Stratum: Corporate Case Study

June 2021

Porphyry Gold-Copper Overview

The Deposit:

- [redacted] is a 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

The Challenge with [redacted] . . .

The Problem

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

The Objective

More accurately model arsenic to derisk initial mine design

The Outcome

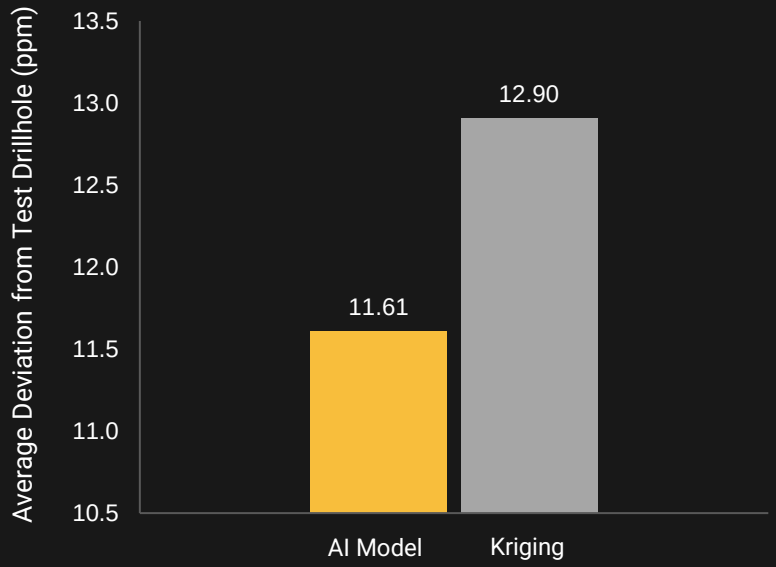
A more accurate arsenic resource model creates value by better identifying high risk deleterious ore early in mine design

THE SOLUTION

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

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:

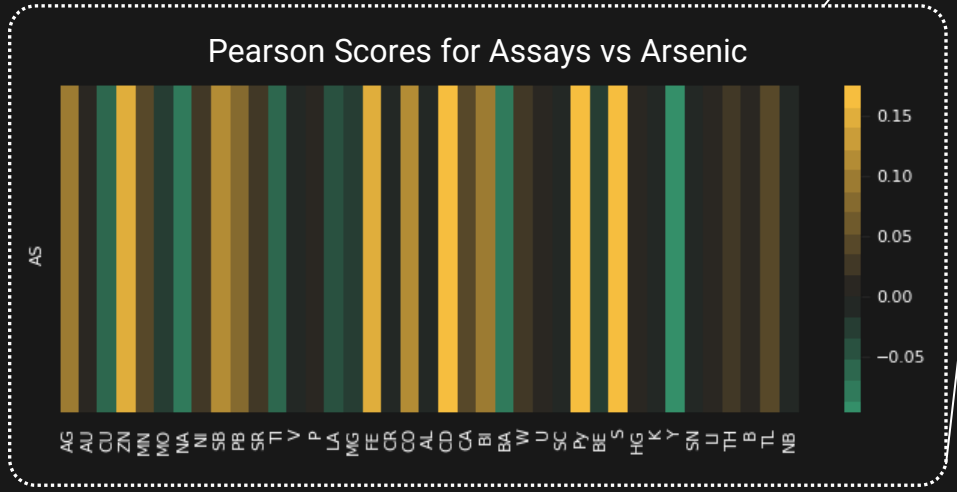
- AI multi-element model has 10.0% less deviation compared to kriging

Can we improve accuracy by feeding other elements to the model? What elements should we use?

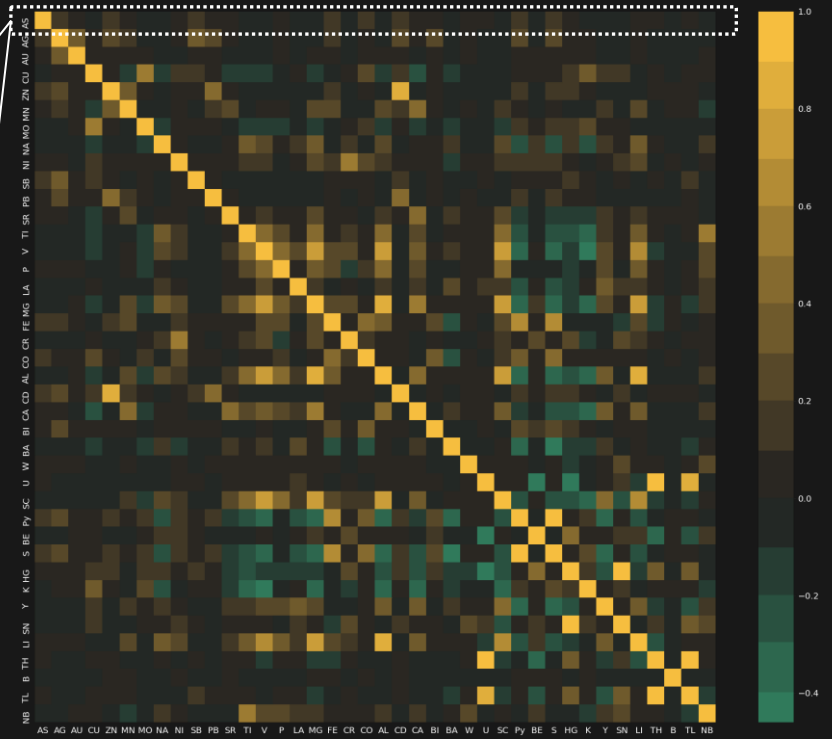
Linear Correlation Analysis Between Elements

