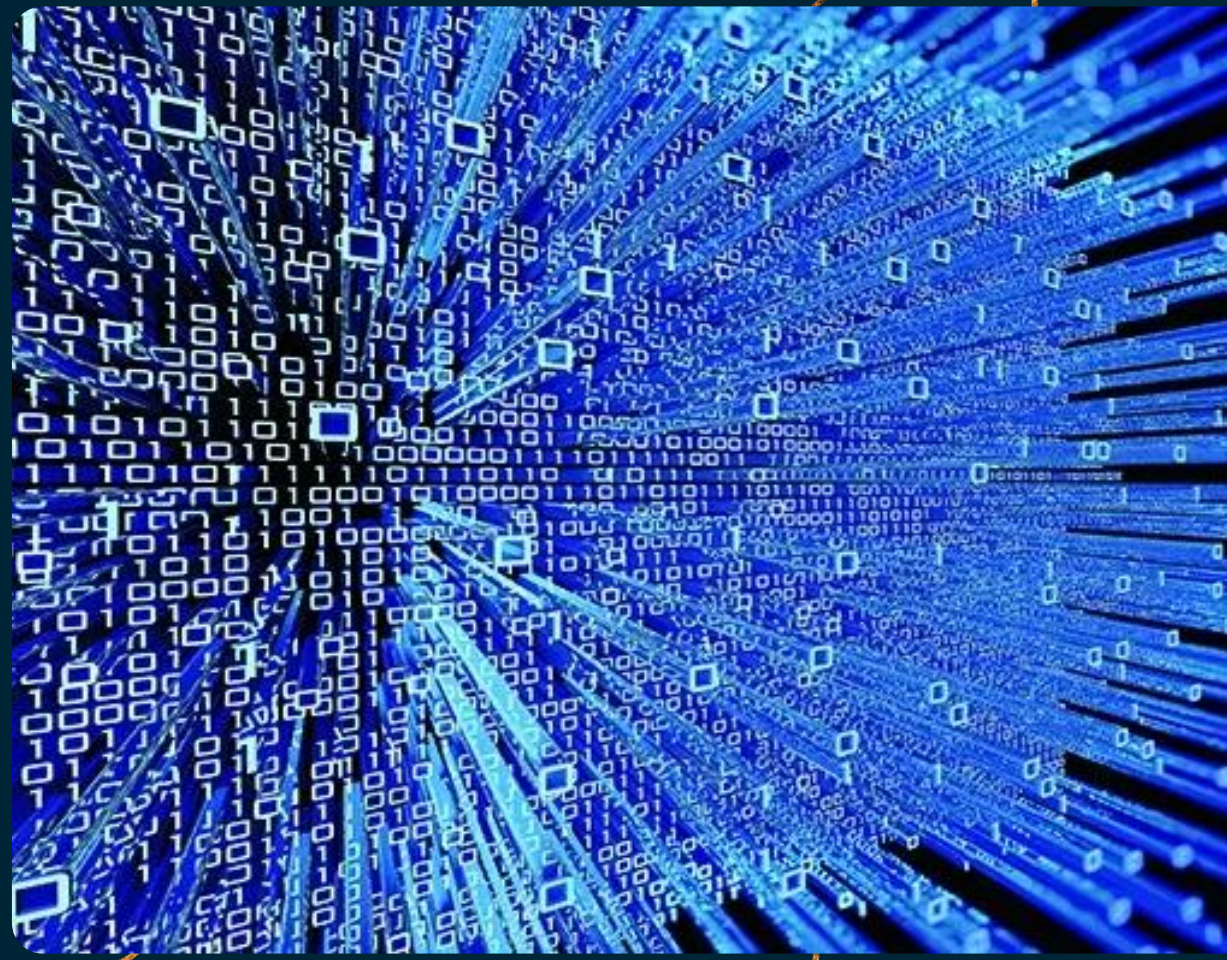
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The Next Wave of Discoveries

Are We Asking the Right Questions?

