

AI: Opportunities in Minerals Discovery

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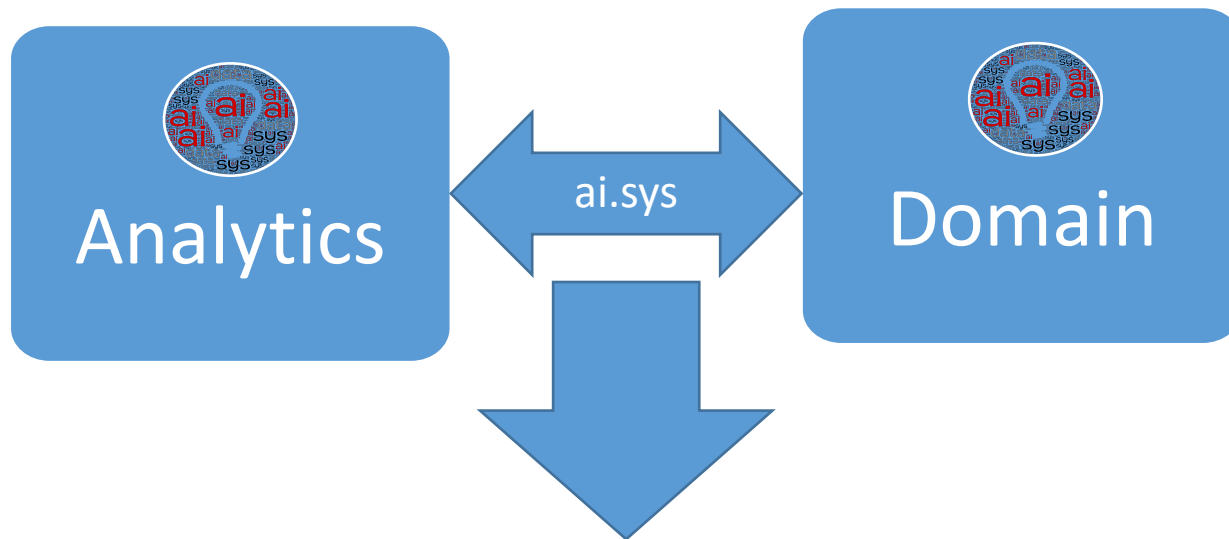
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ai.sys						
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<i>GRADUATE STUDENTS</i>						

