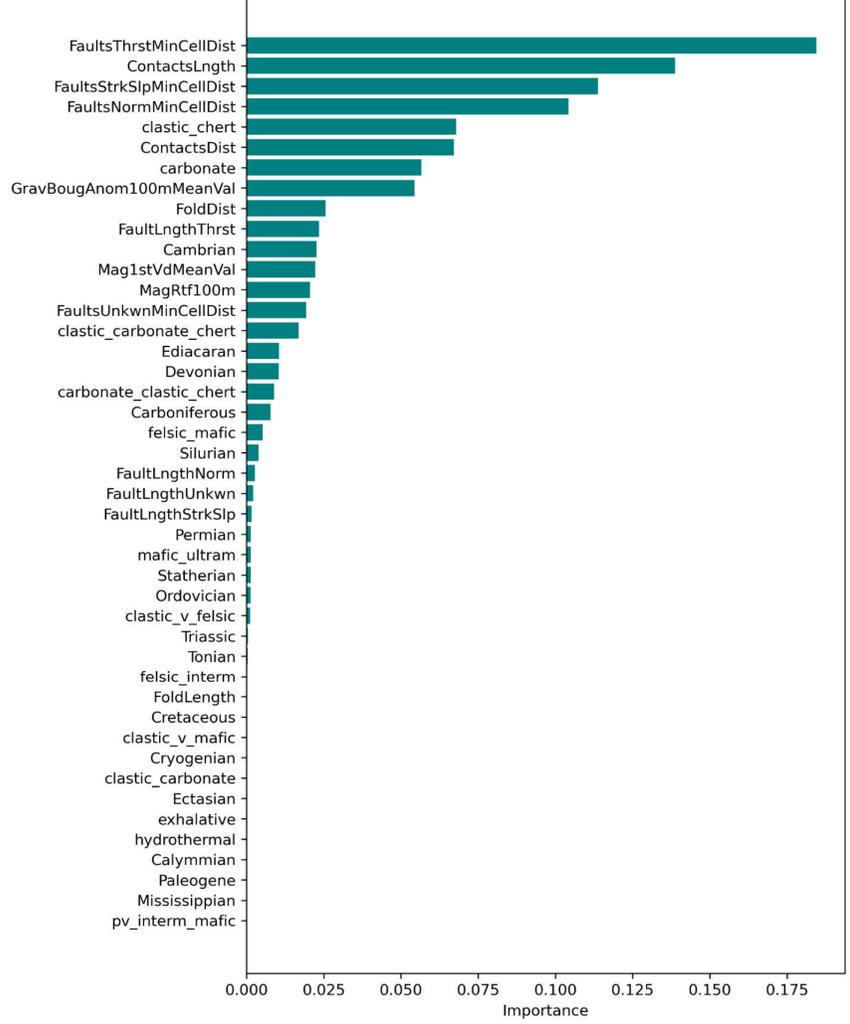


Random Forest Feature Importance



Data sources:  
 Infrastructure, river and lake data: <https://mapservices.gov.yk.ca/GeoYukon/>  
 Bedrock geology, faults, folding, stratigraphic contact and mineral deposit data: <https://data.geology.gov.yk.ca/>  
 Gravity and aeromagnetic data: <https://geophysical-data.canada.ca/Portal/Search>

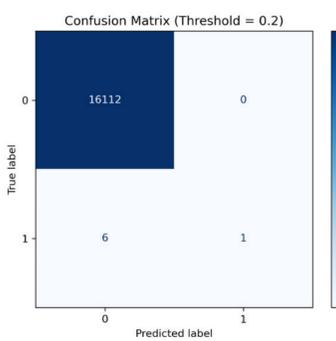
This map is designed to be printed at A1 size. Coordinate system: NAD 1983 Yukon Albers.

### Mineral Potential Map of Carlin Deposits in Yukon using the Random Forest Machine Learning Algorithm

- Carlin mineral deposits and occurrences
- Stratigraphic contacts
- ..... Folds
- ..... Faults - unknown type
- - - - Thrust faults
- - - - Strike-slip faults
- Normal faults

**Bedrock geology**  
 For an explanation of bedrock geology labels, refer to the Yukon Geological Survey's bedrock geology legend.

**ROC - AUC metric = 0.704**  
 (i.e., - the random forest machine learning model has a 70.4% probability of ranking a randomly chosen mineralized location higher than a randomly chosen non-mineralized location. This means that the random forest is capturing real geological signal and separates mineralized from non-mineralized areas sufficiently well for prospectivity purposes.)



The confusion matrix shows strong confidence in identifying areas with no mineralization, while adopting a conservative stance toward predicting mineralized cells. As a result, false alarms are rare, but some mineralized cells may be missed.

- Mineral potential**
- Significantly prospective
  - Highly prospective
  - Optimally prospective

- Map descriptions**
- A** Mineral potential map of Carlin deposits and occurrences within a 100km radius of known deposits.
  - B** Enlarged mineral potential map of Carlin deposits in the vicinity of the Tiger deposit.
  - C** Enlarged mineral potential map of Carlin deposits in the vicinity of the Osiris and Ibis deposits.

**Explanation**  
 This mineral potential map for Carlin-style mineralization in Yukon was generated using the random forest (RF) machine learning algorithm. The RF was initially run in Python (on Jupyter Notebook) and the prospectivity data was then transferred to ArcGIS Pro for map compilation. The RF algorithm is a supervised machine learning method which generates a prediction model using decision trees. The predictions from each tree are averaged to produce a final prediction.

The RF classification tool was used to train a number of models on known Carlin-style mineral occurrences. The models were then used to predict where, within a 100km radius, mineralization is most likely to occur.

A 1km x 1km fishnet grid (>64,000 cells) was created for training purposes. Cells with one or more mineral occurrences were ascribed a label of 1. Cells with no mineral occurrences were labeled 0.

Seventeen explanatory layers were used for training purposes, and to predict areas prospective for Carlin-style mineralization. Two categorical layers were used - rock age and rock class - along with 15 continuous layers: faults (normal, thrust, strike-slip and unknown type, with the length of each fault in each cell and the distance of each fault in each cell from known mineral deposits quantified); folds (length and distance as above); stratigraphic contacts (length and distance as above); and gravity and magnetic (RTF, 1stVD) airborne geophysical grid data.

Additional outputs from the random forest classification included: the confusion matrix; and feature importance (see figure on left).