TERRA·EYE

Reading Shadows

Proxy Signals, Bias, and Trust in Mineral Exploration

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The different datasets answer the same geological questions differently.

Coverage and diagnosability are not the same thing.

The same spectrums can be compared in different ways.

ONE
(spectra)
observation

S A M

Spectral Angle Mapper

Angular similarity. Compares spectral direction.

S F F

Spectral Feature Fitting

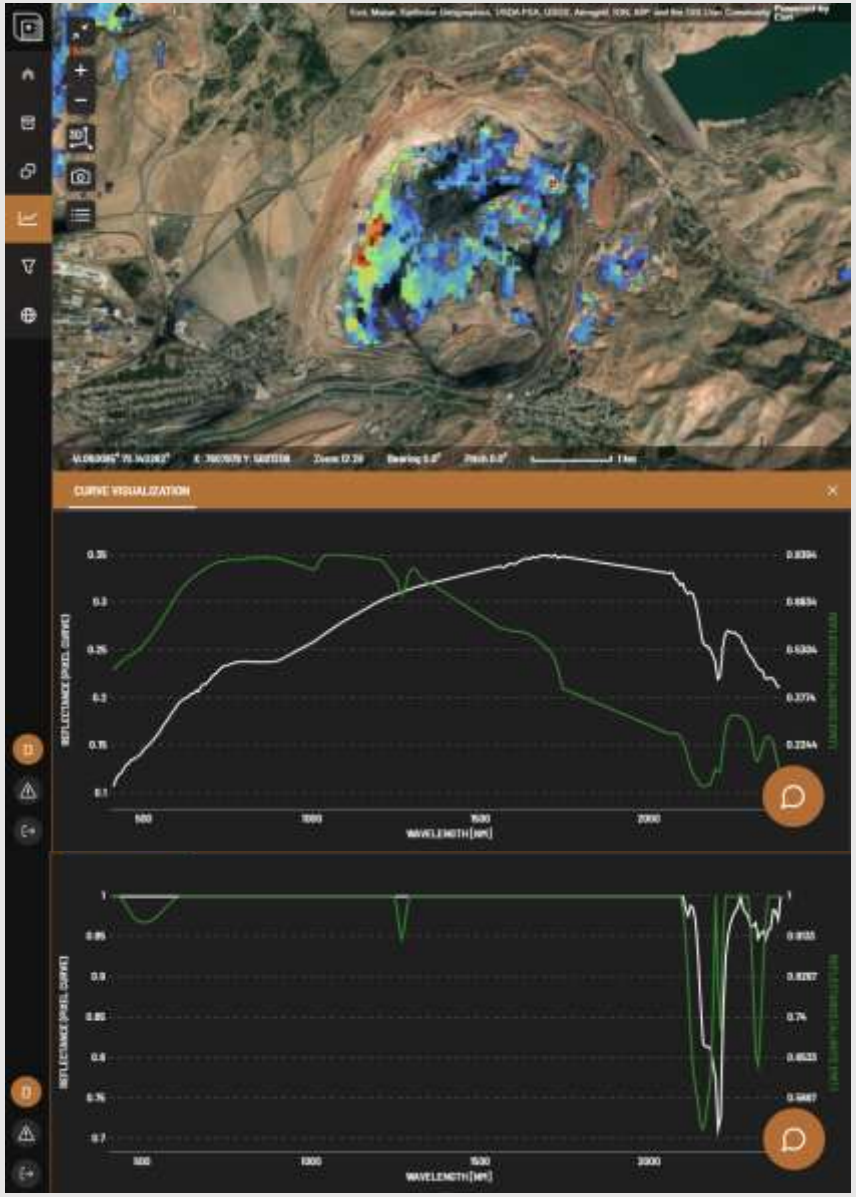
Absorption-feature oriented. Less sensitive to magnitude.

