of Earth imagery at planet scale (RS-SigLip2)



Zero-shot open vocabulary **object detection** on Earth imagery at planet scale (RS-OwL-ViT)





Detections	
Aircraft	0
Construction	154
Vehicle	3,440
Total detections	3,594



Storyline

SUMMARY

- Areas with existing emergency presence:
 - [41125292°N, 87.515068°W](#) (Fire/Rescue actively searching pulverized buildings)
 - [41126828°N, 87.648228°W](#) (Police/Fire actively searching a destroyed foundation)
 - [41123943°N, 87.515848°W](#) (Search and rescue underway at leveled structures)
- Geographic distribution: The most severe damage is highly localized, presenting as linear "scars" or corridors of extreme destruction characteristic of tornadoes or intense hurricane eyewall microbursts. Total obliteration of structures is clustered alongside areas of massive directional tree "blowdowns."

200ft 14.48

500 m

LAT: 41.128115, LON: -87.529348

Add another point like this.

Enter to add, Shift+Enter for new file

© OpenStreetMap contributors

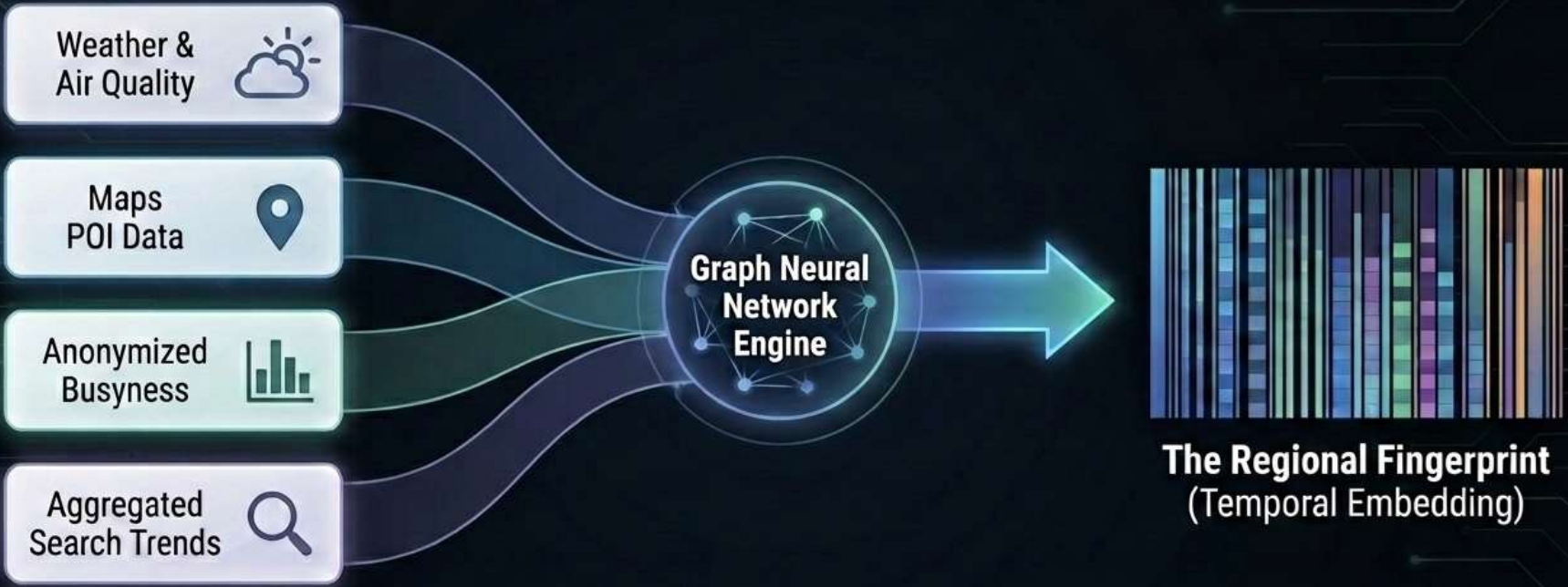
Mar 2015

Go to date

View range

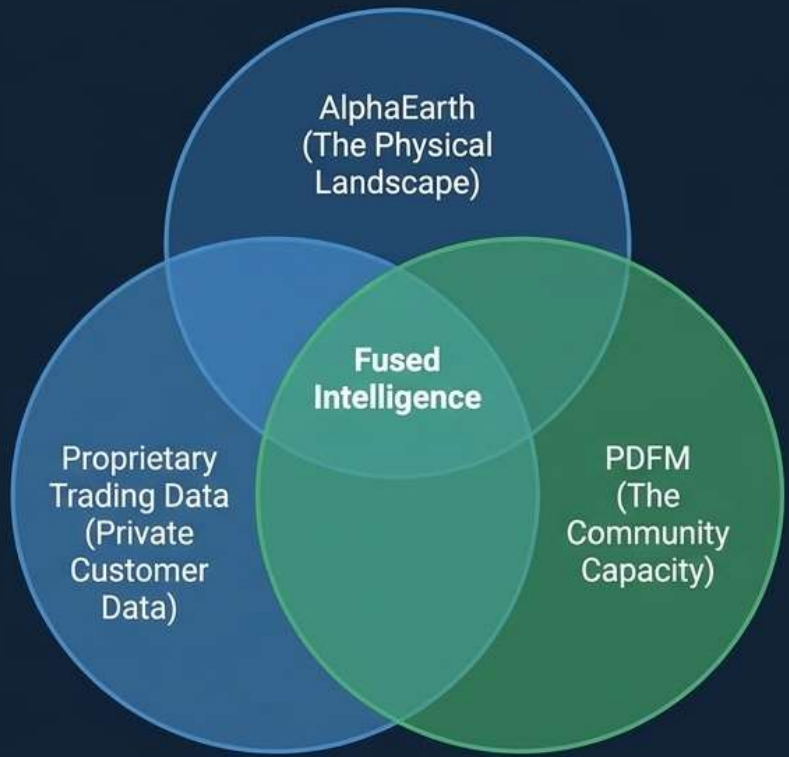
Jan - Mar, 2016

Population Dynamics Insights: Distilling the Regional Fingerprint

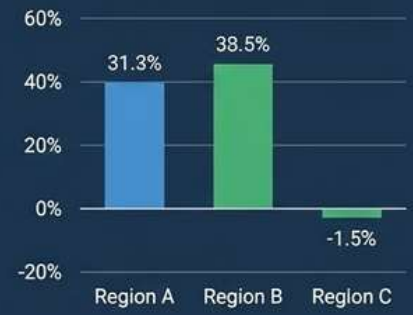


By capturing where people are and what they care about—not just where the census says they live—we achieve state-of-the-art performance across numerous health, socioeconomic, and environmental forecasting tasks.

Commodity Trader (Agriculture)



Regional Crop Yield Forecast (vs. 5-yr Avg)



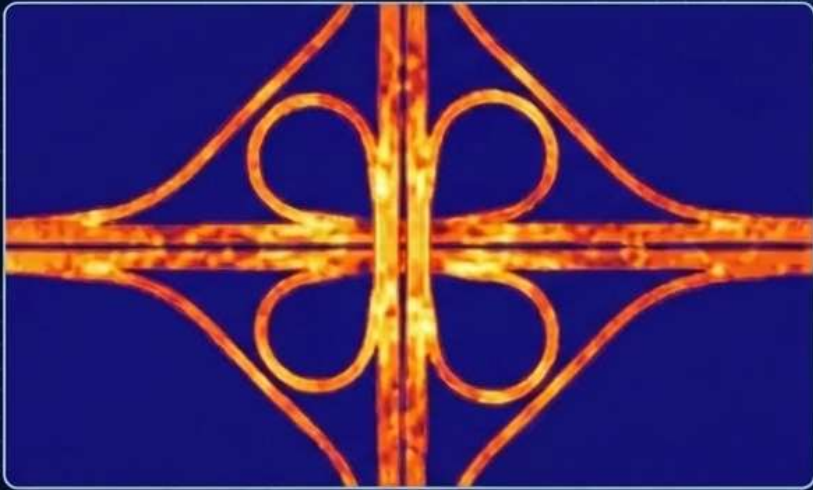
Leverage AlphaEarth's continuous planetary view to predict regional crop yields and identify supply risks early by analyzing satellite imagery and climate patterns.

Demand & Supply Chain Indicators



Utilize PDFM's human behavior insights to anticipate demand shifts and optimize supply chain logistics by correlating aggregated search search trends and mobility data.

