STRATUM: Corporate Case Study

Arsenic (Deleterious Element) Modelling with Stratum SATS

June, 2022

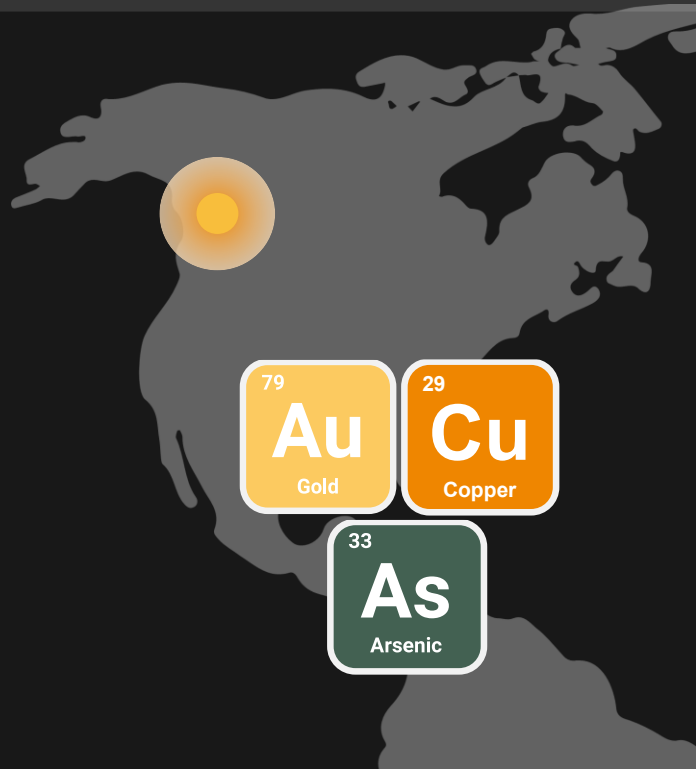
STRATUM AI

STUDY CASE
GOLD-COPPER DEPOSIT

Large Copper-Gold porphyry in British Columbia

THE DEPOSIT

- Large feasibility stage Gold-Copper Porphyry in British Columbia with high arsenic occurrence
- Data consists of ~20k samples over ~120 drillholes
- Most drillholes are assays for over 30 elements



STUDY CASE
GOLD-COPPER DEPOSIT

Large Copper-Gold porphyry in British Columbia

PROBLEM

The deposit has high arsenic occurrence & variation while being located in an environmentally sensitive area

OBJECTIVE

More accurately model arsenic to de-risk initial mine design

OUTCOME

A more accurate arsenic resource model creates value by better identifying high risk deleterious ore early in mine design

SOLUTION

Despite limited data, **AI outperforms Kriging** by learning complex non-linear patterns from multi-element assay data

STUDY CASE
GOLD-COPPER DEPOSIT

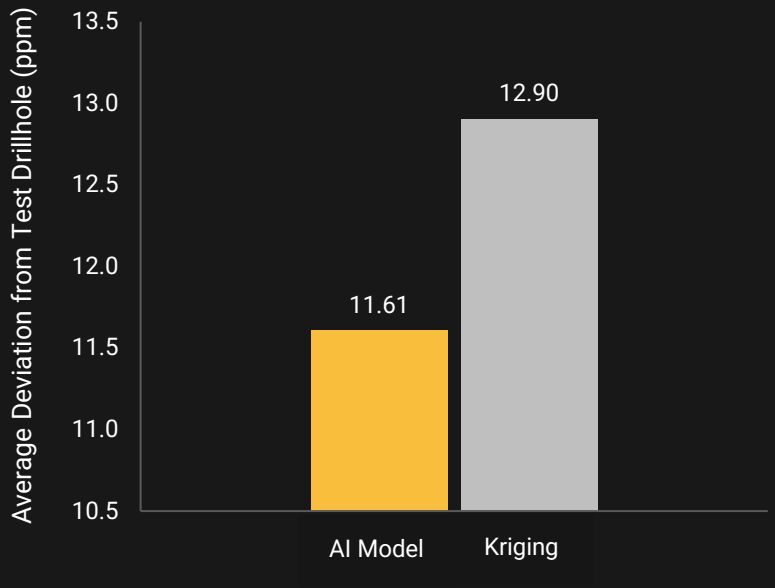
QUESTIONS WE ANSWER

1 **ARSENIC MODELLING**
Does the AI outperform kriging on single element arsenic modelling?

2 **MULTIELEMENT ANALYSIS**
Can AI accuracy be improved by leveraging multi-element assays?

3 **IMPROVE MODELLING**
What assays contribute to improved arsenic modelling?