Keenan Jennings | OceanaGold

AusIMM NZ Branch Conference | Rotorua | August 2026



Disclaimer | It wasn't me guv!

A user guide to this presentation

- Parts of this presentation were built with AI
- I am not a data scientist – I am the person they must explain this stuff to
- I am an exploration geologist who has been off the rig long enough to think about what we should have been asking while I was on it
- I don't know much about AI but I do know a model has never said no to another drill hole
- I hope to have good arguments with you after this talk
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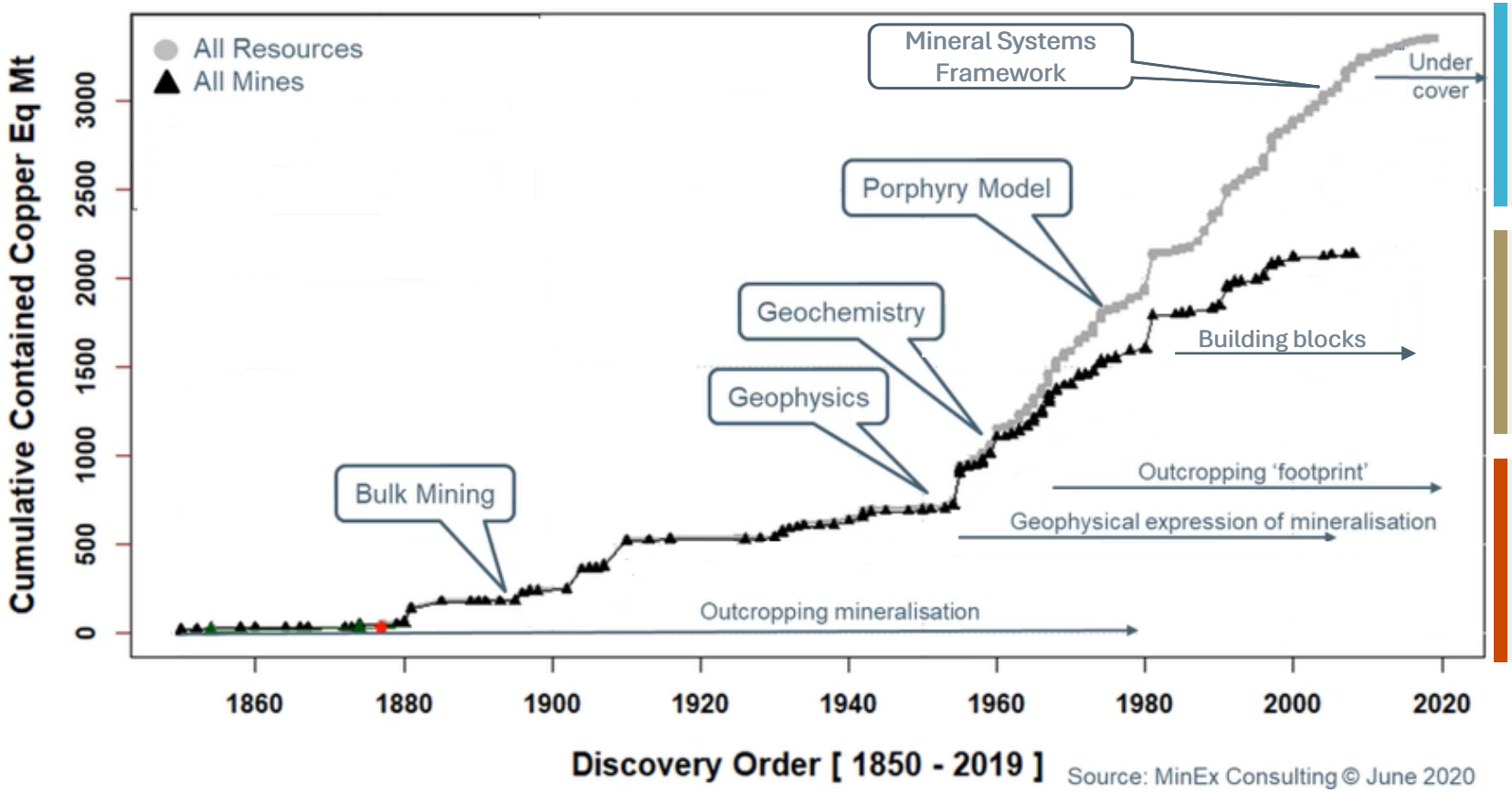
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- I got better results once I stopped asking “build me a presentation”