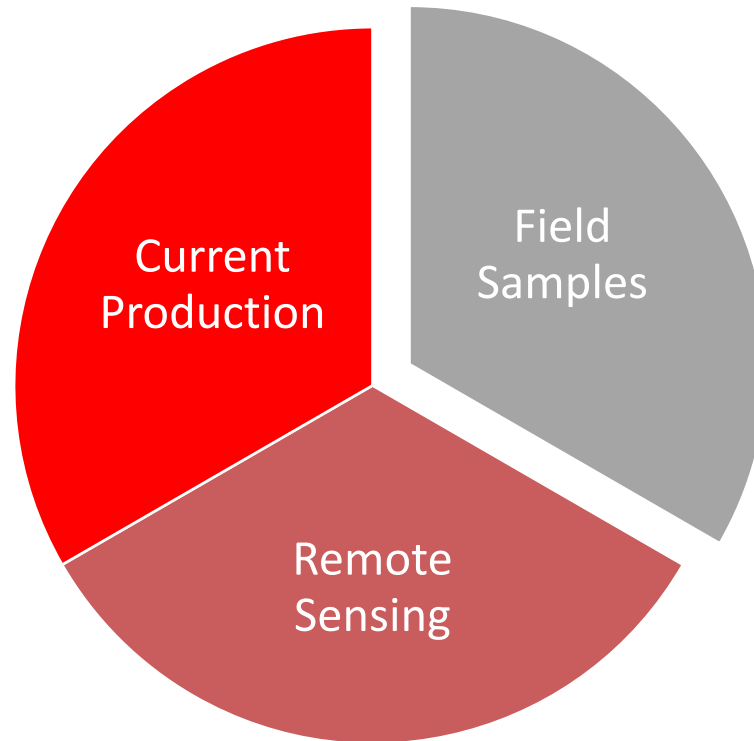




Misleading conclusions



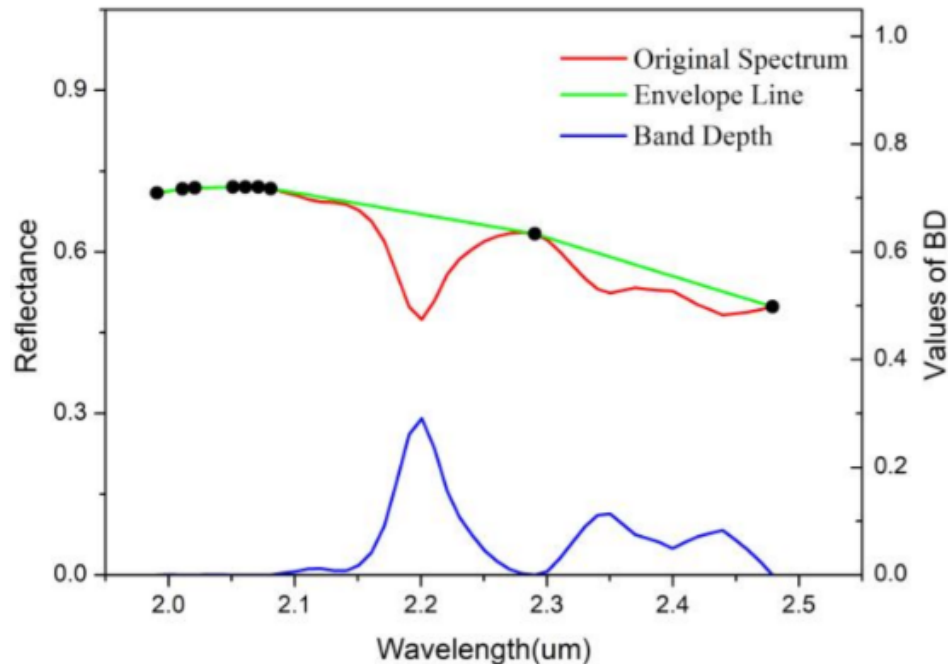
Discovering Minerals



Hyper Spectral, Geophysics



USGS, CSIRO Spectral Signatures



From: Ren, Z.; Zhai, Q.; Sun, L. A Novel Method for Hyperspectral Mineral Mapping Based on Clustering-Matching and Nonnegative Matrix Factorization. Remote Sens. 2022, 14, 1042 <https://doi.org/10.3390/rs14041042>