ARSENIC MODELLING
GOLD-COPPER DEPOSIT



KRIGING VS ARSENIC ONLY AI MODEL

AI can deliver performance improvements without needing to leverage multi-element data

Method (cross validation):

- Create kriging, AI model with 90% of drillholes to predict remaining 10%.
- Repeat with 10 different 90/10 splits.
- Measure average deviation between prediction and drillholes in remaining 10%

Results:

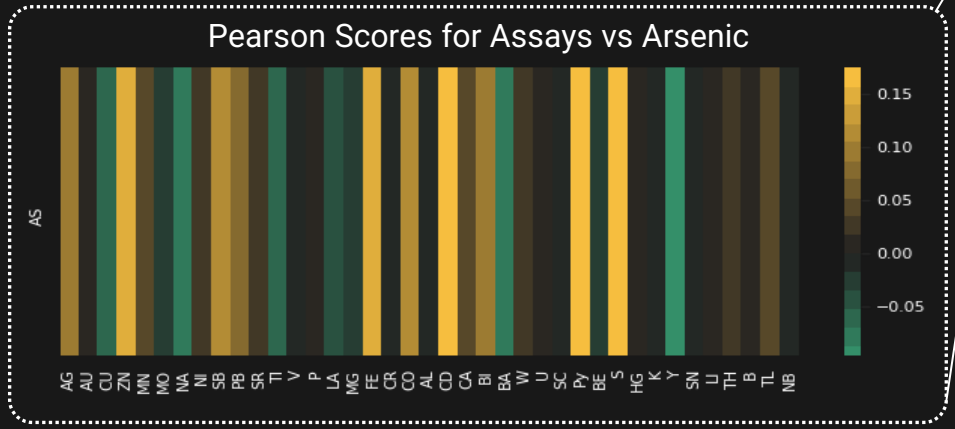
- AI multi-element model has 10.0% less deviation compared to kriging

ARSENIC MODELLING
GOLD-COPPER DEPOSIT

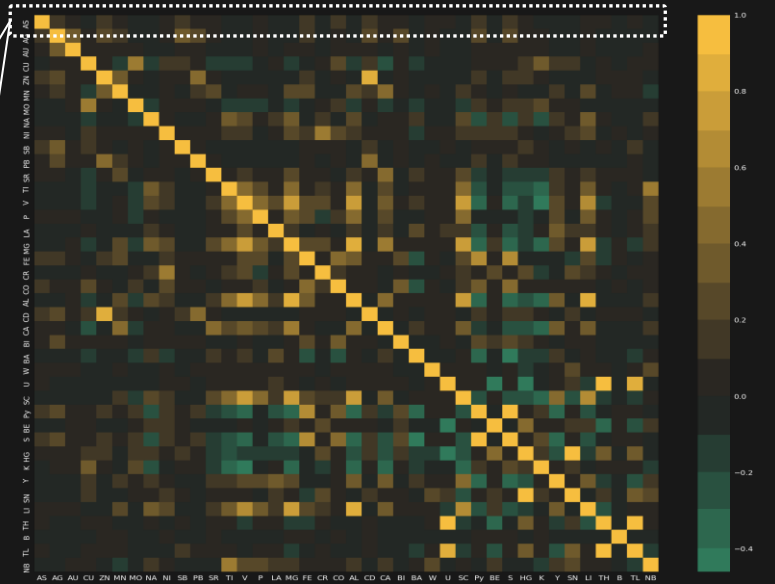
LINEAR CORRELATION ANALYSIS BETWEEN ELEMENTS

Method (Pearson Correlation)

- The Pearson correlation matrix tracks how strongly every pair of elements is correlated
- It can only identify linear correlations
- **S**, **Py**, **Cd** have strongest linear correlations



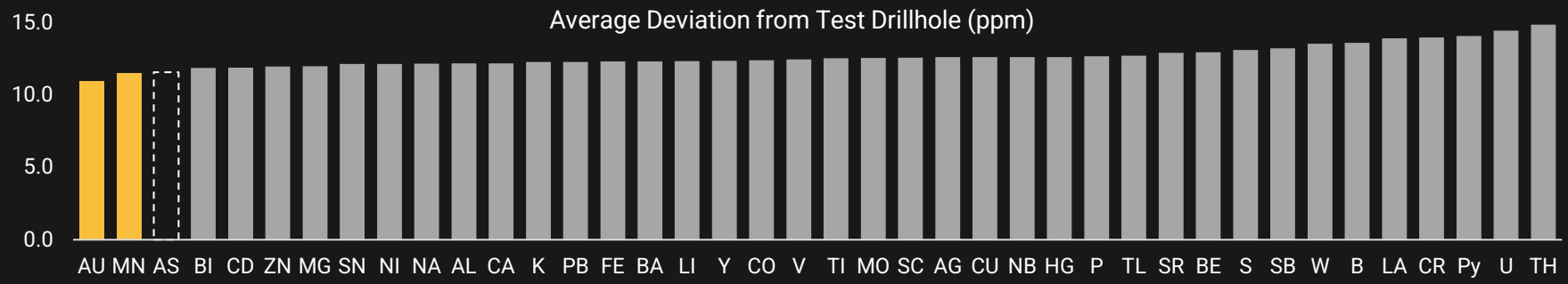
MULTI-METAL PEARSON CORRELATION MATRIX



ARSENIC MODELLING
GOLD-COPPER DEPOSIT

NON-LINEAR CORRELATION ANALYSIS

Many geological patterns are non-linear and form complex relationships between different elements



