SensOre iNSIGHTS

SensOre's igROCK and Simclust ML Tools

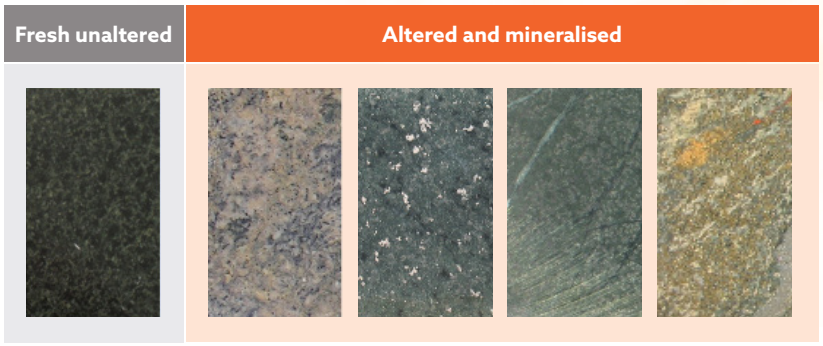
Supervised and Unsupervised ML Tools Generate Geological Insights from Geochemistry

ML for Capturing & Generating Knowledge for Early Decision-making in Targeting and Discovery

SensOre Ltd has productionised a range of innovative ML tools and workflows to derive geological knowledge from geochemistry data. The power of these tools are realised by leveraging data from our substantial geoscience **Data Hypercube** and subject matter expertise in both data science and geosciences.

SensOre's ML solutions address protracted, everyday problems and challenges faced by geologists across the mining value chain and provide information and insights that allow decisions to be made on how projects should progress.

Two of our most sought-after ML tools are igROCK and SimClust for Geochemistry. When used in tandem, these supervised and unsupervised approaches produce powerful and reinforcing results that increase understanding and confidence in the data collected.



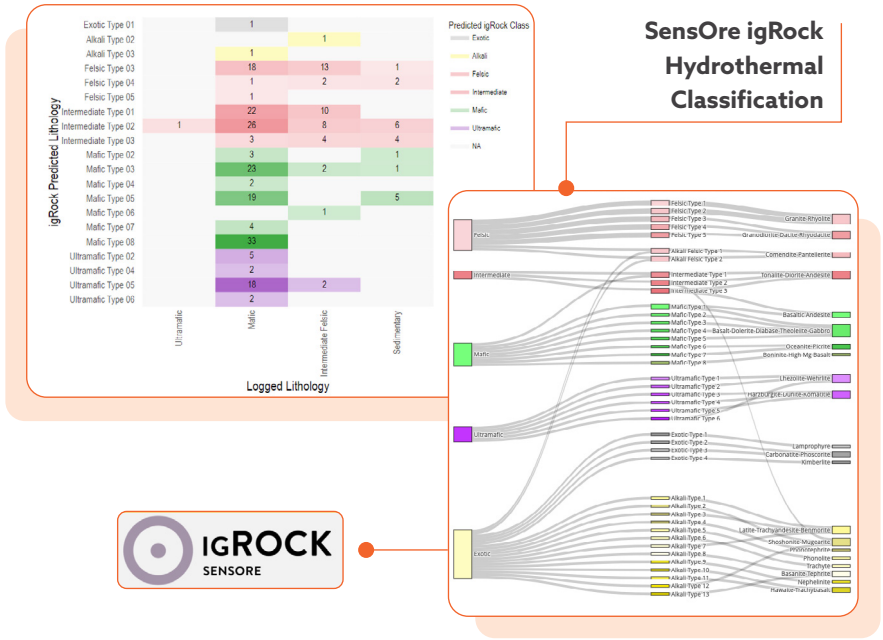
The same original rock type (fresh and altered equivalents)

IGROCK: A supervised ML tool that leverages SensOre's Data Cube

Correctly identifying protolith types is critical when defining the spatial distribution of geological sequences. Especially where hydrothermal alteration and/or weathering and/or metamorphism is pervasive (and let's be honest, if the rocks are interesting rocks they will often be altered!). To make things even more difficult a massive amount of the samples geologists have to log come from RC or aircore drilling programs.