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

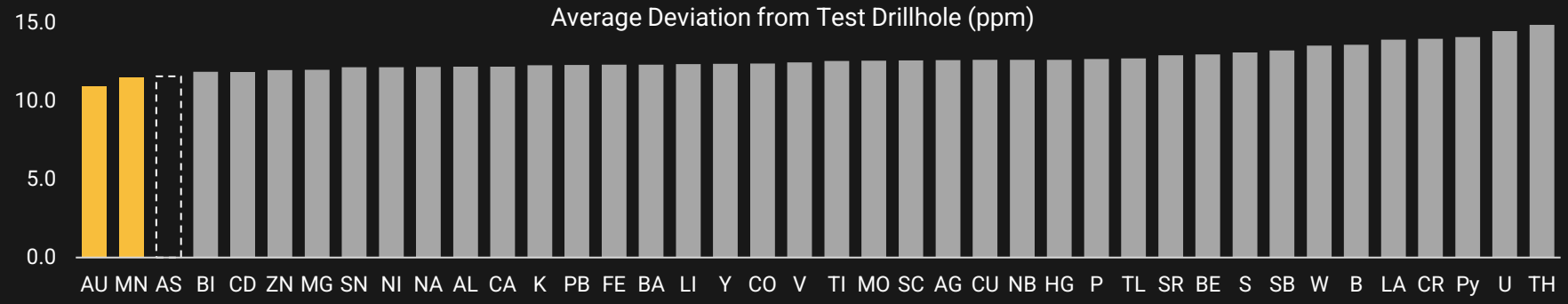


Multi-Metal Pearson Correlation Matrix



Non-Linear Correlation Analysis

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



Method (Interaction Testing)

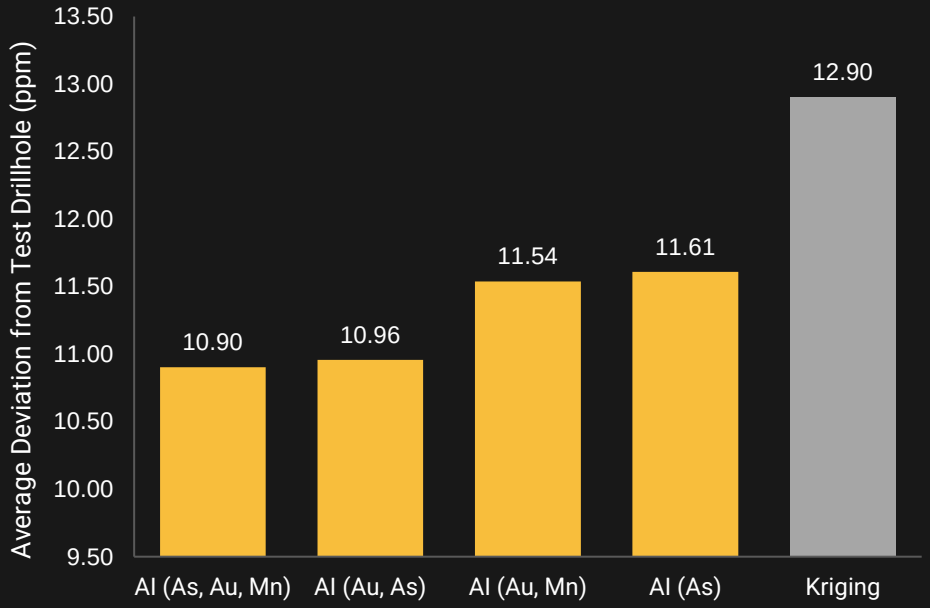
- In geology, these correlations are often so complex they cannot even be modelled by simple mathematical functions
- The best way to identify them is to add individual elements into the AI model and track accuracy improvement

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

Accuracy of Multi-Metal Estimations

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



Method (cross validation):