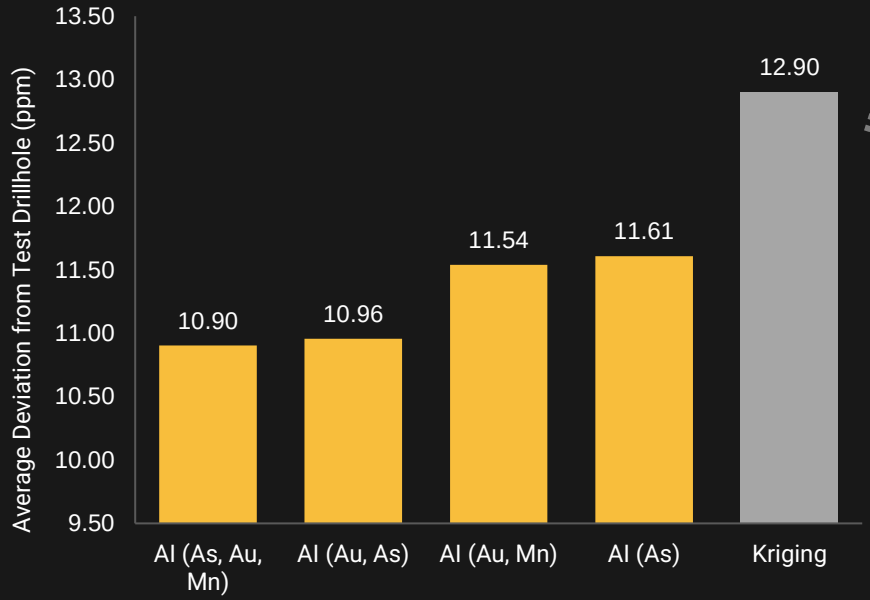
Method (Interaction Testing)

- In geology, these correlations are often so complex they cannot even be modelled by simple mathematical functions
- The best way to identify them is to add individual elements into the AI model and track accuracy improvement

Results:

- Elements that most improve model: **Au**, **Mn**
- Elements with strong **linear** correlation did not improve model because they did not add **unique** information to model

ARSENIC MODELLING
GOLD-COPPER DEPOSIT



ACCURACY OF MULTIMETAL ESTIMATIONS

AI successfully leverages multi-element patterns from Mn, Au to more accurately predict As

Method (cross validation):

- Create kriging, AI model with 90% of drillholes to predict remaining 10%.
- Repeat with 10 different 90/10 splits.
- Measure average deviation between prediction and drillholes in remaining 10%

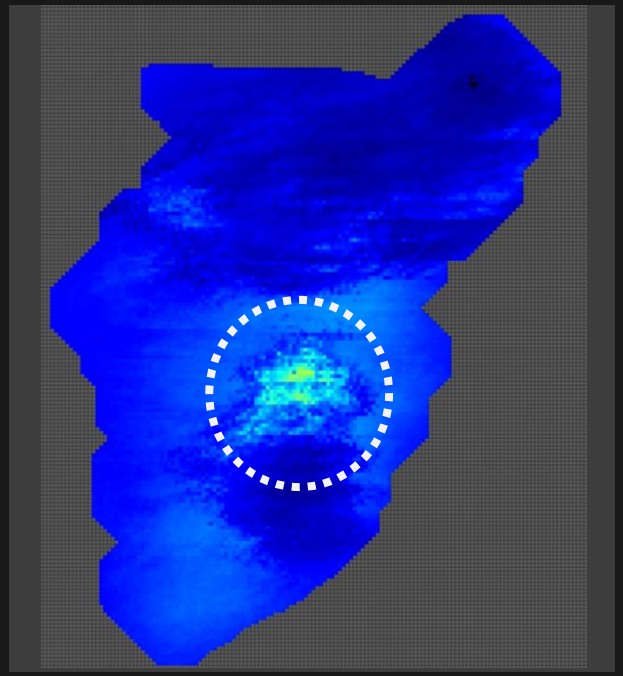
Results:

- AI multi-element model has 18.4% less deviation compared to kriging

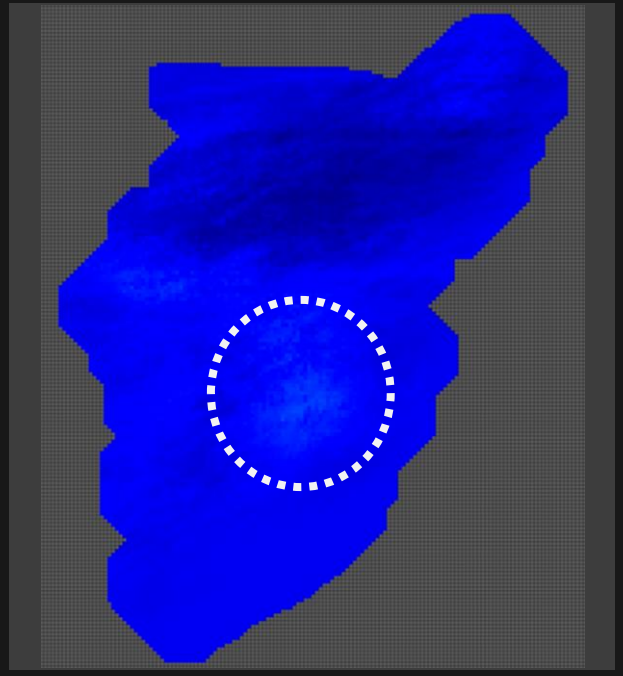
ARSENIC MODELLING
GOLD-COPPER DEPOSIT

CROSS SECTION
X=22095

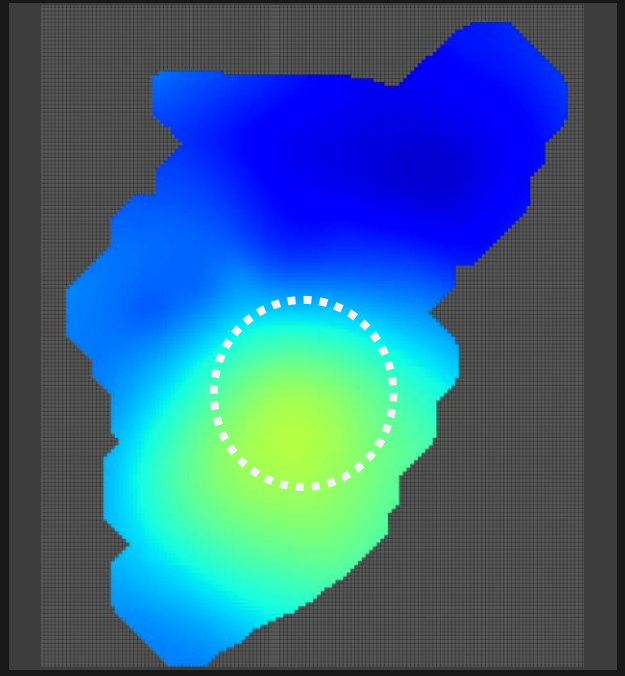
Block size: 5 x 5 x 5m



AI (As, Au, Mn)



AI (As)

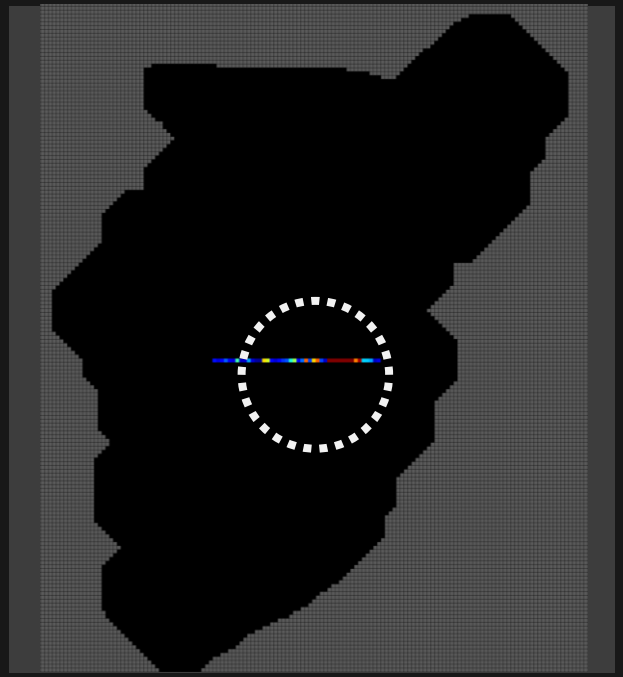


Kriging

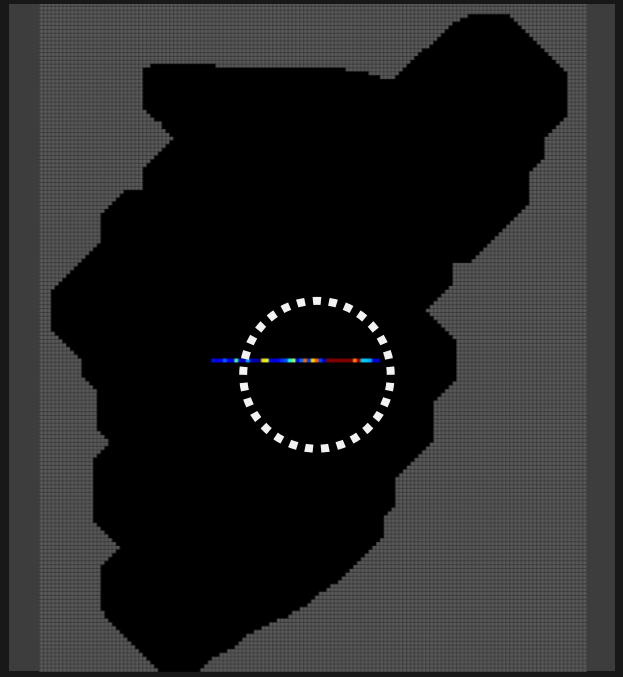
ARSENIC MODELLING
GOLD-COPPER DEPOSIT

CROSS SECTION
X=22095

Block size: 5 x 5 x 5m



AI (As, Au, Mn)