L E A R N E D

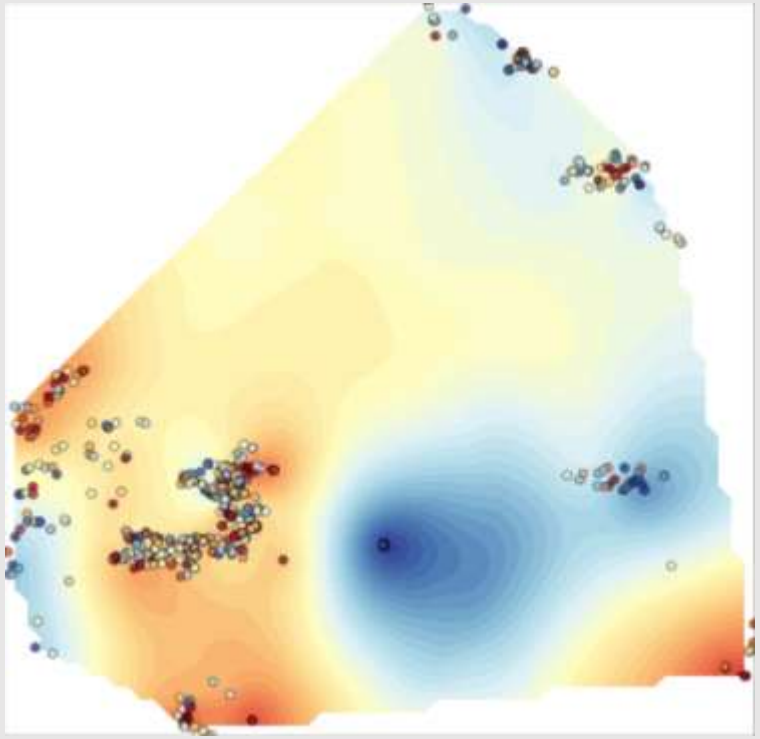
SIAMESE/EMBEDING MODEL

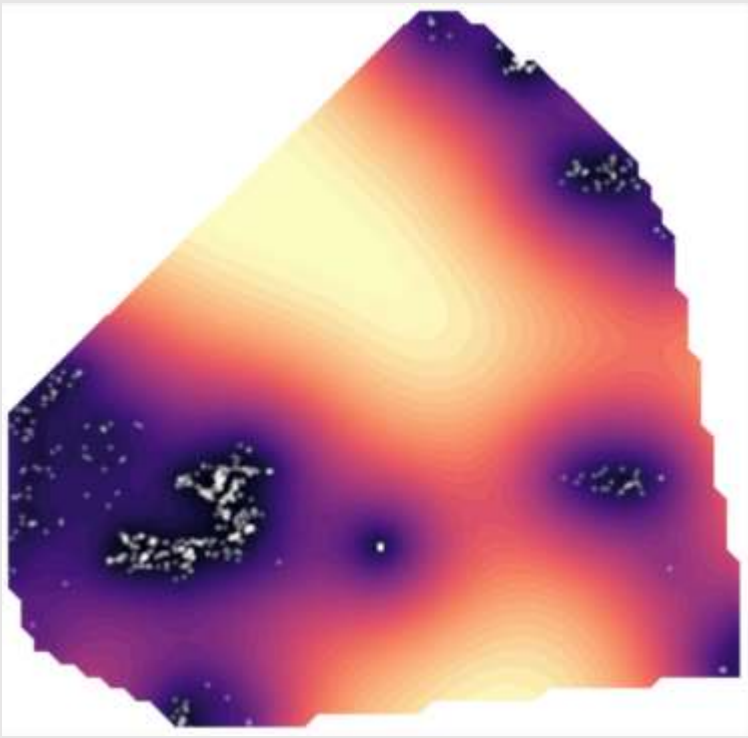
Flexible, data-driven. Needs representative pairs.

Method choice shapes
what counts as evidence.



A geochemical map may also be a map of where we chose to look.





A geochemical anomaly map may also be a map of past and subjective attention.

Model often learn the representation of the strongest signal, not the mineral signal.