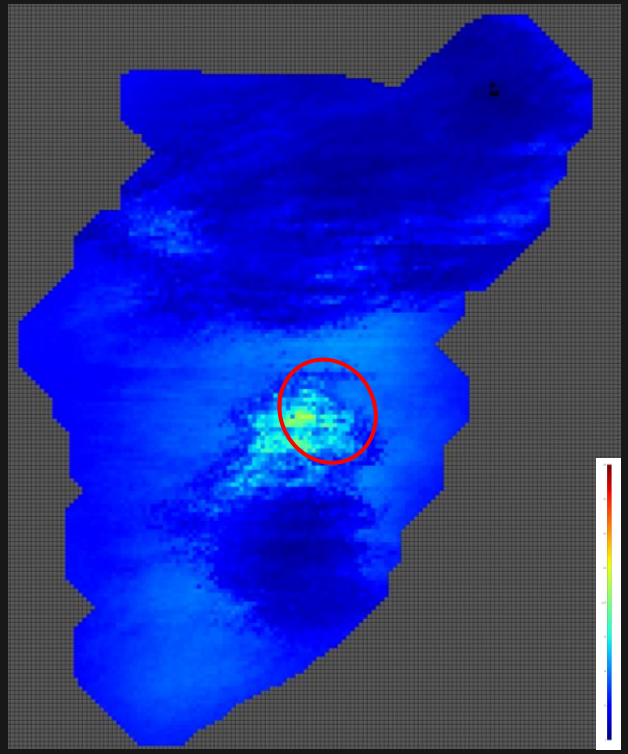
- Create kriging, AI model with 90% of drillholes to predict remaining 10%.
- Repeat with 10 different 90/10 splits.
- Measure average deviation between prediction and drillholes in remaining 10%

Results:

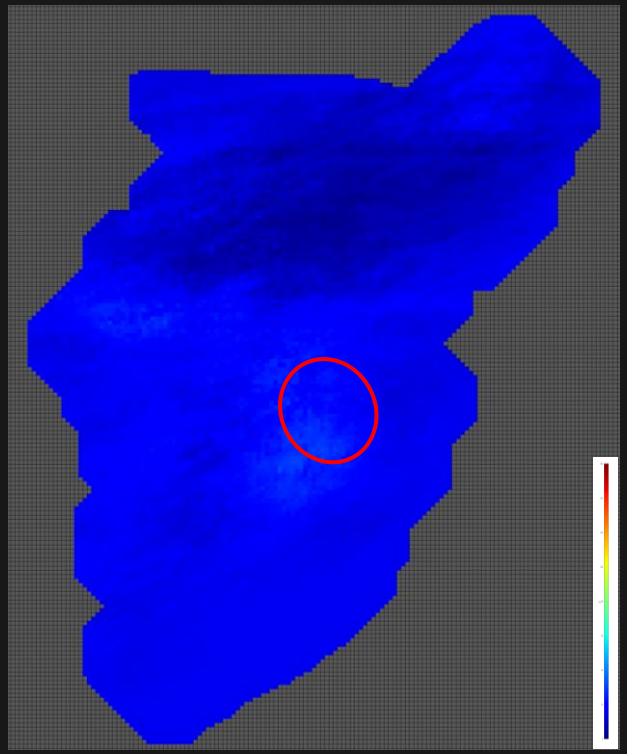
- AI multi-element model has 18.4% less deviation compared to kriging

Cross Section Analysis (X=22095)

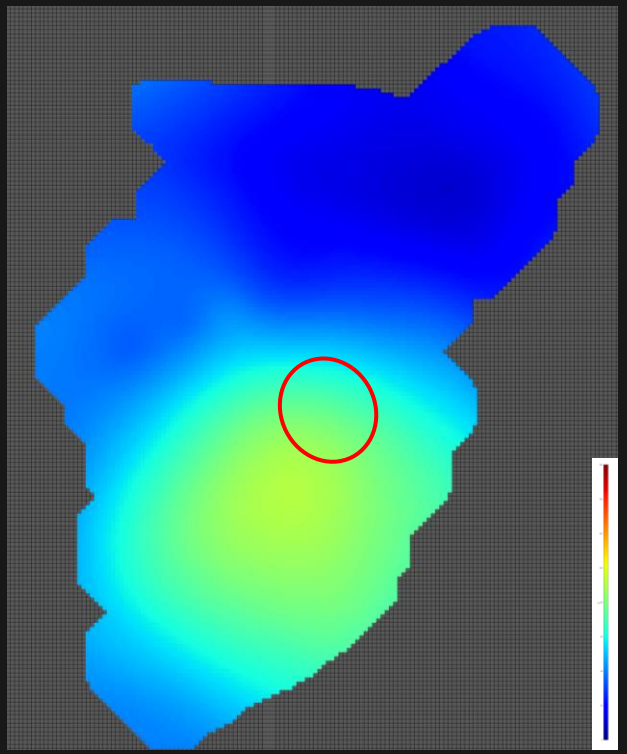
Block size: 5 x 5 x 5m



AI (As, Au, Mn)