AI on Hyper Spectral, GeoPhysics

✓ Vegetation can be an issue

 Vegetation removal algorithms exist and can be improved

 Possible application on old tailings piles

✓ Combine with geochem etc for ground truthing

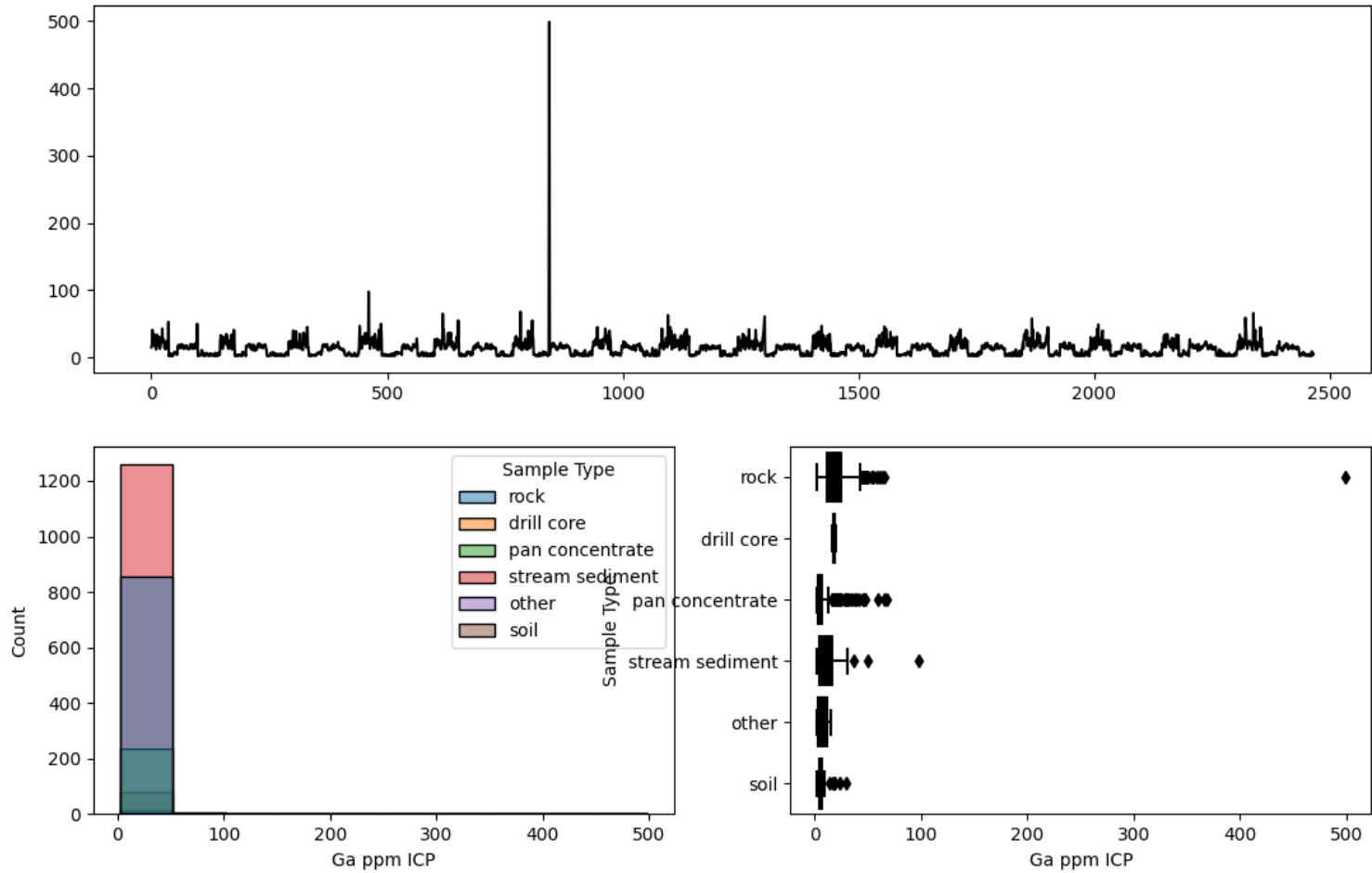


AI for Gallium (Ga): Alaska DGGS Geochemical Database

Analysis presented in the next few slides are preliminary