LITHOLOGY
regional host rock

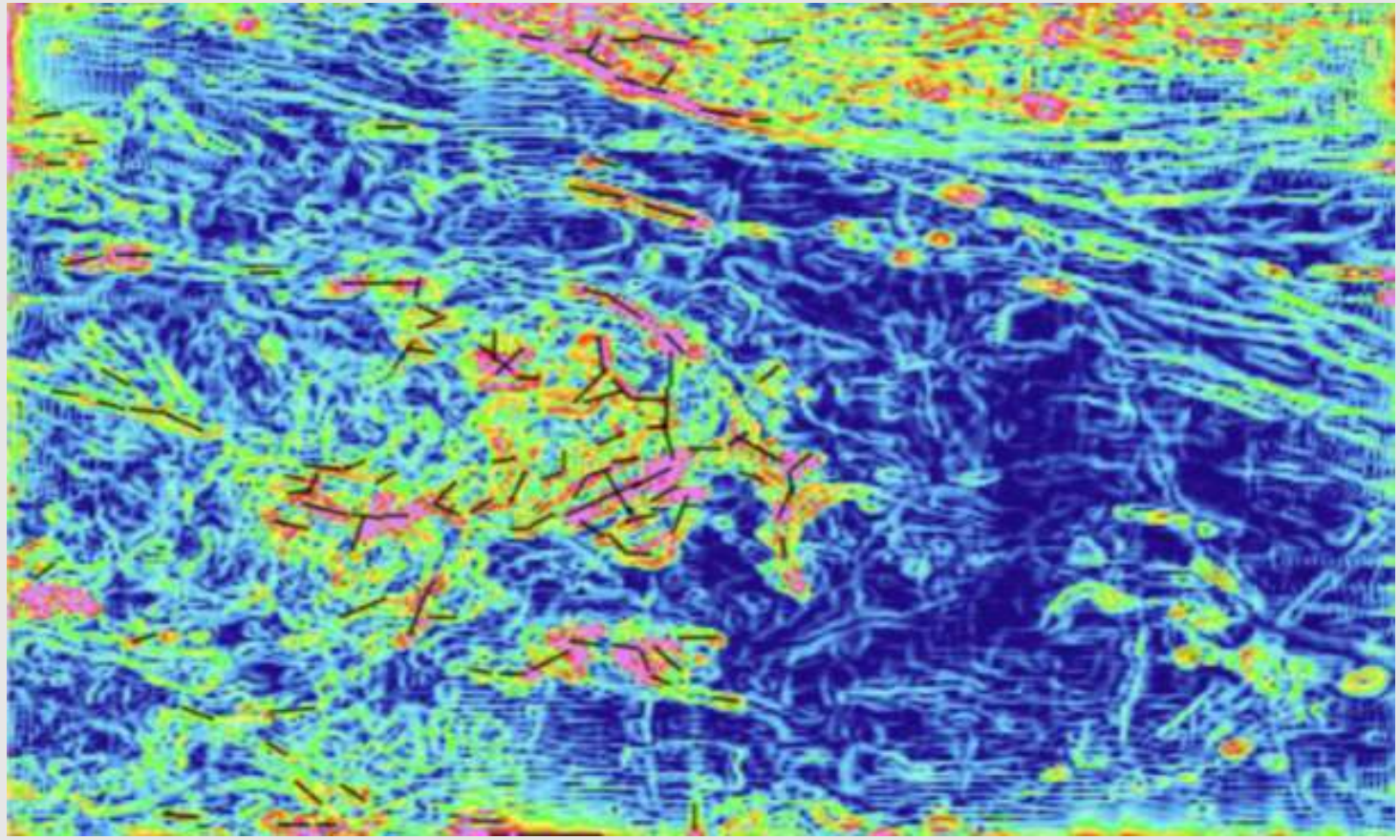
STRUCTURE
lineaments

GEOCHEMISTRY
sampling footprint

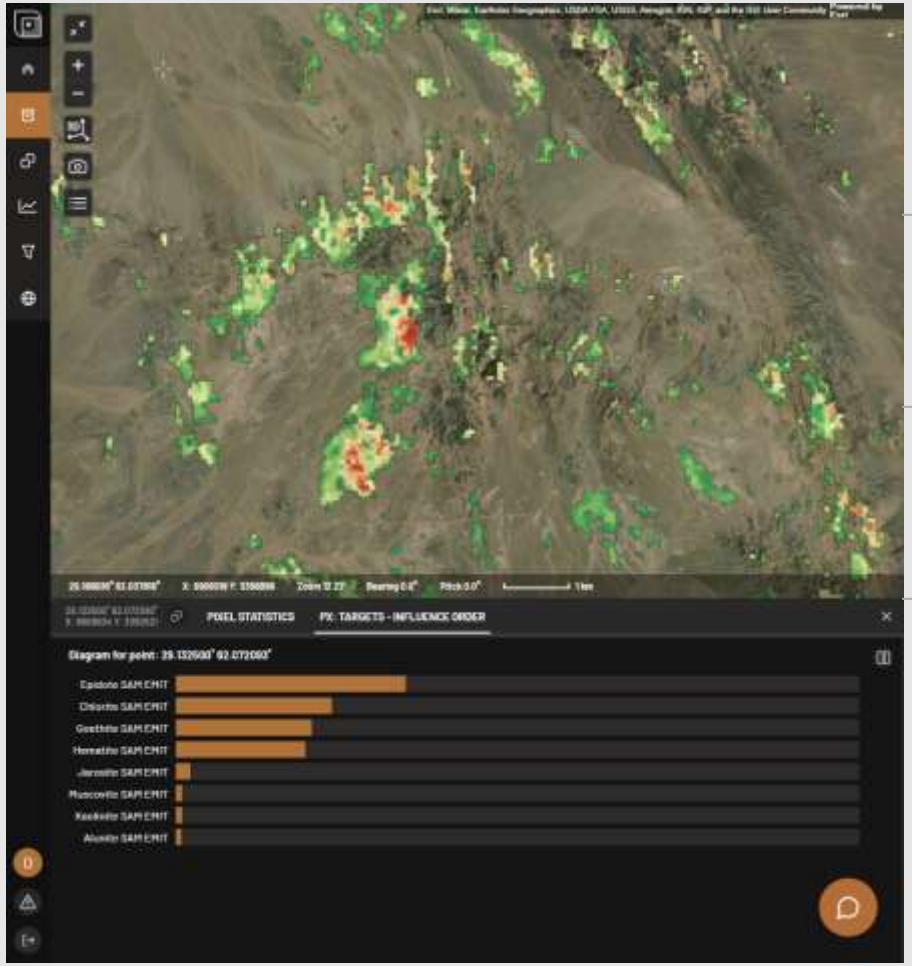
ALTERATION
proxy signal

HISTORICAL SAMPLING