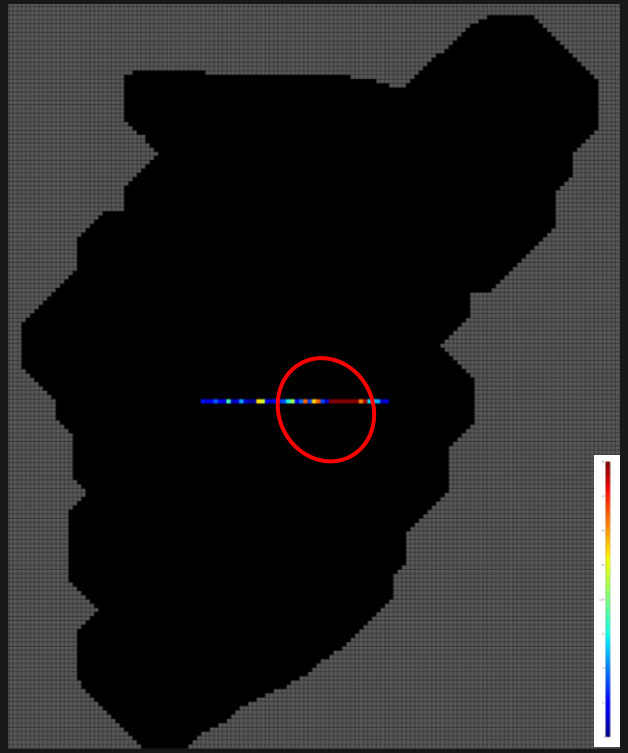
AI (As)



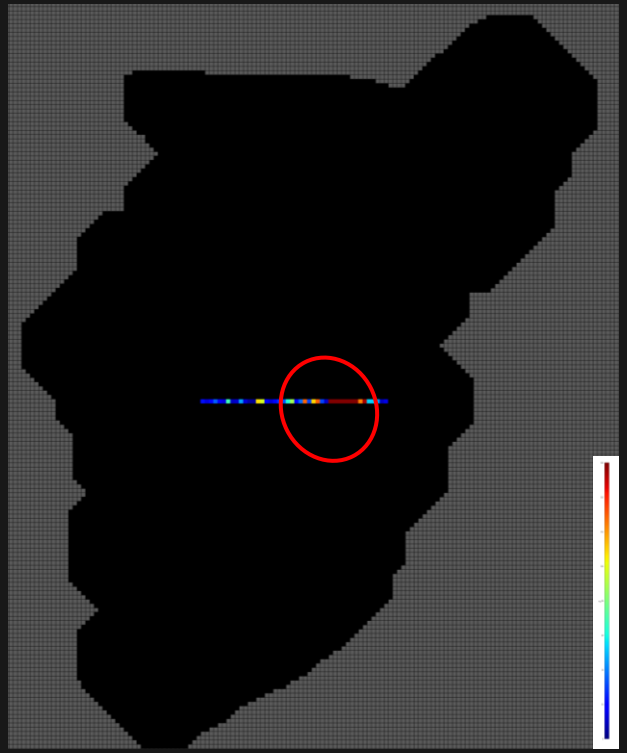
Kriging

Cross Section Analysis (X=22095)