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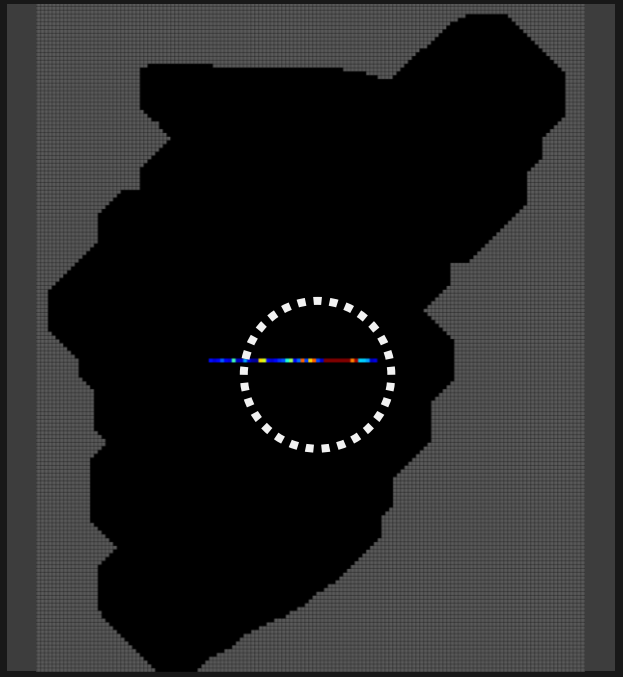
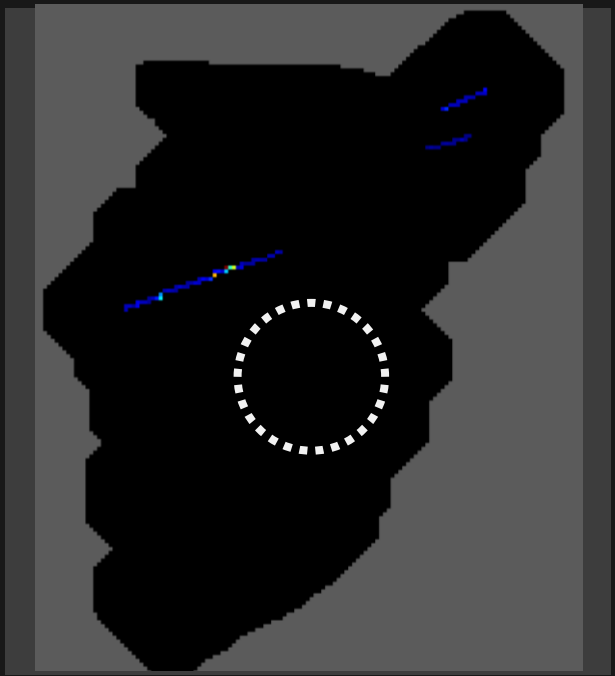


Kriging

ARSENIC MODELLING
GOLD-COPPER DEPOSIT

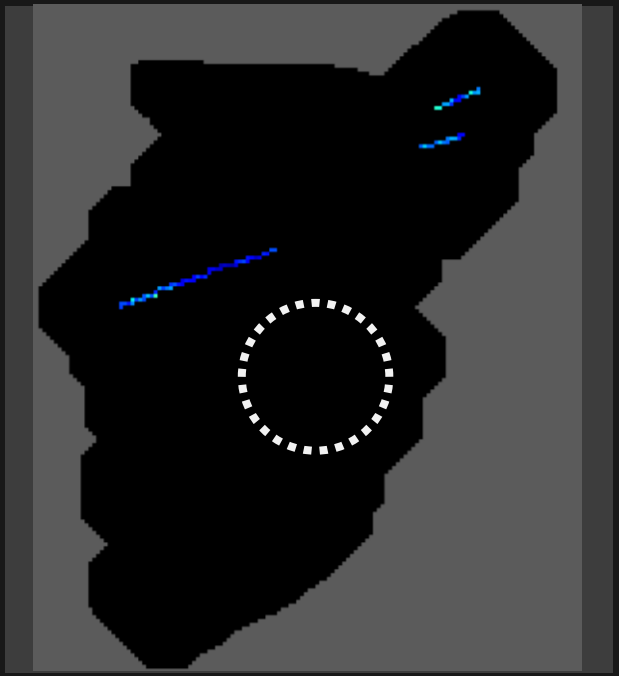
CROSS SECTION
X=22095

Block size: 5 x 5 x 5m
Drillholes within 45m of X=22095 included



AI (As, Au, Mn)

AI (As)



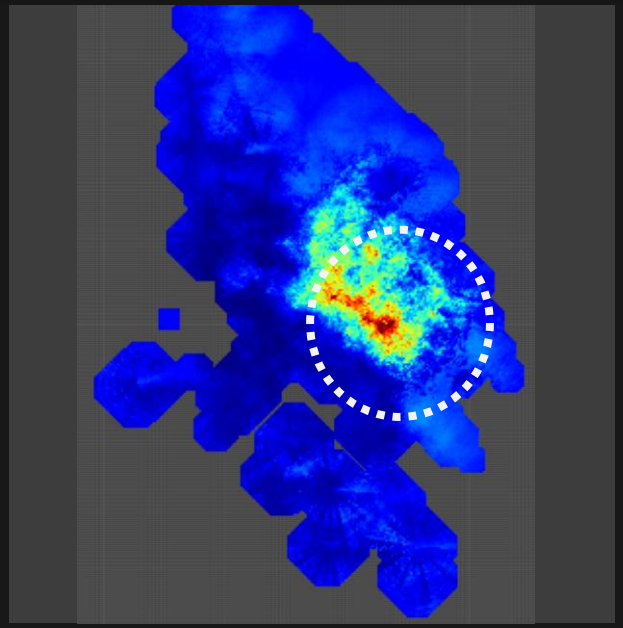
Kriging

ARSENIC MODELLING
GOLD-COPPER DEPOSIT

BENCH ANALYSIS
Z=1275

Block size: 5 x 5 x 5m

AI models predict similar complex arsenic mineralization structures allowing for precise ore sterilization