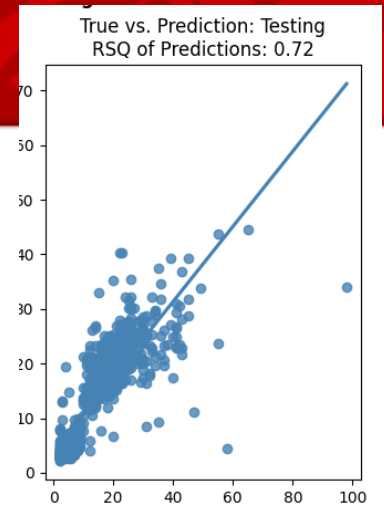


LinePlot | Histogram | BoxPlot of Ga ppm ICP



Gallium: All Alaska

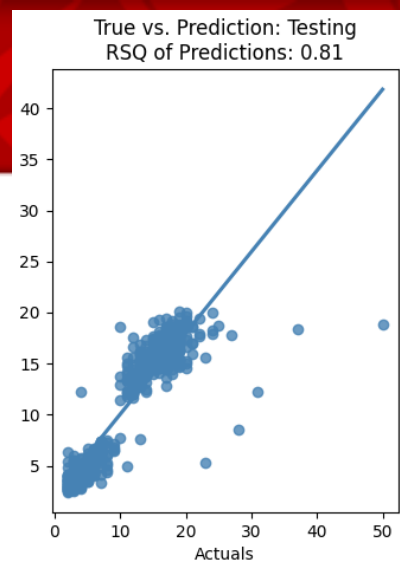
Key Factors →



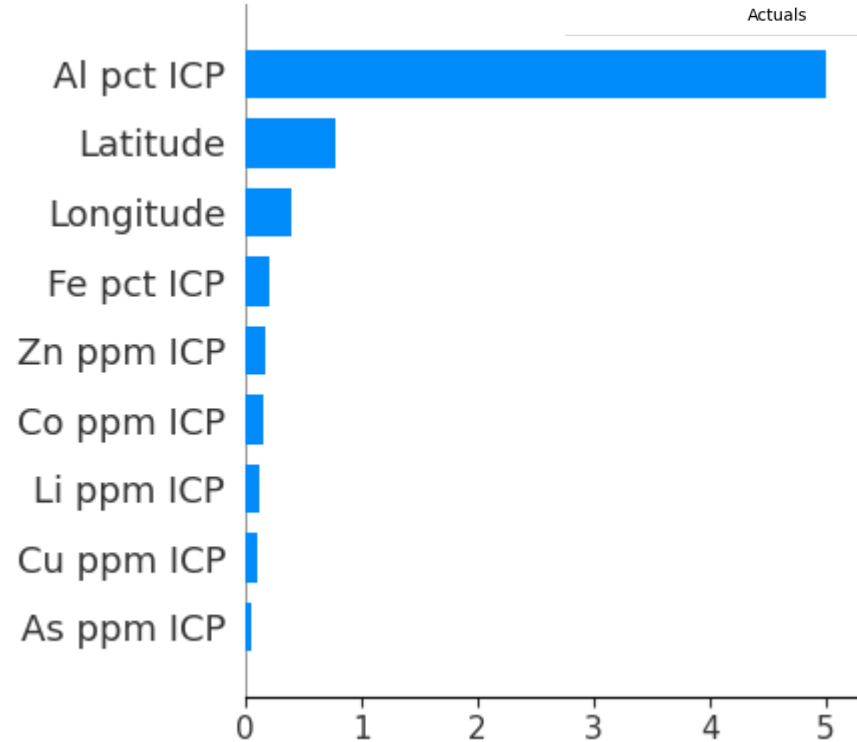
- Latitude
- Longitude
- Al pct ICP
- Co ppm ICP
- Fe pct ICP
- As ppm ICP
- Cu ppm ICP
- Li ppm ICP
- Zn ppm ICP



