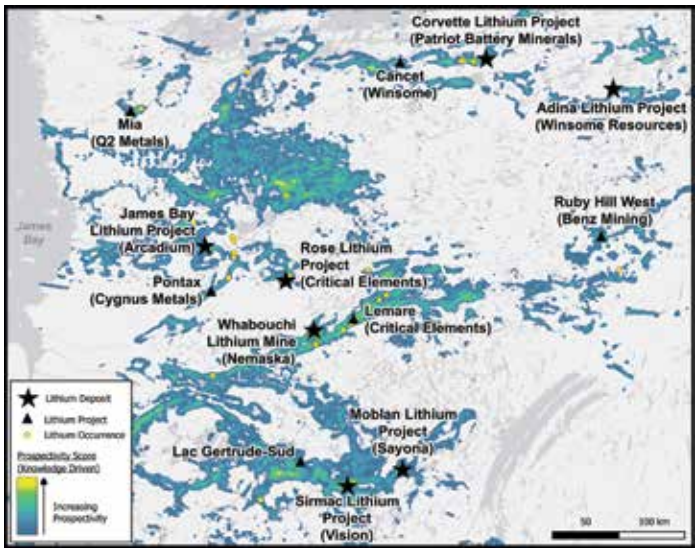
Exploration innovation

How Mercator Geological Services is using AI to make data-driven critical mineral discoveries



Knowledge-driven prospectivity heat map.

With the impacts of climate change at the forefront of global concerns, governments worldwide are implementing policies and strategies to combat climate change. A commitment to a low-carbon future has driven innovations and advancements in green technologies leading to a greater demand for critical minerals.

The Canadian Critical Minerals Strategy stated that "Discoveries of future mineral wealth, particularly in rural, remote, and northern regions, will require advanced technologies at the exploration stage to identify areas of highest potential, while minimizing exploration costs, reducing the carbon footprint of exploration programs, and minimizing the environmental impact on the landscape".

In response to this, Mercator Geological Services (Mercator) has taken an innovative approach, leveraging artificial intelligence (AI) and prospectivity mapping techniques to guide mineral exploration projects.

Mercator's prospectivity mapping method uses a fusion of AI data-driven supervised machine learning models and knowledge-driven models. Supervised machine learning models are developed by training the algorithm with a dataset of user-defined training data identifying areas of high prospectivity for a desired deposit (e.g., existing mineral deposits). The model trains itself, without being explicitly programmed, to learn patterns within the dataset to make the best predictions for prospective areas. For knowledge-driven models, Mercator incorporates their 25+ years of industry experience and expertise into the model's algorithm. They program the algorithm applying their expert knowledge through feature selection, logical constraints, and weighting based on the desired deposit type.

Canada holds great potential for critical mineral exploration and development, however locating the best areas to explore in Canada's vast landscape is challenging. Mercator's solution of using AI and knowledge-driven models allows for rapid analysis and evaluation of multiple large geoscientific datasets, including structural, lithological, mineralogical, geochemical, and geophysical information. Data is processed by the models, producing heat maps identifying priority targets for areas where the probability for a specific mineral or "prospectivity score" is predicted to be high. This enables companies to plan and focus their fieldwork exploration programs in a more cost-effective and sustainable way, especially for areas with limited site access.

Evaluation areas can be mapped at both regional and detailed scales. Mercator applied their prospectivity models for lithium to the James Bay area of Québec, Canada, producing a prospectivity map covering a 300,000-square-kilometre area at a spatial resolution of 250 square metres. They further used these models at more detailed scales to assess over 50 properties across the James Bay region, producing property-scale prospectivity maps with spatial resolutions as high as 12.5 square metres.

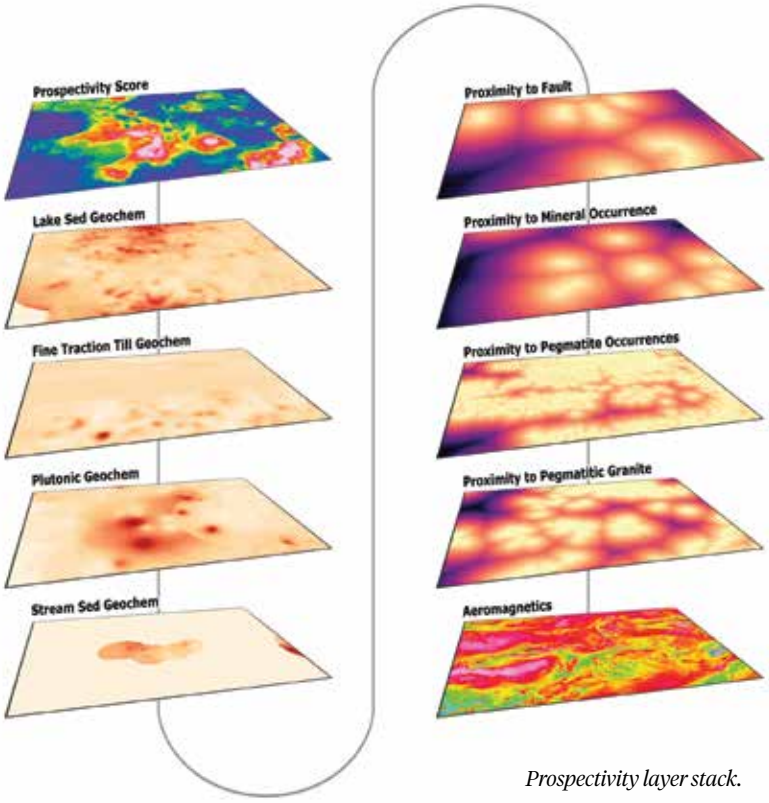
The true test of this prospectivity mapping method comes from the success of making new discoveries of critical minerals on the ground. Mercator is proud to say that their approach has led to the new discoveries of lithium within the James Bay region, including one that has now been successfully drill tested.

Mercator is committed to advancing their prospectivity

mapping method. Currently, they are developing a cloud-based database that will be continuously updated using data scraping techniques to automatically extract new geological information from publicly available sources. This database will be connected to a web-based front-end updating their prospectivity mapping models with new data, generating new predictions, visualizations, and even faster delivery of prospectivity results.

Mercator's forward-thinking prospectivity mapping approach is transforming the way we explore for critical minerals, making discoveries more efficient, cost-effective, and sustainable. This ensures that the mineral exploration industry evolves as the world transitions to a greener future.

For more information on Mercator's services and how prospectivity mapping can be applied to your project, visit their website www.mercatorgeo.com or email them at exploration@mercatorgeo.com. ✘



Prospectivity layer stack.