survivorship

> Strongest pattern ≠ most causally relevant pattern.



No hotspot does not necessarily mean no deposit.



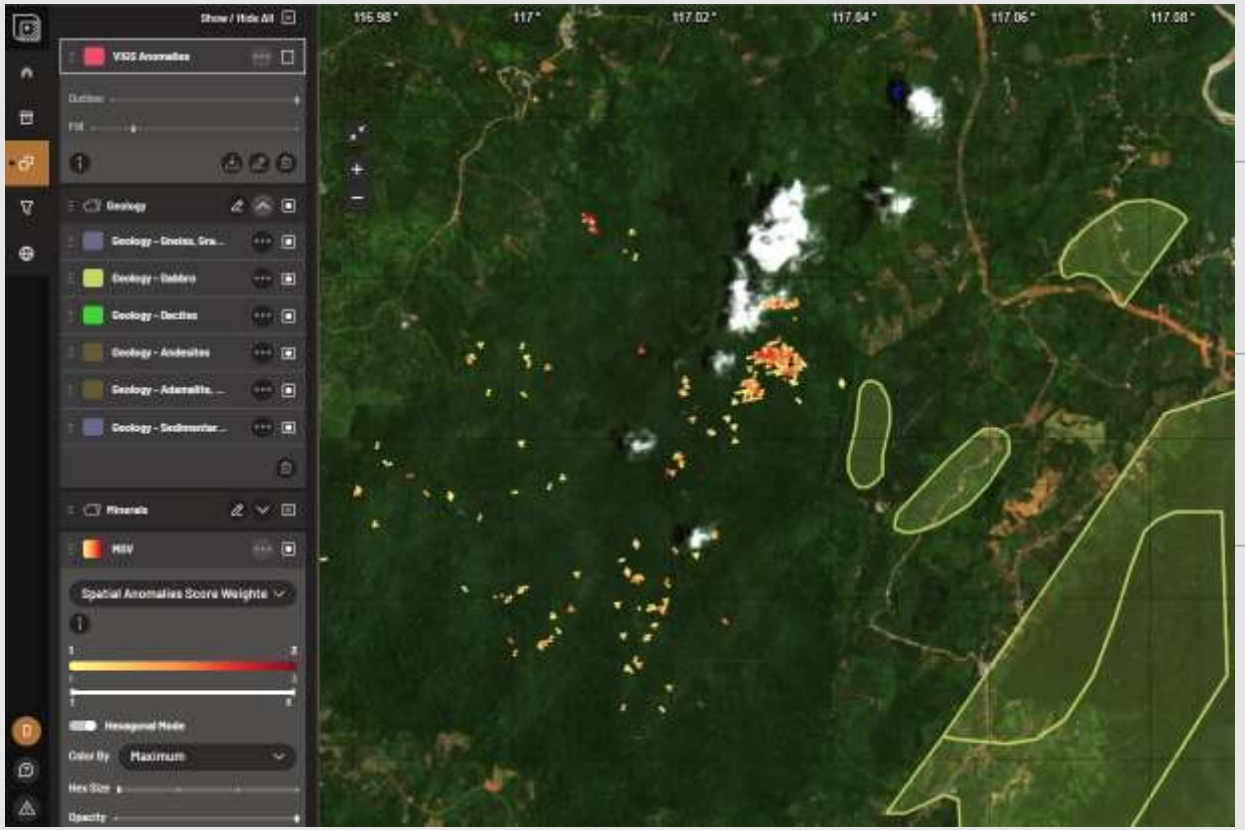
NO DEPOSIT
Geological absence.