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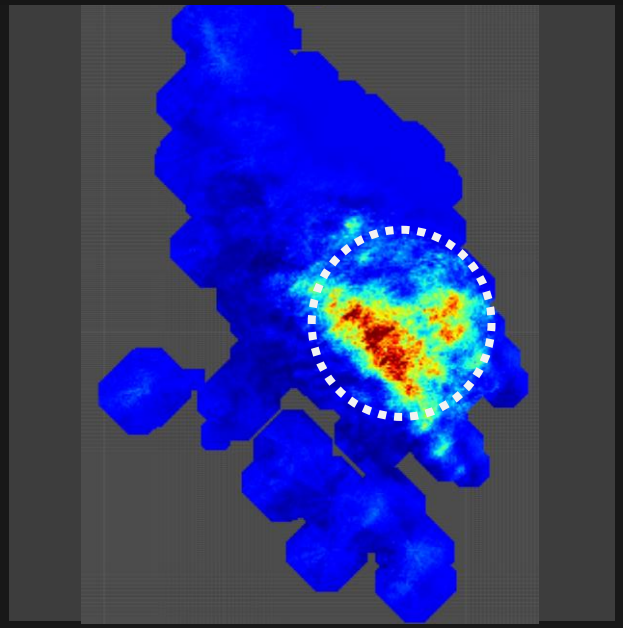
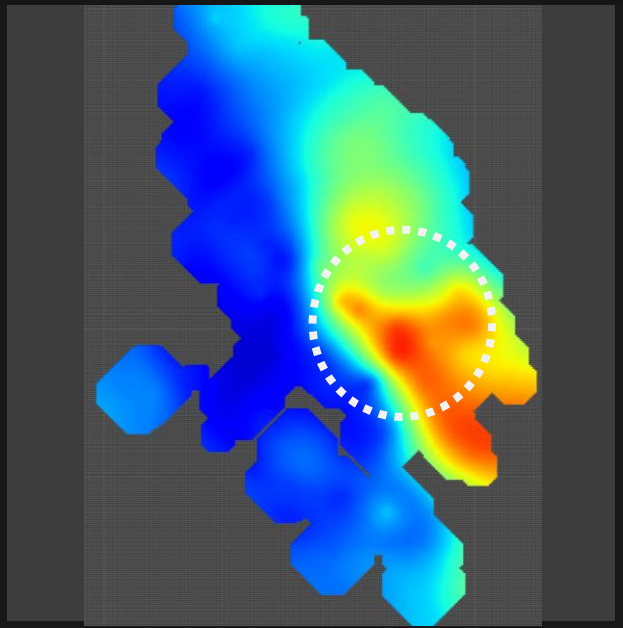


AI (As)



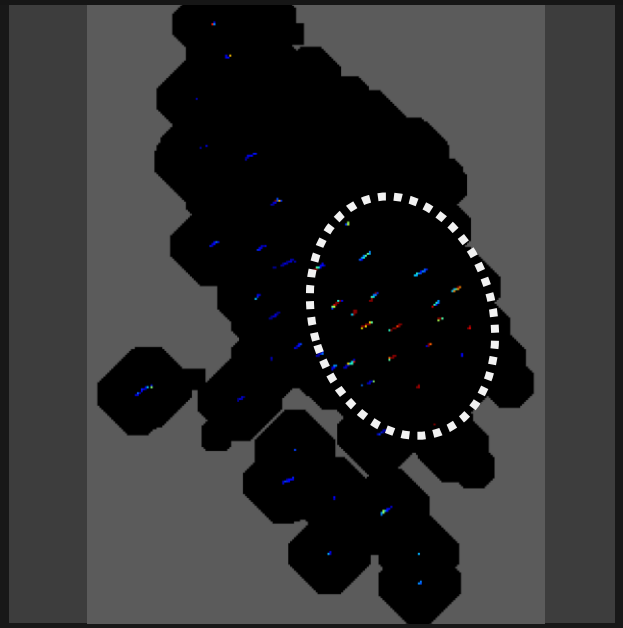
Kriging

ARSENIC MODELLING
GOLD-COPPER DEPOSIT

BENCH ANALYSIS
Z=1275

Block size: 5 x 5 x 5m
Drillholes within 30m of Z=1275 included

AI models predict similar complex arsenic mineralization structures allowing for precise ore sterilization



