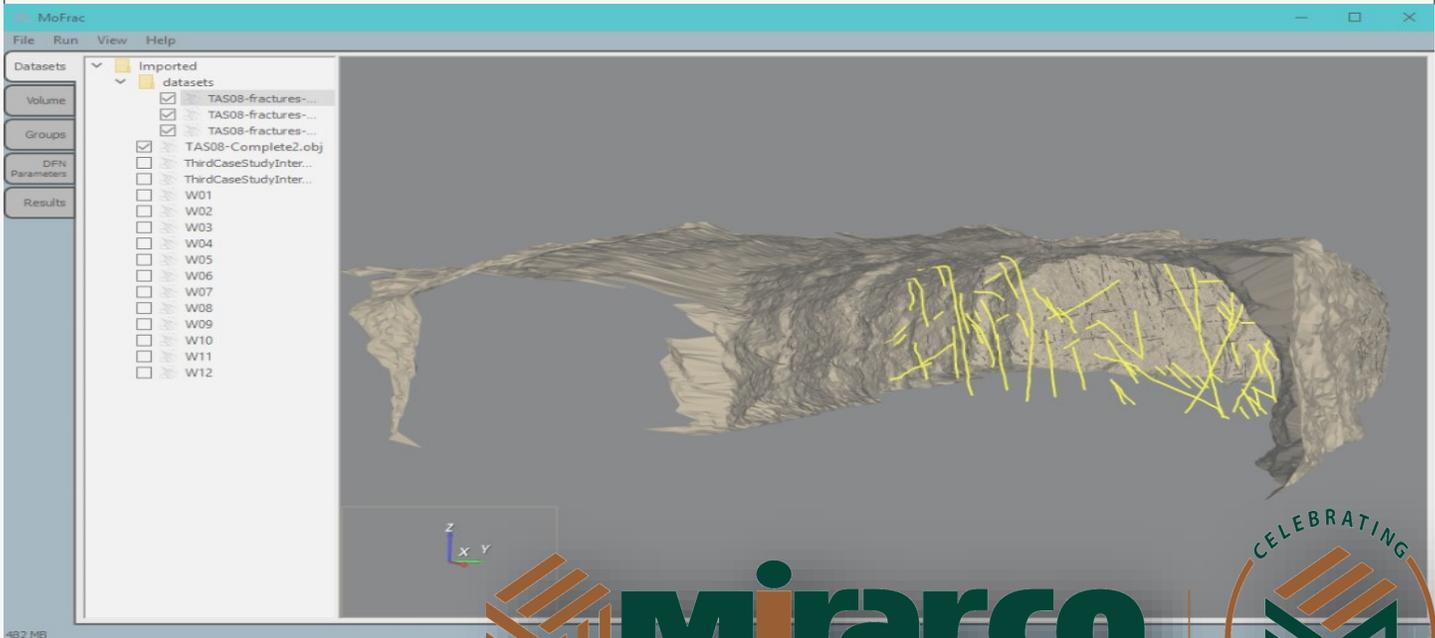# SOFTWARE

## SOFTWARE CENTER

The Software Centre is developing the next generation of decision-support tools for mining with an emphasis on underground mine ventilation and life-of-mine schedule optimization. These two areas of research are key in maximizing the profitability of a mining operation.



AREAS OF EXPERTISE
- Production Optimization
- MIRARCO is developing underground mine planning software that will ensure:
- stope sequences are geotechnically feasible,
- ventilation scenarios supporting the optimized plan are identified, and
- life-of-mine schedules are robust to mineral prices and ore grades.

Discrete Fracture Network (DFN) Modeling
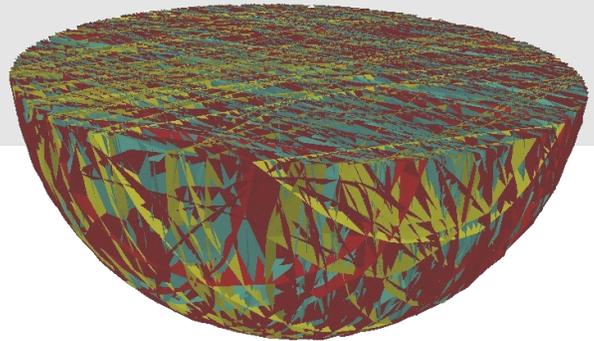- MIRARCO's new software tool, MoFrac, is a state-of-the-art DFN generation tool.

Ventilation Optimization
Proper planning and operation of underground mine ventilation systems can:
- Minimize both capital and operating costs
- Ensure that underground workers are provided with a safe and healthy work environment

## SOT+

The SOT+ project has developed three new modules that increase the scope of SOT capabilities to take into account a broader range of constraints important to the mine planner. The modules are Advanced Valuation, Ventilation Constraints, and GeoSequencing. Industry partners participating in the SOT+ project include Vale Canada, Newmont, Agnico Eagle, Datamine and Deswik. Click here to learn how your mining company can participate in the next phase of the SOT+ consortium project that will build on the success achieved to-date. Case study opportunities are currently available exclusively to prospective participants.

## Extending the Benefits of the Natural Heat Exchange Area

MIRARCO is developing software to optimize the use of the existing natural heat exchange area system at Vale's Creighton mine. This will allow Vale to avoid or postpone the significant capital and operating costs of mechanical refrigeration, while providing a healthier work environment for miners as deeper levels of the mine come into operation.

## MoFrac

Rock masses contain discontinuities at different scales, such as cracks, joints, shears and faults, forming discrete fracture networks (DFNs). The geometry of these fracture networks and the fracture surface conditions control the strength and deformation behaviour of rock masses, and the geometry and interconnectivity of a DFN can influence groundwater flow and contaminant mobility. This research program is developing a new software tool called MoFrac implementing the novel techniques of R. Mohan Srivastava for the application of rule-based geostatistical methods to generate realizations of site-specific DFNs that explicitly honour fracture network geometry and spatial characteristics. The project will:

⇒ develop improved algorithms, novel interface paradigms and novel workflows to allow geotechnical engineers to generate visually realistic and geologically plausible fracture networks;

⇒ investigate how rock engineering in fractured rock masses can be enhanced with the aid of better-characterized DFNs;

⇒ transfer knowledge to the industry by means of embedding algorithmic and methodological improvements in the MoFrac software tool andtrain highly qualified professionals.

The approach to be adopted is a combined application of experimental observation, field monitoring, and numerical modeling. This research is intended to advance DFN generation and materially improve the safety, productivity and profitability of underground engineering projects.

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