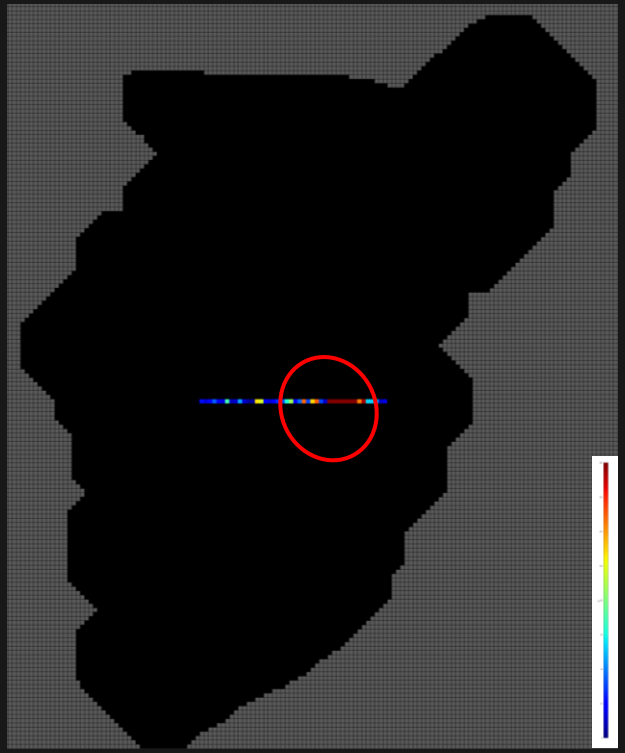
Block size: 5 x 5 x 5m



Test Set Drillhole



Test Set Drillhole

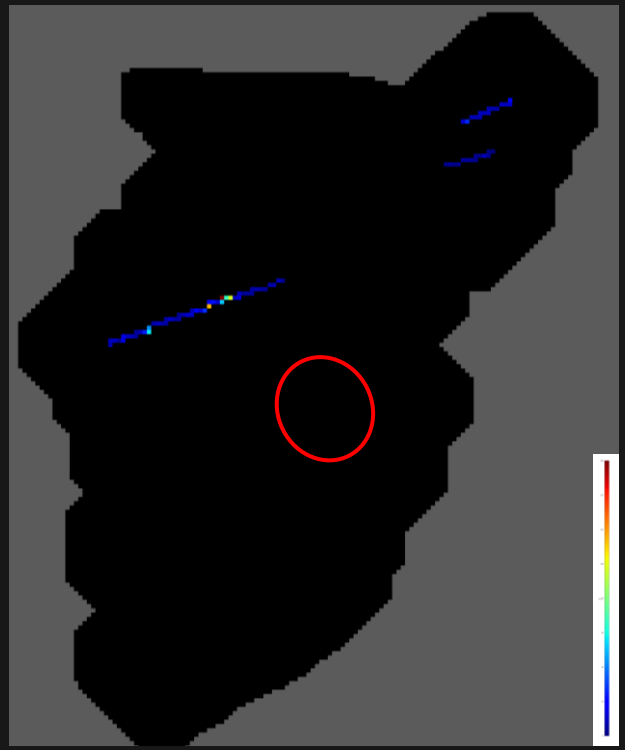


Test Set Drillhole

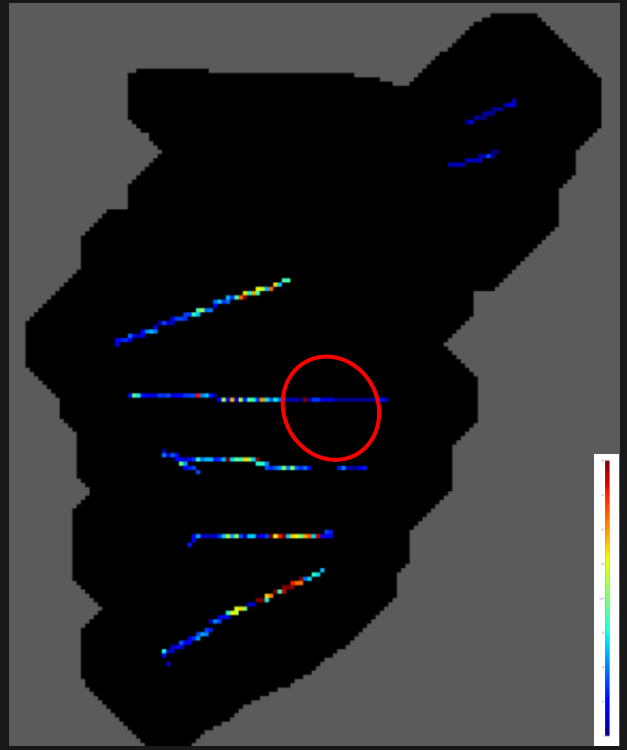
Cross Section Analysis (X=22095)

Block size: 5 x 5 x 5m

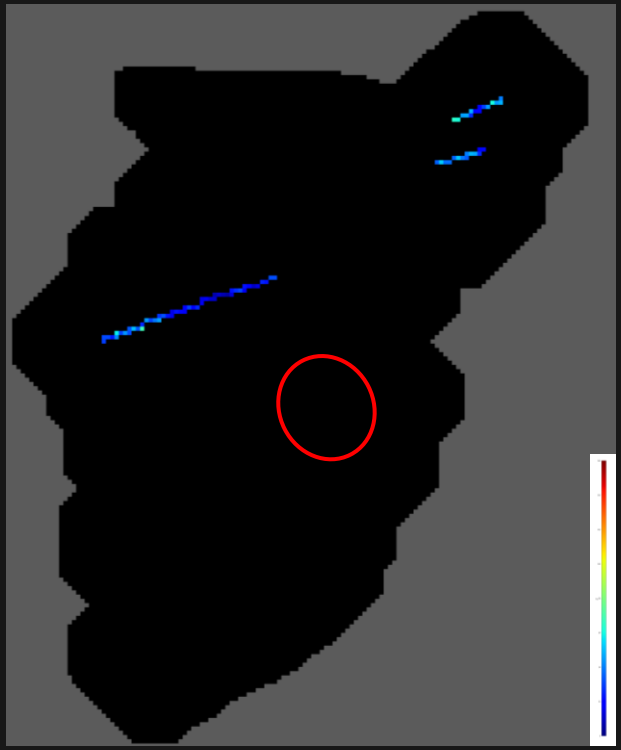
Drillholes within 45m of X=22095 included



Input (As)



Input (Au)

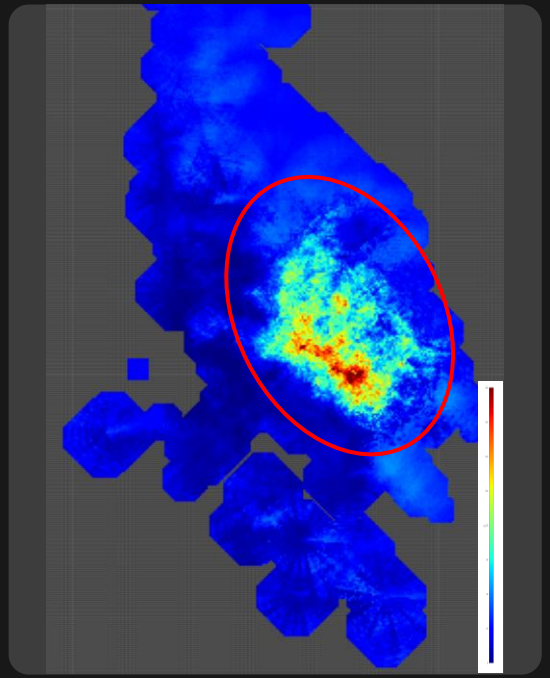


Input (Mn)