Gallium: All Alaska Stream Seds



Key Factors →



Ga trimmed to <50

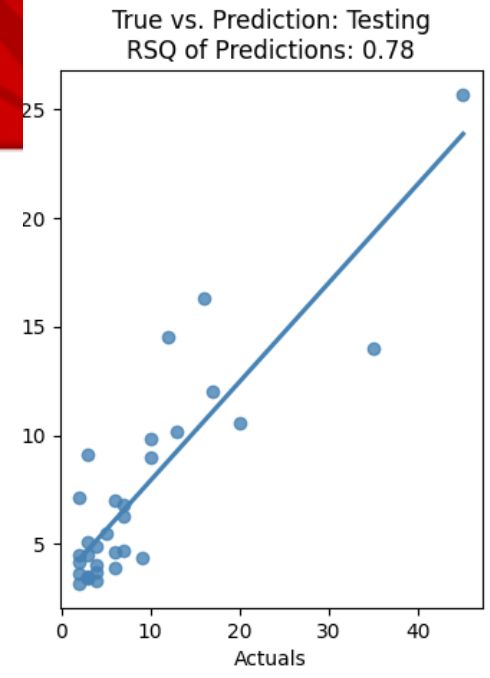
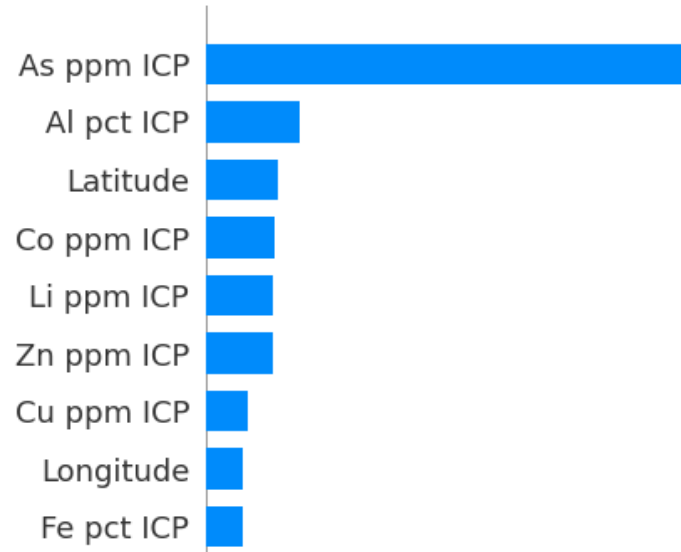


Gallium: Rampart Area

	Lat	Long
Min	65	-153
Max	67	-148

Key Factors →

Top Influencing Features

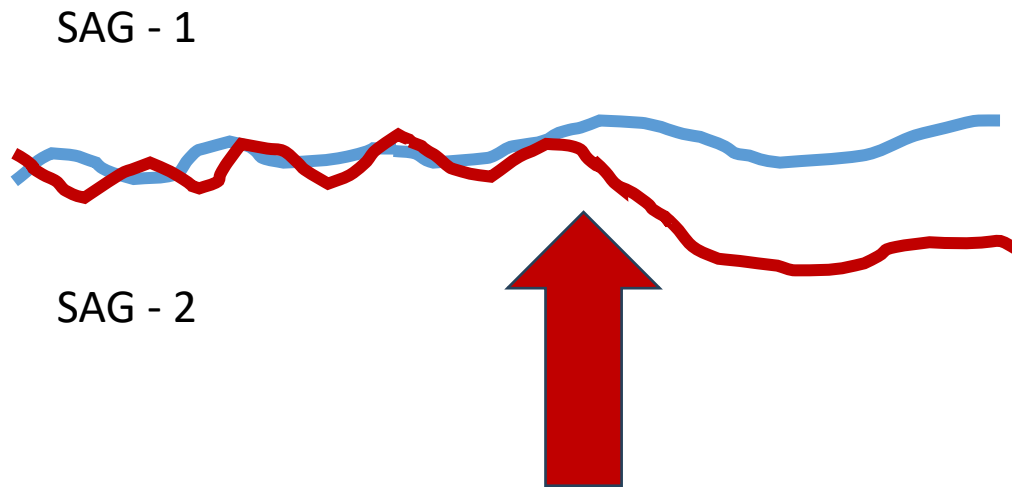


Bird In Hand:

AI Opportunities in Mine Operations



Monitoring Plant Performance: Newmont Peñasquito Mine, Mexico



Belt for hard material stockpile
was turned on for SAG 2



Custom Algorithm: Random Forest Modified

Mine	Data Set	scikit (R)	Ganguli (R)
Erdenet, Mongolia	Drillhole	0.78	0.83
Polymetal, Mexico	SAG*	0.86	0.89
Polymetal, Mexico	SAG	0.62	0.72

*Provided time series relationship



In development ...

- ✓ Algorithms that take into account nature of deposits



Conclusions

✓ Significant Opportunities Exist for Leveraging AI

 Hail Mary opportunities exist, but

- Many have led to “interceptions” (misdirections)

 Most opportunities require a “running game”

- Thoughtful approach to deploying AI



