The Importance of Mineral System Analysis as Inputs to Data-Driven Gold Targeting Projects

Jean-Philippe Paiement
Mira Geoscience Ltd., Montreal, QC, Canada

Mineral exploration targeting is a key step in ground investigation area reduction that allows for lesser ground disturbance when exploring for gold. In recent years, data-driven mineral targeting has become a trend in the mining industry, which involves using advanced data analytics and machine learning techniques to identify and locate gold deposits with greater accuracy and efficiency. However, this approach requires careful interpretation and geological modelling that should be guided by mineral system analysis (MSA). MSA is an approach to better understand the formation and distribution of mineral deposits within a particular region or mineral belt by identifying the geological processes and events that led to the formation of thedeposits and the geological settings in which they occur.

QAQC of predictive model results is of primary importance. Overreliance on output can be problematic, which is why it's essential to ensure that model results make geological sense and are reliable. By understanding the mineralizing system, geoscientists can better judge the target areas resulting from data-driven targeting. One issue that can arise with data-driven mineral targeting is the introduction of cognitive bias in model training. This bias can be mitigated through MSA, which allows the geoscientist to build an inclusive data store and compile all existing exploration ideas and models at all scales. Bad or incomplete data is frequent in geosciences, which can be mitigated through the MSA review. Additionally, an idea of the predictive importance of different exploration features can be used for later interpretation of predictive model results and the interpretation of feature importance in the light of known mineral system components.

MSA can provide a means of designing, documenting, and QAQC'ing data-driven predictions. It provides context for the review of data-driven models and acts as a base case and lens for understanding data-driven results.