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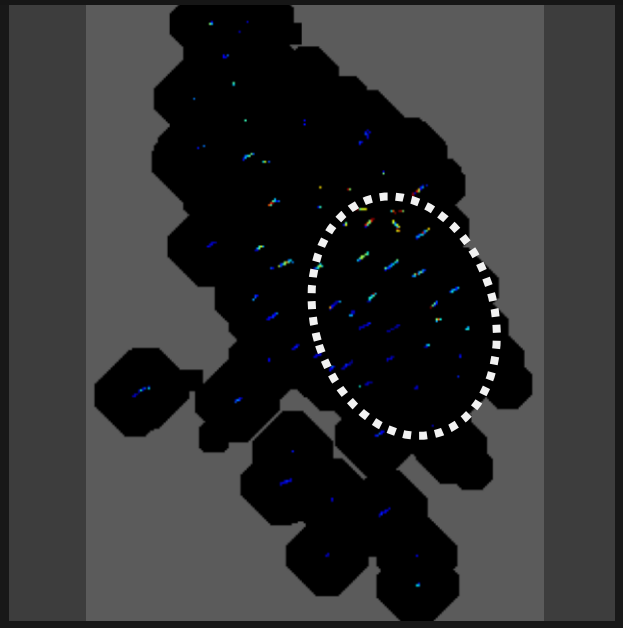
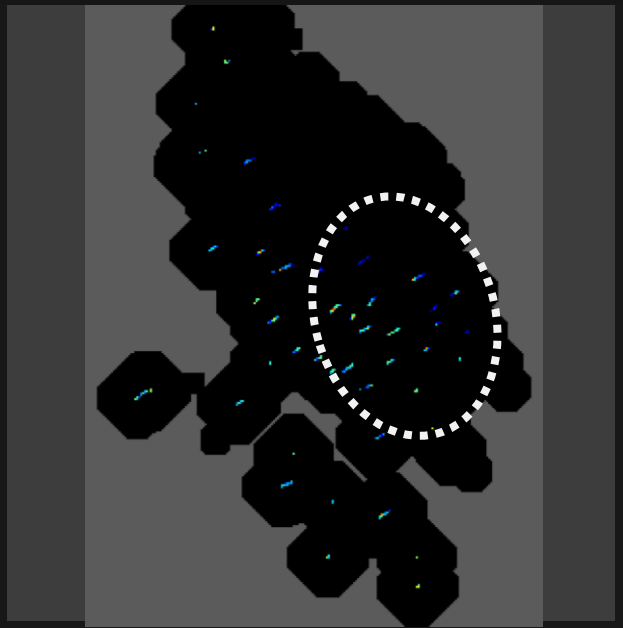


AI (As)



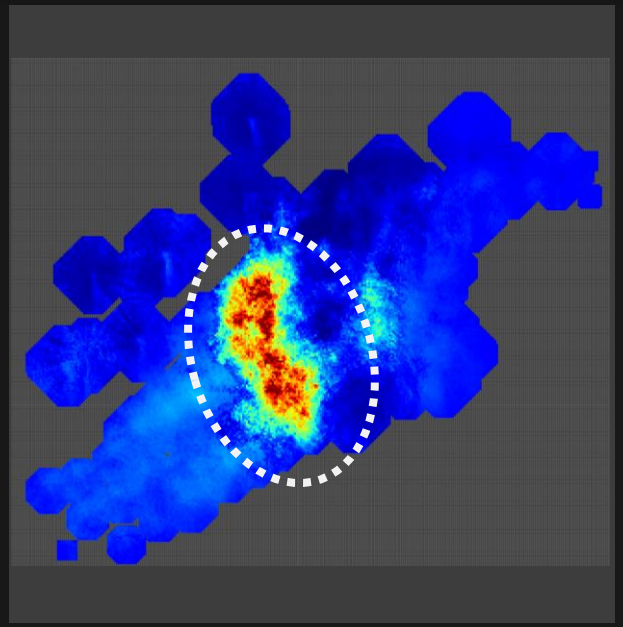
Kriging

ARSENIC MODELLING
GOLD-COPPER DEPOSIT

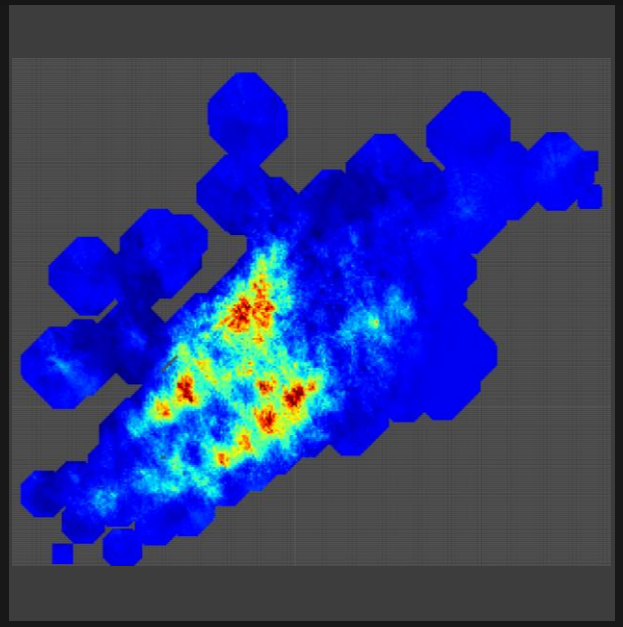
BENCH ANALYSIS
Z=1175

Block size: 5 x 5 x 5m

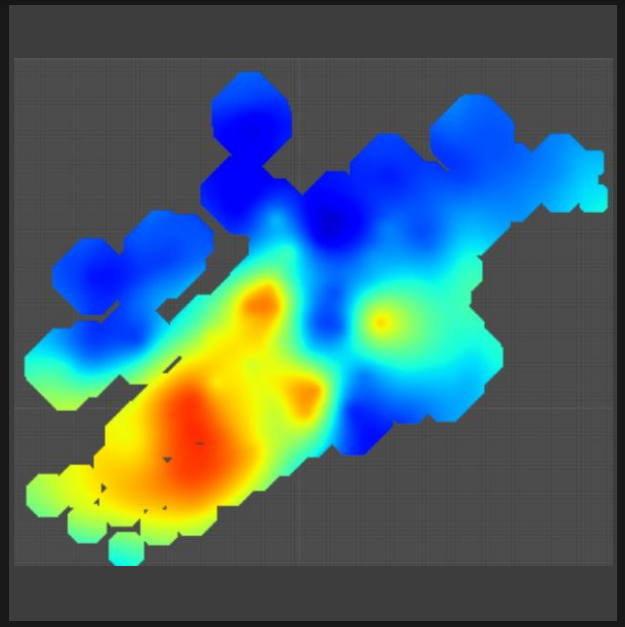
AI leverages Au & Mn data to model complex mineralization structure