To help geologists make sense of their geochemical samples SensOre has developed igROCK – a supervised igneous protolith classification system. igROCK has been trained using igneous geochemical databases comprising over 400,000 samples. It uses the extended multi-element geochemistry to automate the classification of igneous rocks into 42 different rock types. Key to igROCK's performance is the appreciable time SensOre's geoscientific staff members have spent cleaning (and relabelling) these training databases prior to training the igROCK model (you would be surprised how many samples originally labelled as fresh ultramafics are running less than 1 % MgO!).

Protolith identification is typically subjective and experience based. igROCK provides an automated solution to help geologists spend more time on the fun stuff (like interpreting where fluids have come from and planning where to put the next hole).



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Contact SensOre to maximize your exploration success by utilising our proprietary advanced machine learning Geological Prospectivity Modelling. SensOre is here to help you get the most out of your geological data on your way to making a discovery.

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SimCLUST™: An unsupervised ML tool that leverages SensOre's Data Cube

SimClust Geochemistry is an unsupervised ML tool used to identify and classify natural geochemical populations of surface and drillhole point data using multiple, multivariate statistical models.

The results can be used for rock characterisation, exploration vectoring, identification of altered equivalents, and differentiating regolith from saprock to name a few applications.

The first image to the right shows the Kundana Drill hole assay data in SimClust space.

Supervised and Unsupervised ML: A match made in heaven

When the results from igROCK are used to inform the unsupervised outputs from SimClust, magical things happen.

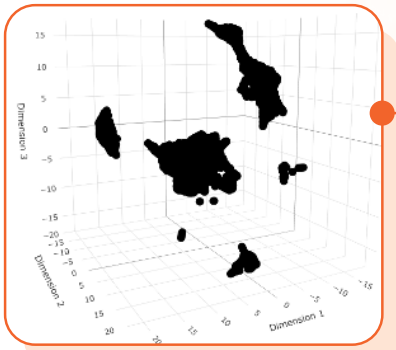
When combined, igROCK and SimClust provide the geologist with valuable insights regarding different protoliths and altered equivalents and can help reinforce or challenge previous interpretations.

The second image to the right shows the Kundana Drill hole assay data SimClust clusters trained by igROCK.

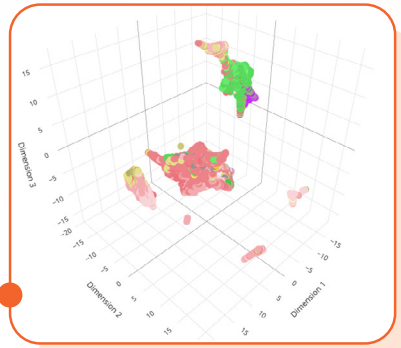
The geologist can now answer questions such as which samples within these clusters are mafic? Are there multiple mafic groups or just one? Are there multiple fractionation trends representing multiple magmatic pulses in the AOI? Does a cluster represent multiple subclusters?

In our example using the Kundana Drillhole assay data, igRock is able to inform SimClust there is ultramafic, mafic and felsic units in the first cluster, there is a felsic and intermediate subcluster in the second cluster, and that the remaining clusters are all felsic.

The map to the right show the igROCK results plotted spatially, revealing coherent geological trends for the ultramafic, mafic and felsic units.

