

Case Study: Helping IGO better utilise their minerals exploration data by producing a prospectivity heatmap, using AI

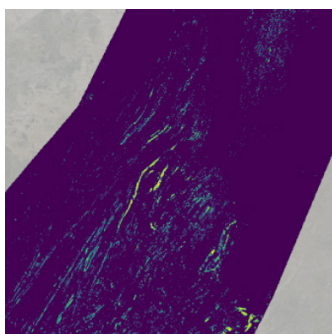
Challenge

To develop a prospectivity heatmap from IGO's minerals exploration data for the Albany-Fraser Range in Western Australia

Approach

Data Science was applied to minerals exploration data from a survey area of over 30,000km² - the 2 month project included

- Visit to IGO's Perth office to
 - Meet the exploration team
 - Understand the data and mafic-ultramafic intrusions which may host Ni-Cu-Co sulphide mineralisation
- Receipt of geospatial data
 - Ground gravity - measurement and first vertical derivative
 - Airborne magnetic - measurement and first vertical derivative
 - Geochemistry - over 9,000 drill holes with elemental assays
- Data analytics
 - Geophysics interpolated to a 10m grid
 - Geochemistry converted to prospectivity binary labels using provided elemental thresholds and ratios
- Machine learning
 - Unsupervised - clustering similar geophysics
 - Supervised - using binary prospectivity labels
 - Multiple algorithms and visualisations
- Regular feedback from exploration team for geological interpretation
- Delivery of report, GeoTIFF heatmap and CSV results



Prospectivity map excerpt; purple is low confidence, yellow is high confidence

Findings

The key learnings included

- Supervised machine learning was the best approach
 - Model was trained using geophysics data as inputs and prospectivity as outputs, on 80% of drill holes
 - Model performance was tested and verified on 20% of drill holes, and qualitatively assessed using other known prospects and geochemist feedback
- Model generalised well over the large survey area, providing prospectivity confidence at each location with geophysics data
- The heatmap can be viewed with a colour scale covering
 - Full confidence range (0-1) which highlights more false positives but no false negatives
 - Narrowed confidence range (eg. 0.5-1) to highlight only the more likely prospective areas
- Multi-dimensional spatial data can be summarised in one heatmap
- Machine learning pipeline is now established for next survey area

Benefits

IGO gained

- A simple tool which provides
 - Drilling targets - avoiding pattern drilling effort and cost
 - Increased speed and likelihood of finding an ore body
- Rapid ROI potential
 - Small investment in AI much less than 1% of the cost to collect and analyse data
 - One discovery will pay back thousands of times over
- Trusted AI partner for other and future exploration projects

“Consilium was a pleasure to work with, and delivered a useful and interactive exploration tool”
Paul Polito, Exploration Manager at IGO Limited