Discovery History | Copper creaming curve

We have never been better at finding things that never become mines



302

circum-Pacific copper deposits discovered since 1960

> 1,300 Mt

of contained copper in those discoveries

< 40%

have become mines

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Discovery curve: MinEx Consulting (2020). Quality-gap statistics: Jennings, McCuaig, Januszczak & Evans, SGA 2022; after Schodde (2017).

Inflections | Asking a specific question

Sharp questions report sharp answers

Initiation	Issue	Defining Question	Uplift
~1895	**Flotation & bulk mining**	Can we process lower-grade material economically?	**1910s**
1940s	**Airborne magnetics & EM**	What petrophysical properties relate to mineralisation?	**1950s**
1960s	**Stream sediment geochemistry**	Can low-level geochemical halos vector into buried ore?	**1970s**
1970s	**Porphyry deposit models**	What is the 3D alteration geometry, and how does it vector?	**1980s**
2010s	**Mineral systems thinking**	Can we predict camps rather than individual deposits?	**Soon?**
2018 +	**Machine learning & AI**	**What is the question here that we can agree on?**	**When?**

After Jennings et al., SGA 2022.

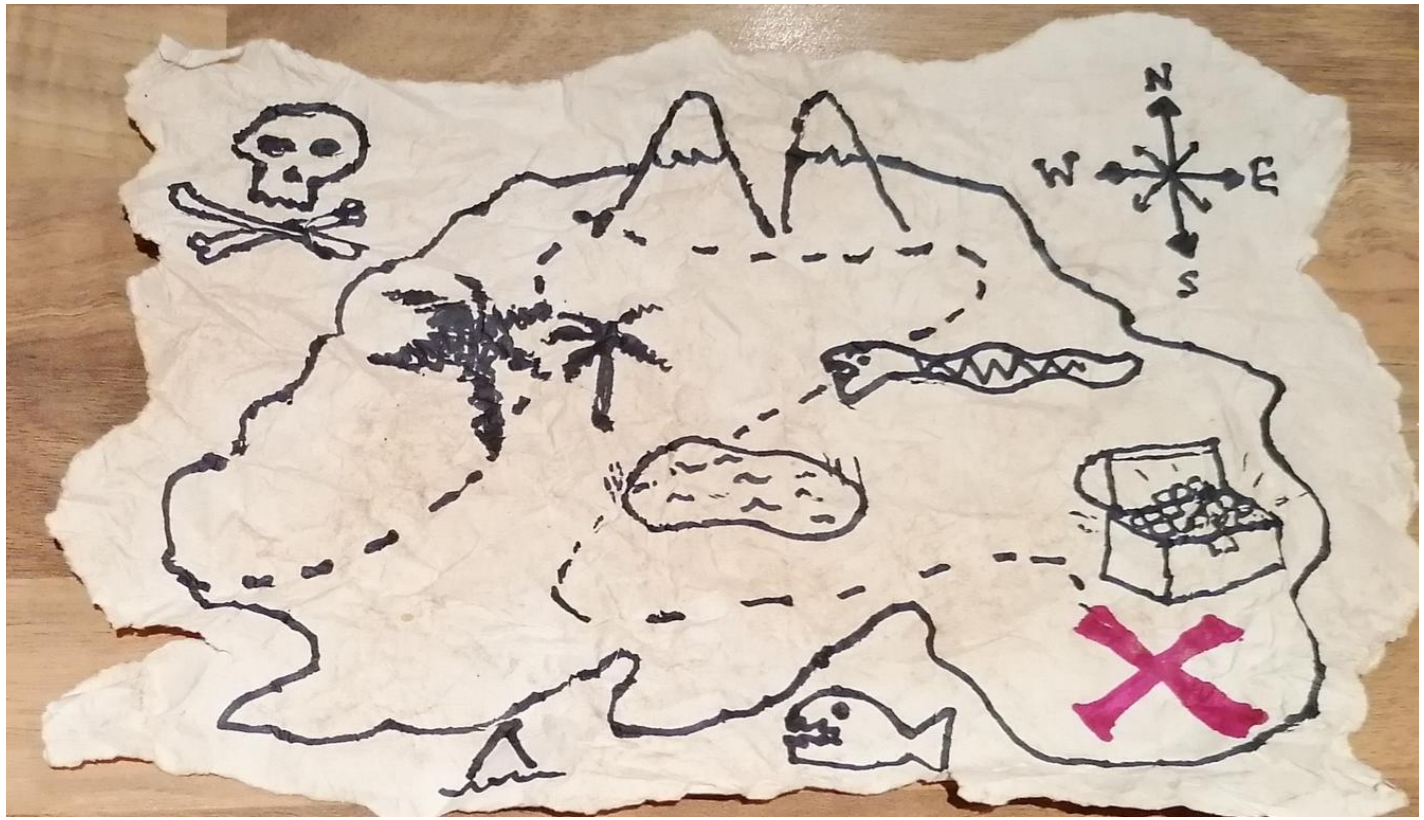
Hypotheses | Essential to success

All sound science starts with a testable hypothesis

“Generate Targets”

“Taa daa”

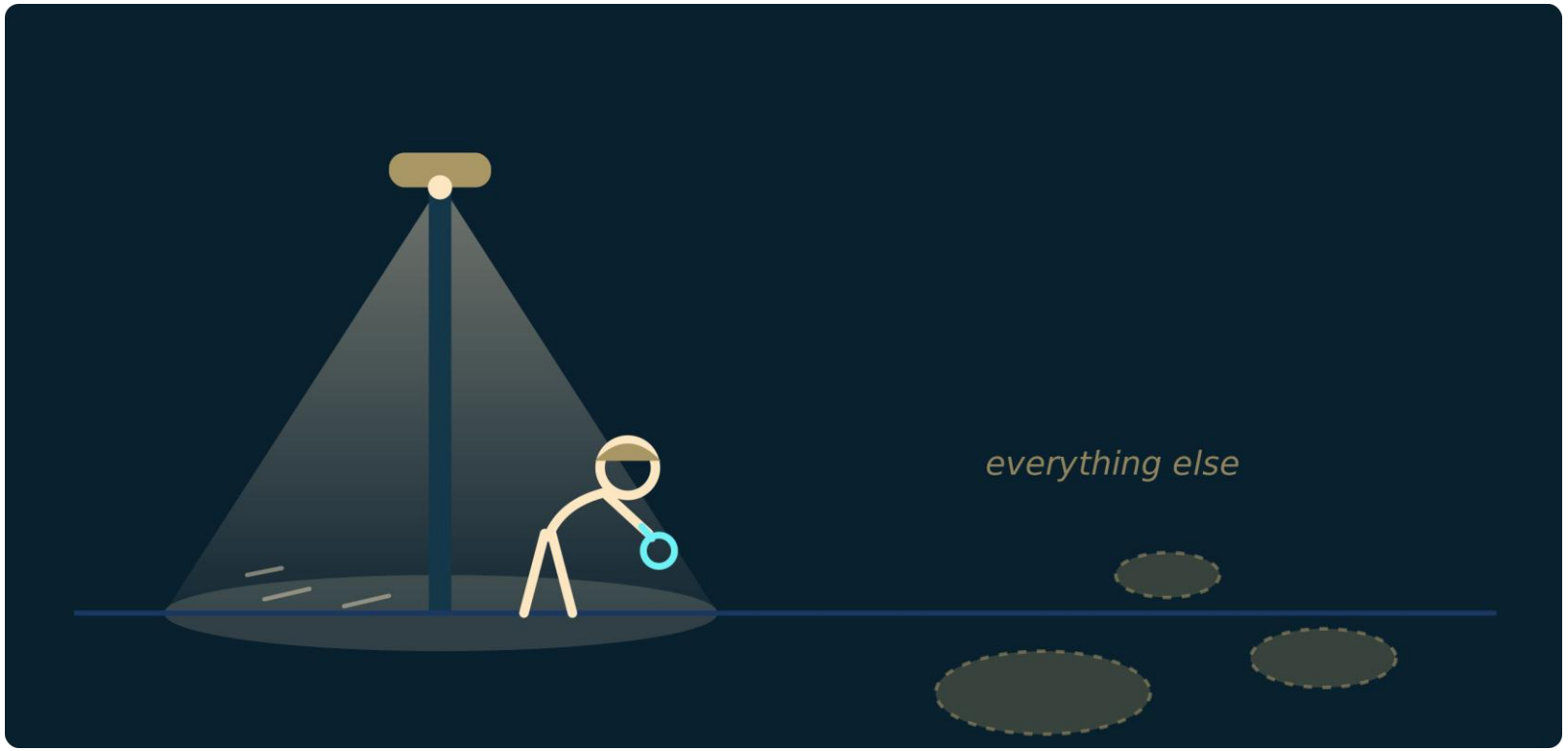
AI is very good at drawing this map….it is not very good at telling you why.