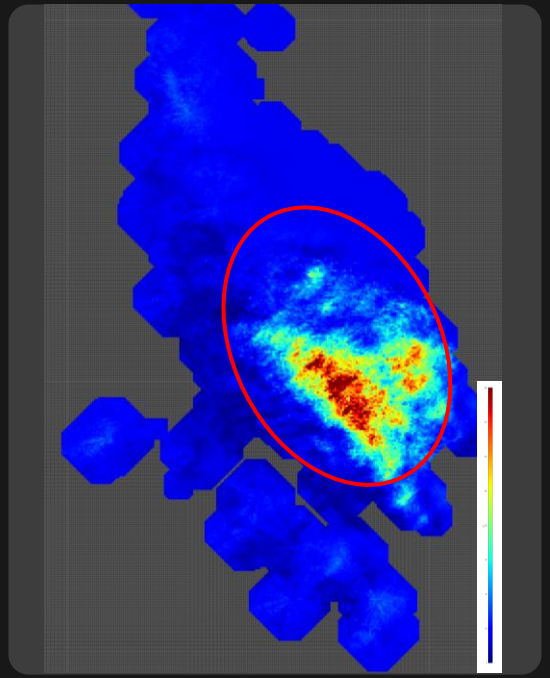
Bench Analysis (Z=1275)

Block size: 5 x 5 x 5m

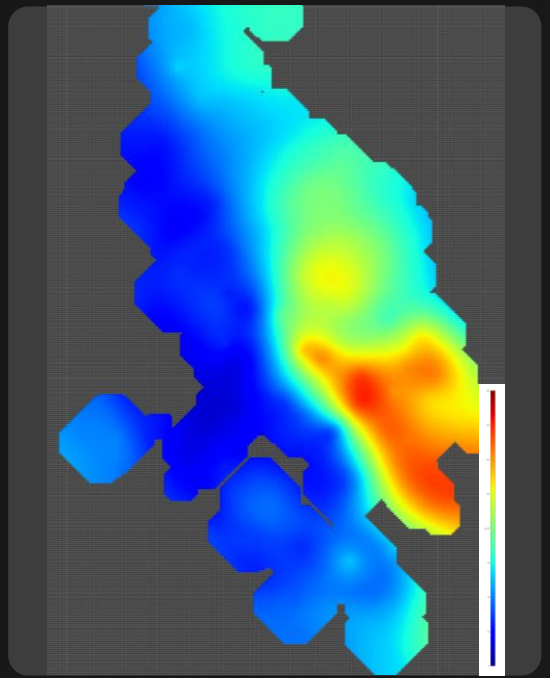
AI models predict similar complex arsenic mineralization structures allowing for precise ore sterilization



AI (As, Au, Mn)



AI (As)