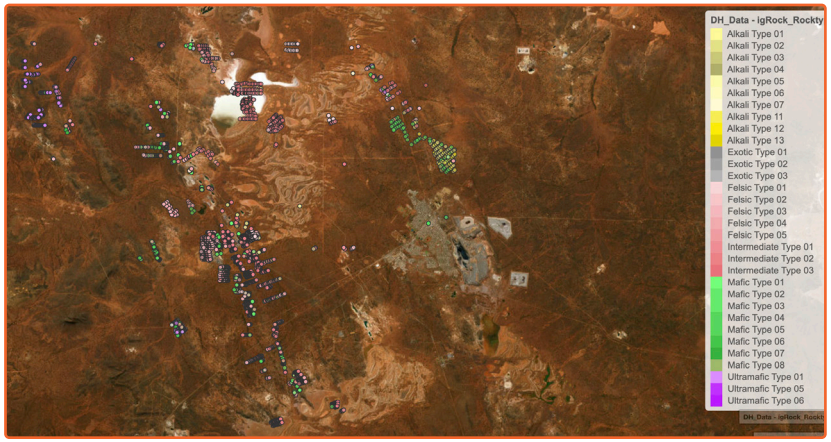


Kundana DH in SimClust Space



Trained by igROCK

igRock Data – Rocktype



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A Joint Supervised and Unsupervised ML: Case Study

The case study presented here is from bottom of hole chips collected from aircore surveys from an area near Mulga Bill. As if logging Aircore chips isn't hard enough, the weathering at Mulga Bill is deep (150 m!), and the alteration is pervasive.

The image in top left represents the geologists original interpretation of the samples. The image in the top right are the results from igRock. As you can see there are some significant differences between the two classifications. The original logging considers the samples in the east to be predominately mafics, while igROCK has classified the samples in east as being predominately intermediates with some lenses of ultramafics. That's great, but how do we know igRock is providing reasonable predictions?

When combined with the outputs from SimClust we can see that igROCK's interpretation is far more consistent (bottom images). igROCK is also able to inform SimClust as to the location of cluster boundaries.

Why are SensOre's SimClust and igROCK ML tools worth talking about?

SensOre's SimClust and igROCK geochemistry workflows are powerful proxy mapping tools in low-data density regions and in areas under cover.

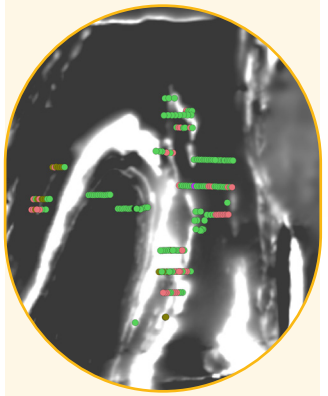
The igROCK protolith classification system provides information critical in defining the spatial distribution of geological sequences where the primary mineral assemblages are obscured or have been destroyed by hydrothermal alteration and/or weathering. igROCK also provides a data-driven approach to classify difficult to log samples from RC and air-core programs.

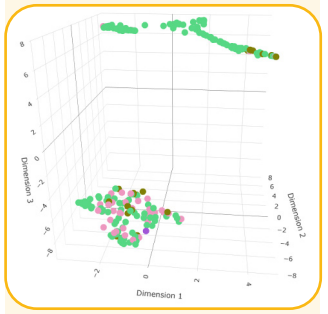
SimClust provides powerful unsupervised validation for igROCK as well as a number of SensOre's other supervised ML tools including AGLADS and iGOSSAN, which can be found in our **brochure**.

How do you get access to SimClust, igROCK and other SensOre ML resources?

Contact SensOre to maximize your exploration success by utilising our propriety advanced machine learning capabilities and our vast geoscience database. SensOre is here to help you get the most out of your geological data on your way to making a discovery.

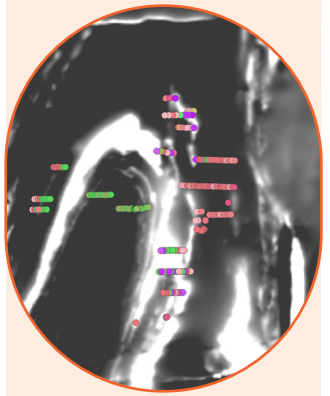
Geologist's Interpretation

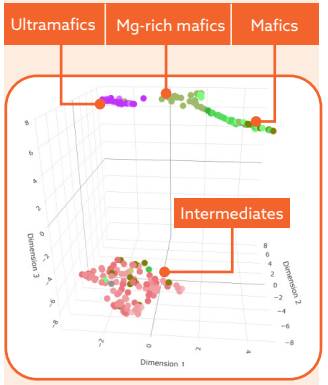




Sample coloured by geologist rock type interpretation

SimClust & igROCK ML Results





Sample coloured by igRock classification