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Data | Where we look

We have an inherent bias that is hard to shake



“Why are you looking here?”

“Because this is where the light is.”

Are we training on a behaviour or on geology?

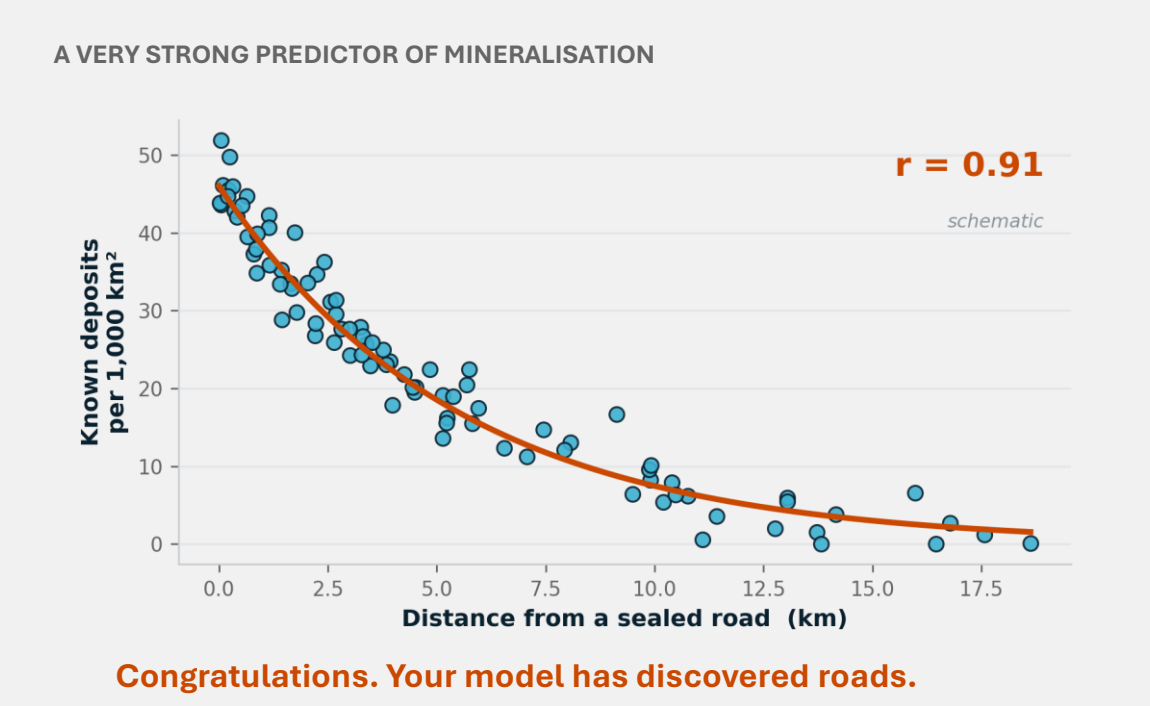
Data density records where we have already been. It is not evidence of where ore is.