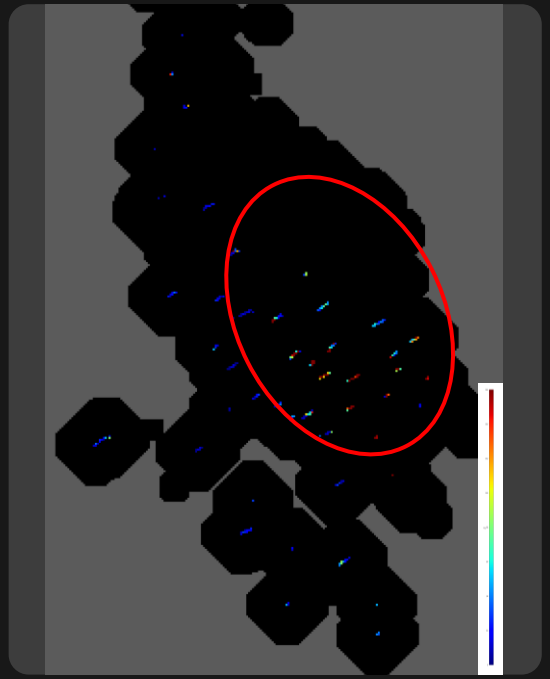


Kriging

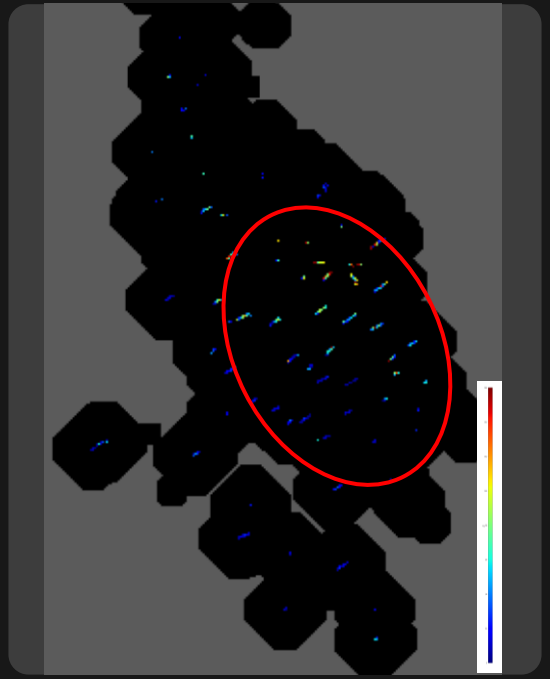
Bench Analysis (Z=1275)

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

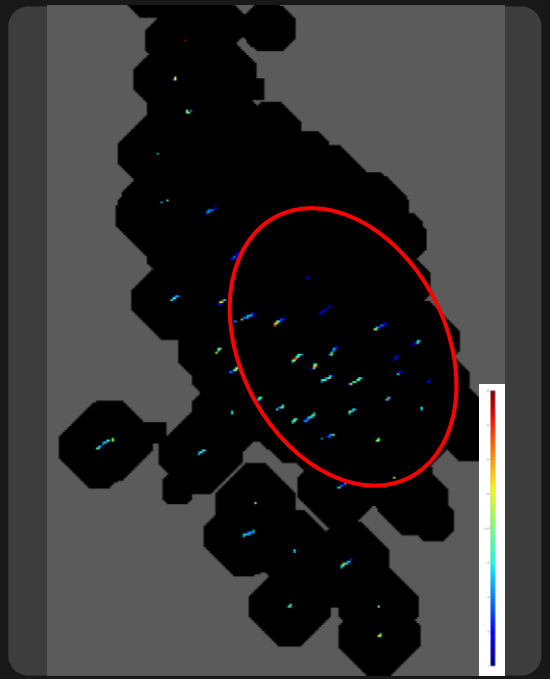
AI models predict similar complex arsenic mineralization structures allowing for precise ore sterilization



Input (As)



Input (Au)

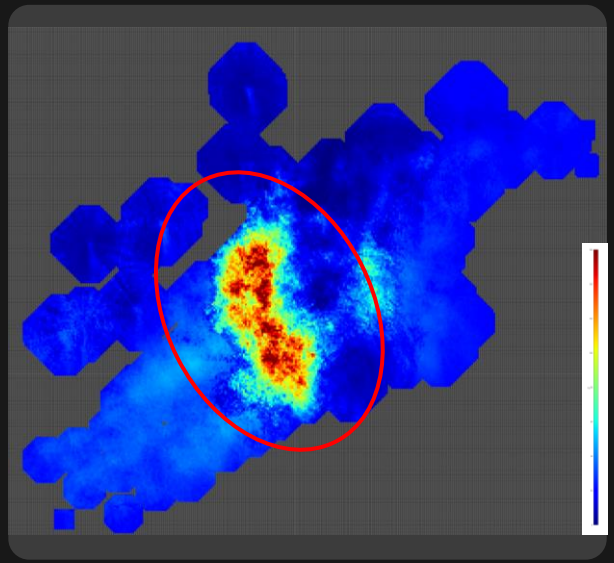


Input (Mn)

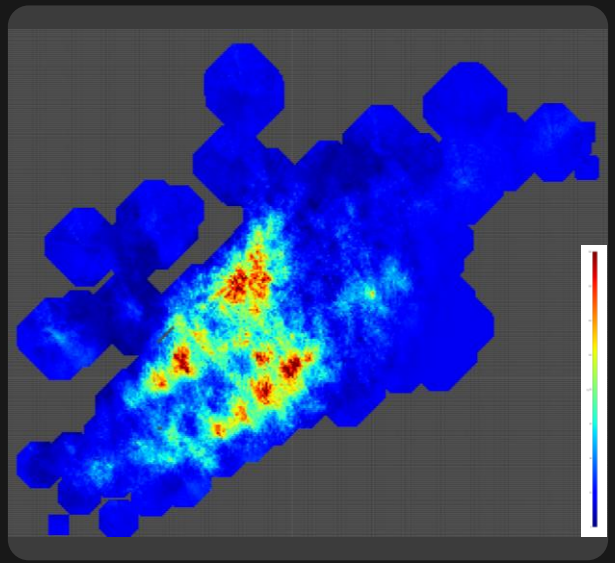
Bench Analysis (Z=1175)