NO DETECTABLE EXPRESSION
The data cannot see this deposit.

NO LEARNED ANALOGUE
The model never saw this scenario.

Non-detection is not the same as geological absence.

A weak signal cannot predict, but it can prioritize.



METAL-STRESSED VEGETATION
Biology responding to geology.

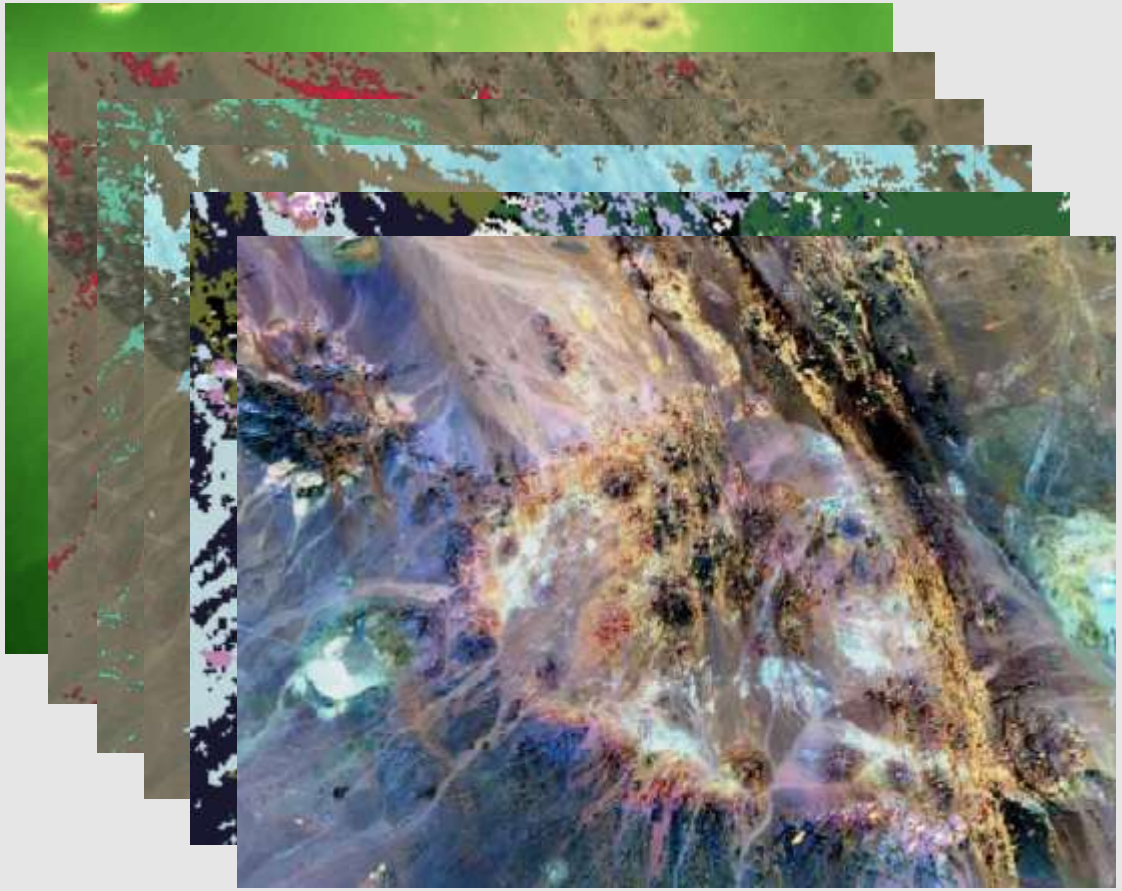
WATERSHED GEOCHEMISTRY
Chemistry transported from unknown source.

DRAINAGE & SNOWMELT PATTERNS
Surface physics responding to substrate.

> The value of a proxy is not in what it proves, but in preventing one from ignoring.

Not more outputs. More defensible decisions.

more maps · less clarity



GOAL

1 defensible exploration action

EXPLAINABLE	*why here, on which evidence*
CHALLENGEABLE	*can be stress-tested*
EXPLICIT	*acknowledges what we do not know*
DECISIVE	*changes what happens next*

Value is in reducing uncertainty where decisions are expensive.

The hardest problem in exploration is not generating signals. It is knowing which signals deserve trust.

We do not explore deposits directly.
We explore incomplete evidence to reduce uncertainty.

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