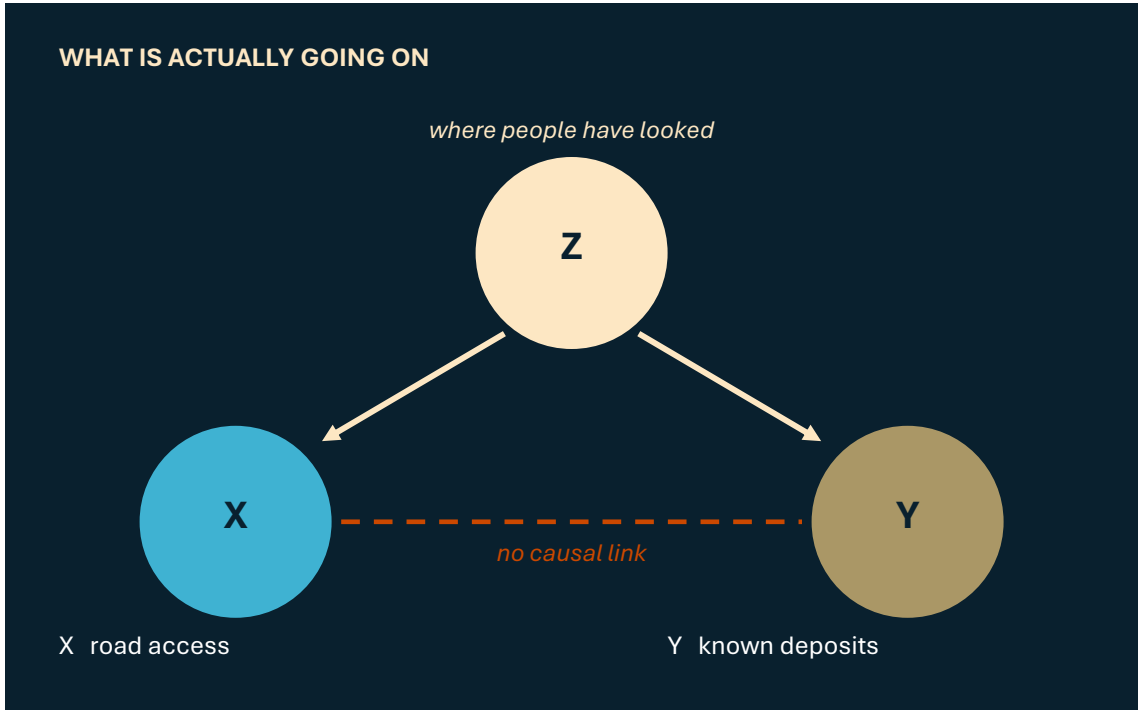
This bias is real, it is measurable, and it is in every training set we own. Give it a name — call it Z.

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Data | Correlation or causation

But wait, there's more!