Block size: 5 x 5 x 5m

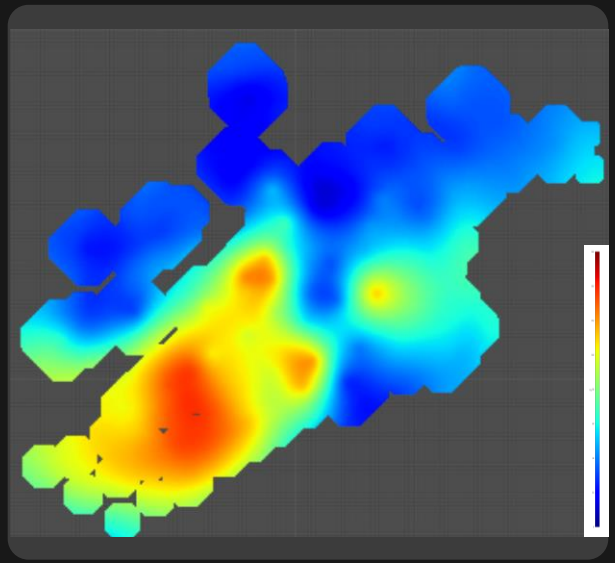
AI leverages Au & Mn data to model complex mineralization structure



AI (As, Au, Mn)



AI (As)

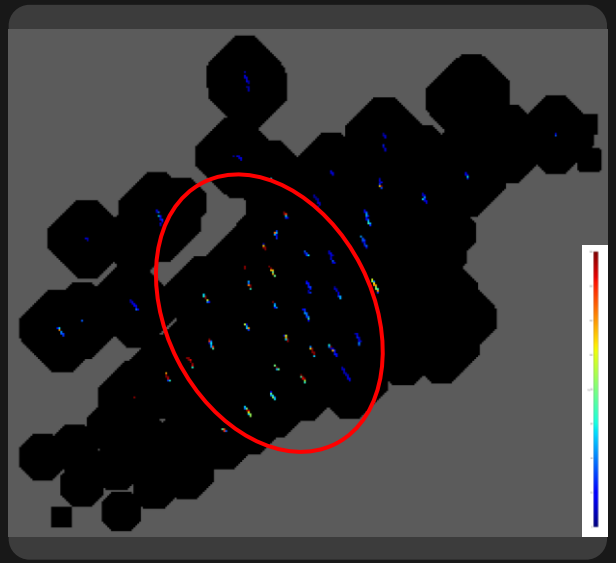


Kriging

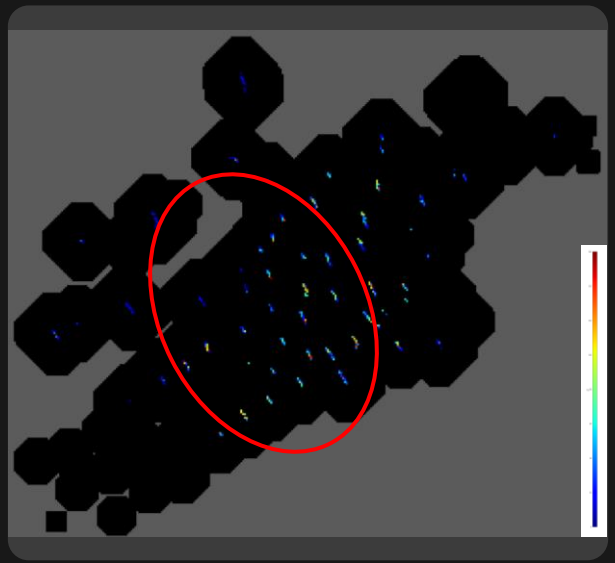
Bench Analysis (Z=1175)

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

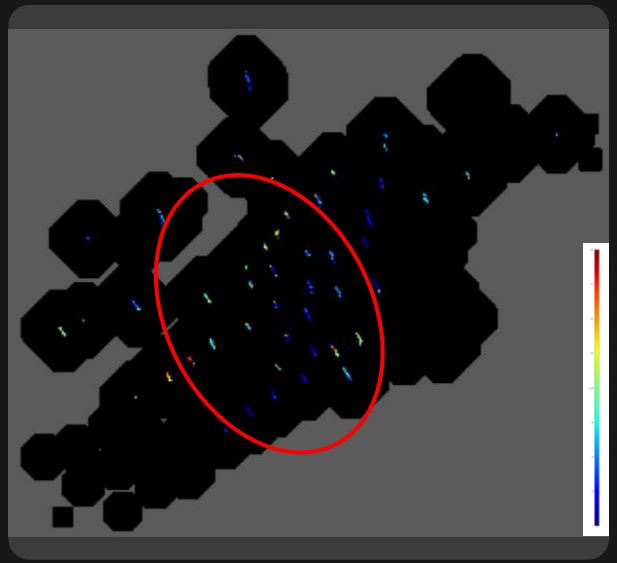
AI leverages Au & Mn data to model complex mineralization structure



Input (As)



Input (Au)



Input (Mn)

Summary

1	Does the AI outperform kriging on single element arsenic modelling?	AI determines the arsenic concentration of any block with 10.4% higher accuracy
2	Can AI accuracy be improved by leveraging multi-element assays?	AI model with access to multi-element assays is 18.4% more accurate than kriging
3	What assays contribute to improved arsenic modelling?	Modelling improvement is achieved by adding **Au** & **Mn** assays to AI input