DeepGIS-XR

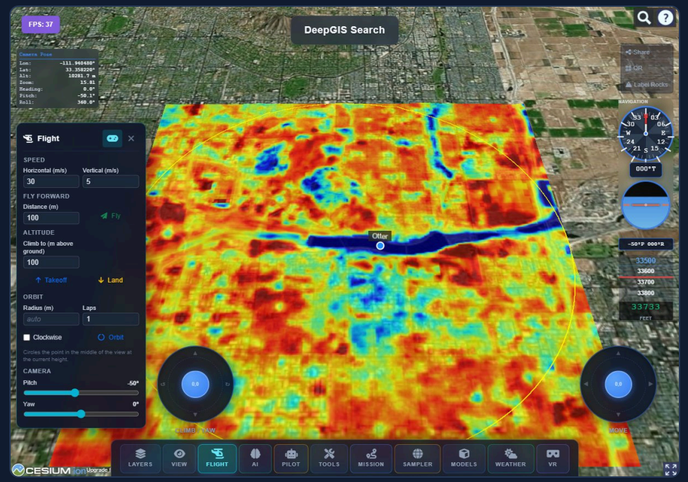
One globe where maps, robots and AI meet: from satellite pixels down to a rover's spectrometer

24 data layers the AI pilot loads on request

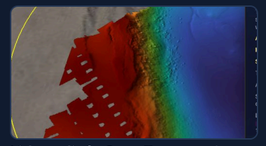
4 robots, extendible to N 3 digital twins + 1 field rover on one globe today; N is constrained by CPU and GPU

1.5 cm/px drone surveys; 222,657 rocks outlined

1 What it is — A 3D globe in the browser that you fly like a drone and drape with open data



Flight panel and sticks over Landsat surface temperature, Tempe; live robot pin on the lake



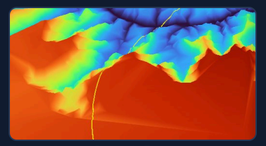
Lidar relief · OpenTopography



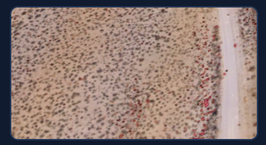
Active faults · USGS



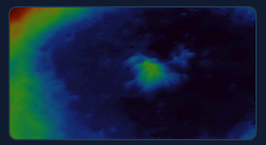
Geologic map · Macrostrat



Elevation · Grand Canyon

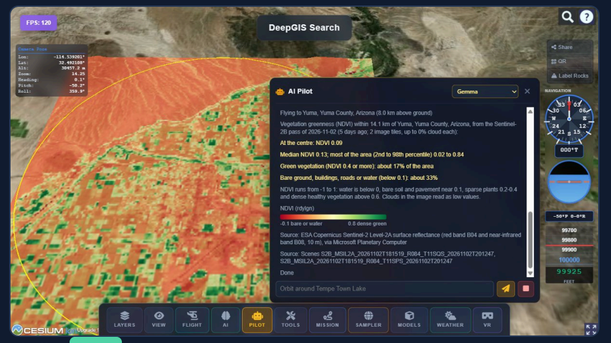


Rock survey · drone, Bishop CA



Moon viewer · Tycho, LOLA

2 How you use it — Ask in plain language, watch live robots, step inside in VR



AI pilot LIVE flies there, loads the layer, reports numbers and sources

> Asked for vegetation around Yuma, the pilot reported:
> **Median NDVI 0.13; green vegetation on about 17% of the area.**
> From the Sentinel-2 pass of 2 Nov 2026, 10 m pixels, scene IDs cited.
> A lab-hosted LLM plans the steps; the browser runs them.



VR cockpit BUILT console, robots and pilot panels (illustrative composite)

Kestrel	Badger	Otter	Earth rover
multirotor twin	rover twin	boat twin	field robot
Bishop fault scarp	Bishop fault scarp	Tempe Town Lake	self-enrolled

Robot commands are confirmed first and checked against geofence, altitude and battery. The LLM advises; it is never in the control loop.

3 Field loop — The earth rover ground-truths the satellite layers, over Starlink



Earth rover: the lab's field robot, ROS 2

Telemetry over Starlink LIVE

Parked	0.4 kbit/s
Logging at 1 Hz	2 kbit/s
Upload cap	50 kbit/s
Standby link	500 kbit/s

Log scale. Samples are saved on the rover, then sent as compressed batches, so **an outage delays data instead of losing it.**

Four instruments already on board

- **Spectrometer** — 2,048 bands · 400–870 nm — what it is
- **Laser ranger** — range to target · 10 Hz — where, how big
- **Stereo colour cameras** — 2 × 2048×1536 px · 15 Hz — the whole scene
- **Heading, pose, GPS** — flight-controller EKF · 46 Hz — aim, sun angle

One fused sample

One spot on the ground — position · footprint time · sun angle

What DeepGIS learns

- **Vegetation health** — NDVI · red edge
- **Material type** — soil · rock · water · road
- **Light** — lux · colour temp · PAR

NEXT **"Spectral samples" layer: points coloured by NDVI or material**

First: unsaturated spectra, timestamps on every sample, one calibration session, GPS fused in the EKF

4 How it runs, and what's next — Self-hosted: one public door, lab servers behind it

People — browser · phone · headset → **Public edge** — TLS · sign-in gates

Open data — USGS · NASA · ESA

encrypted overlay · no inbound lab ports

Earth rover — in the field Starlink, or base ethernet

Lab app server — DeepGIS-XR globe + AI pilot survey tiles · telemetry store digital twins of 3 robots

Lab GPU server — LLM for pilot + robots mission supervisors command gateway

Most layers are fetched by the browser straight from the open sources.

Open source: github.com/Earth-Innovation-Hub/deepgis-xr and earth-rover. Django + Cesium; 102 automated tests on the globe app.

Built by DREAMS Lab, Arizona State University · Earth Innovation Hub · deepgis.org

LIVE NOW

- Fly, orbit and layer any place on Earth or the Moon
- AI pilot: 24 layers, answers with numbers and sources
- Three digital-twin robots today; more as CPU and GPU allow
- Field rover on the globe, with its heading
- Rover telemetry that survives link outages

BUILT **headset test pending**

- VR cockpit for Meta Quest: fly, layers, robots, pilot

NEXT

- Spectrometer: auto-exposure, timestamps, white reference
- Calibrate cameras, laser and spectrometer together
- GPS fused in the rover's EKF; RTK corrections over Starlink
- Spectral-samples layer; bulk upload on base ethernet
- Camera model that spreads spot spectra across images

LIVE running today · BUILT working in a test harness, not yet on hardware · NEXT planned

Screenshots from **deepgis.org**, November 2026. Layer data: USGS, NASA, ESA Copernicus, OpenTopography, Macrostrat, Cesium ion.