AI (As, Au, Mn)



AI (As)



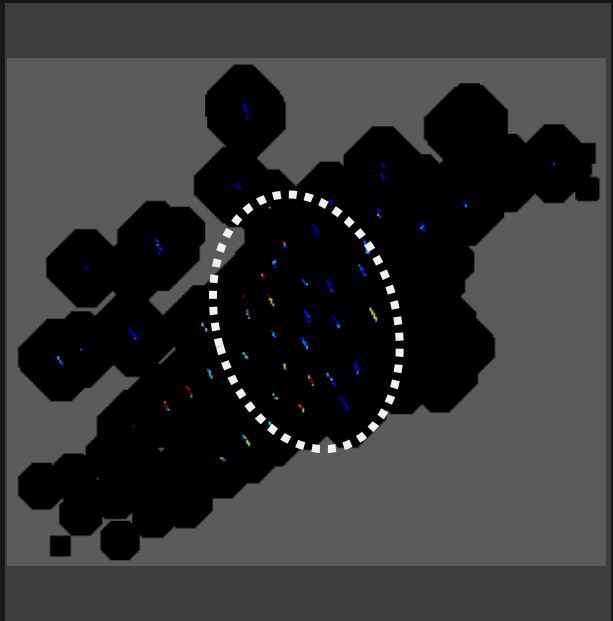
Kriging

ARSENIC MODELLING
GOLD-COPPER DEPOSIT

BENCH ANALYSIS
Z=1175

Block size: 5 x 5 x 5m
Drillholes within 30m of Z=1275 included

AI leverages Au & Mn data to model complex mineralization structure



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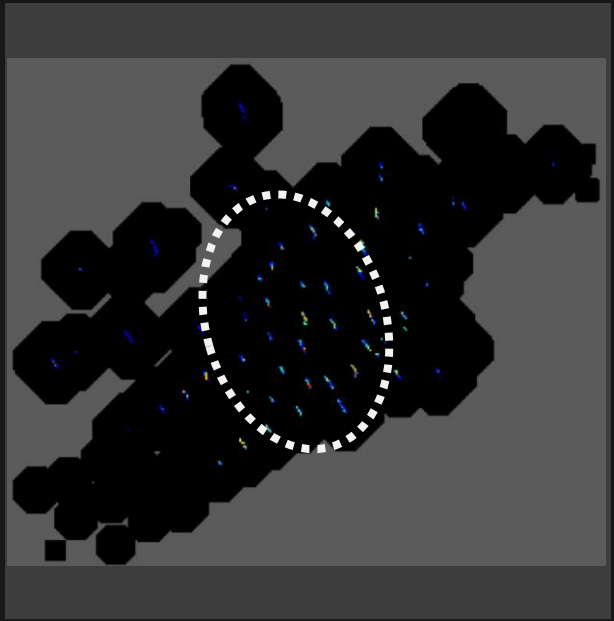

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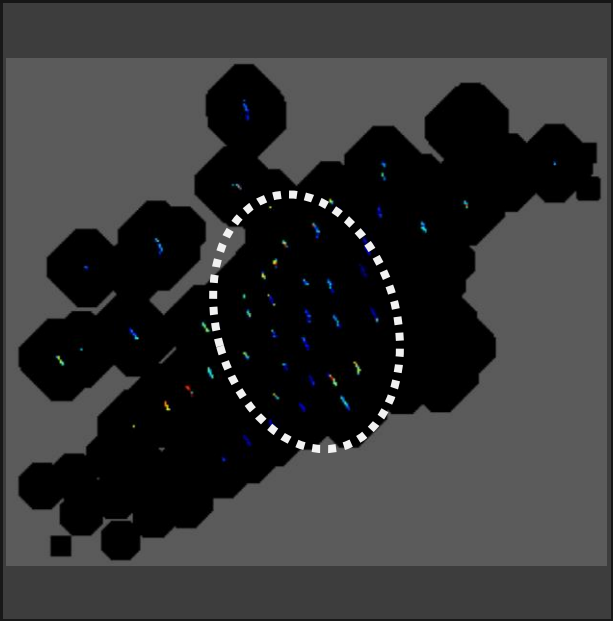

Kriging

ARSENIC MODELLING
GOLD-COPPER PORPHYRY

RESULTS

Does the AI outperform kriging on single element arsenic modelling?

10%

HIGHER ACCURACY
AI determines the arsenic concentration of any block with **10.4%** higher accuracy

Can AI accuracy be improved by leveraging multi-element assays?

18%

HIGHER ACCURACY- MULTIELEMENT INPUT
AI model with access to multi-element assays is 18.4% more accurate than kriging

What assays contribute to improved arsenic modelling?

Au - Mn

RELEVANT INPUTS
Modelling improvement is achieved by adding **Au** & **Mn** assays to AI input

STRATUM

LOW RISK – HIGH YIELD – AI DRIVEN