

Hypercube[®]: New tool for the study of the mineral potential

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The renewal of mineral resources is a daily challenge and new good-quality exploration targets have to be constantly generated in order to improve discovery rate. Some data- and knowledge-driven techniques are already used to produce regional prospectivity maps. However, both techniques have some limitations such as the difficulty to identify local event, to obtain comprehensive results or to follow a clear mechanic (black box). In order to improve targeting procedures, this project proposes to use the Hypercube[®] algorithm provided by BearingPoint and already used in many different industries. This algorithm is considered as the best rare event predictive algorithm by the MIT and Pasteur Institute. Hypercube[®] is a complex mathematical algorithm and a rule generation technology. Hypercube[®] is a powerful tool that can treat large volumes of data and outputs the results from the data alone. This means that all the available data is taken into account. This study is part of a master project based on a partnership between the UQAC, the MERN and IOS Services Géoscientifiques. The studied area consists in a 900 000 km² area located in James Bay (Quebec), and includes more than 1000 gold occurrences. For this study, only tonnage-evaluated orebodies, worked deposits and mines has been used (113 training points). The objectives of the study are 1) to create an orogenic gold prospectivity map of the area using Hypercube[®], 2) to compare this prospectivity map with the one already produced by the MERN using the combination of the weight-of-evidence and fuzzy logic methods and 3) to develop a methodology to efficiently use Hypercube[®] in mining exploration targeting. To interface the SIGEOM database (public domain database managed by the MERN) with a compatible Hypercube[®] format, an ArcGIS Model Builder has been created. The resulting learning matrix consists in 1 433 777 pixels at a spacing of 250 meters, and contains 100 variables extracted from geology, structure, geophysics and geochemistry. Hypercube[®] analysis over 50% of the database returned robust rules that were used to built a predictive model over the complete database and generate favourability zones. Those favourability zones encompass 100% of the 113 known mineral deposits, occurrences or showings with most of them located in highest favourability zones. The preliminary results suggest that the rules obtained are well focused and can be used as exploration vectors.