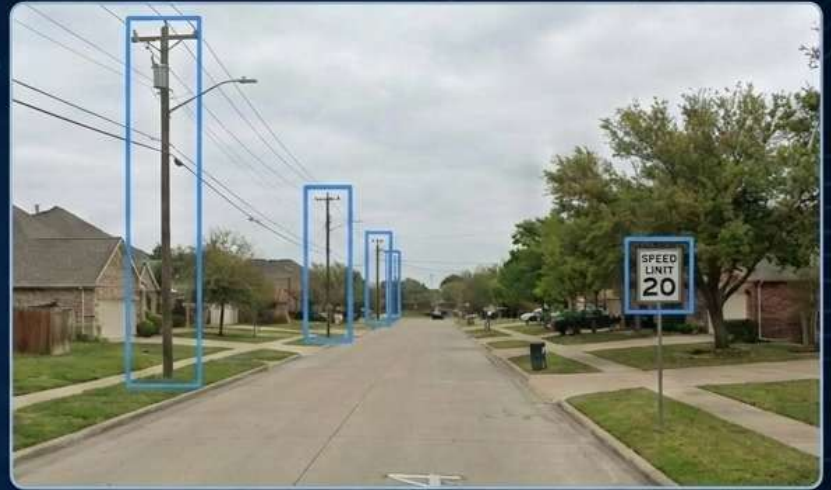
Roads Management Insights



Proactive Flow

AI analyzes live telemetry to identify unusual patterns and hard-braking events, removing the need for expensive physical road sensors.

Street View Insights



Automated Asset Audits

Tap into 280 Billion images across 110+ countries. Extract actionable infrastructure health insights from your desk, eliminating costly field surveys.

Imagery Insights: Anatomy of an Insight

The Input

Privacy-Safe 1P Imagery



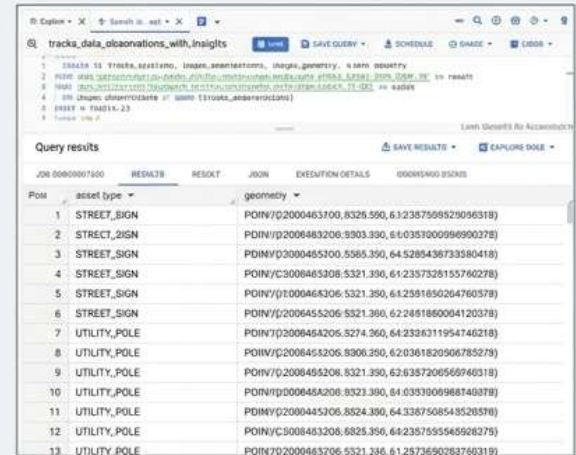
The Processing

Vertex AI Foundation Models



The Output

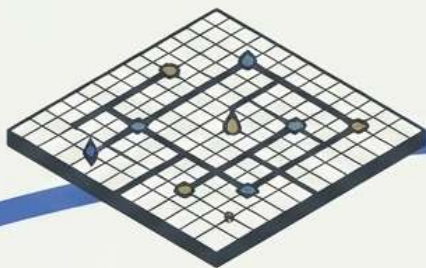
BigQuery Structured Analytics



The screenshot shows a BigQuery query results table for the query 'tracks_data_observations_with_insights'. The table has columns for 'Pos', 'asset type', and 'geometry'. The results list 13 rows of data, including street signs and utility poles.

Pos	asset type	geometry
1	STREET_SIGN	POINT(2000463700, 8328.550, 612357508529096318)
2	STREET_SIGN	POINT(20004683206, 8903.350, 616039300096990278)
3	STREET_SIGN	POINT(2000465200, 5565.350, 64528543873380418)
4	STREET_SIGN	POINT(2000465208, 5321.350, 612357329155760278)
5	STREET_SIGN	POINT(2000464306, 5321.350, 612357329155760278)
6	STREET_SIGN	POINT(2000465206, 5321.350, 622481860064120378)
7	UTILITY_POLE	POINT(2000464206, 8274.360, 642338311954740218)
8	UTILITY_POLE	POINT(2000464206, 8306.350, 620361820906785278)
9	UTILITY_POLE	POINT(2000465208, 8321.350, 62635720666740318)
10	UTILITY_POLE	POINT(2000464206, 8328.350, 840393009968140878)
11	UTILITY_POLE	POINT(2000465206, 8524.350, 643387508543528378)
12	UTILITY_POLE	POINT(2000463206, 8825.356, 642357555569928278)
13	UTILITY_POLE	POINT(2000465206, 5321.336, 612573696083760318)

Imagery Insights bridges the gap between unstructured visual data and structured operational databases, maintaining a strict, privacy-safe chain of custody.



Planetary Scale



Zero-Shot Understanding



Predictive Action

Driving faster, smarter, and more sustainable spatial intelligence. Google GeoAI empowers the enterprise to not just observe the Earth, but to seamlessly predict and manage it.