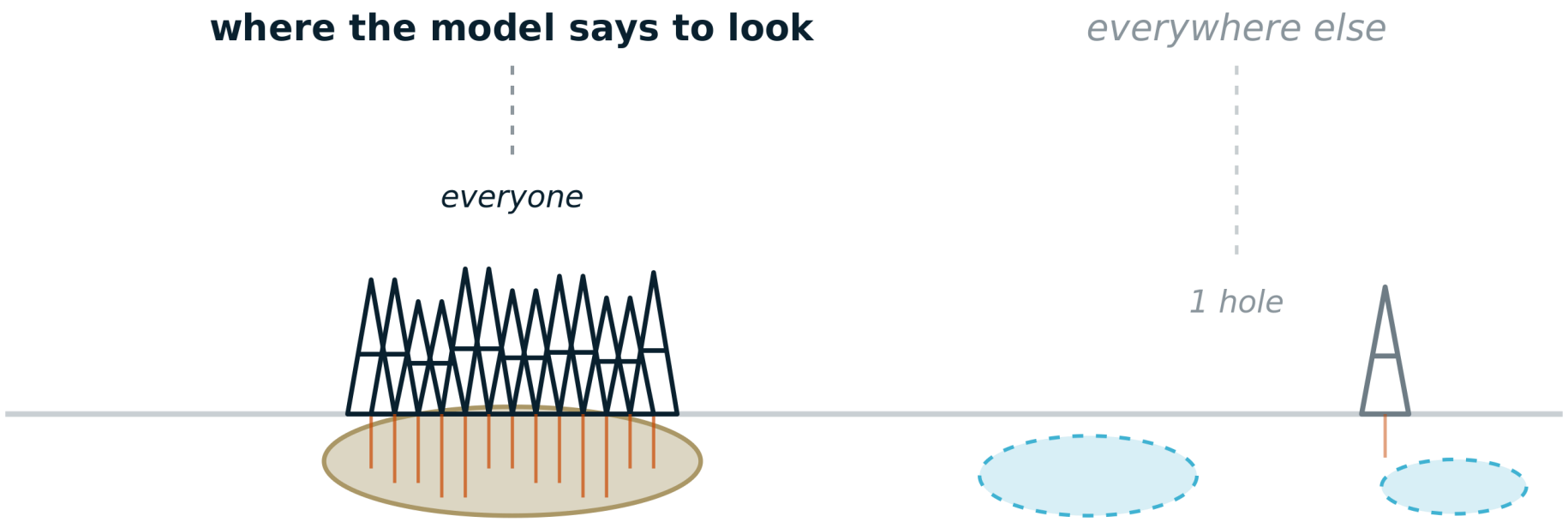


> *"Machine Learning... does fall short of explaining the context of such correlations... or we risk chasing a lot of false positives in our exploration programs or worse, exploring in the wrong areas."*

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Search Spaces | Training data

Risk is not that AI is wrong, but that it is average



Known deposits are the labels

Model optimises on what we have already found.

Variation looks like noise

The fitted model suppresses “variations on a theme”.

Convergence, not discovery

We all start on a path of group think and delude ourselves into becoming (even bigger) data pigs

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Data | Clean or lean

Uncertainty is not the problem, it is the opportunity

The industry habit: clean the data

- Remove uncertain, legacy, or ambiguous data points
- Standardise to a single interpretation before analysis
- Reduce variance to improve model fit
- Result: artificial correlation — signal discarded with the noise

The alternative: lean into the data

- Apply an uncertainty flag rather than deleting the record
- Map uncertainty spatially —reveal the knowledge gap
- Low-confidence guides the next question
- The map of what we do not know is the exploration program

Uncertainty mapped is uncertainty to be addressed.

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The Questions We Need to Ask Ourselves

Before the next model is trained

01

Are our data repositories fit for AI training — or just large?

Volume is not fitness for purpose. Legacy data carries assumptions, biases and missing context.

02

Are we flagging uncertainty as a target — or deleting it?

Spatially mapped uncertainty tells us where the next question sits. Cleaning it away removes the ability to answer that question.

03

What specific vectors and proxies — why?

The question must be geological before it is computational. Define the proxy. Understand the process it represents.

04

How do we define ‘ore’ in 2030 — are today's questions aligned?

Energy, water and carbon intensity will redefine economic thresholds. Today's questions must anticipate tomorrow's ore.

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AI is the engine.
Data is the fuel.
The geologist is the driver.

Be specific.	Generic questions deliver generic results. The question must be geological before it is computational.
Get comfortable with uncertainty.	Exploration is the reduction of uncertainty and search space — not the elimination of doubt.
Be prepared to go where the light isn't.	The best work removes the most uncertainty from the model.

The next inflection on the discovery curve belongs to those who ask better questions.

Start your engines!

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