

SEG 2024 Conference: Sustainable Mineral Exploration and Development

The Transformative Impact of Enhanced Geoscience Data Collection and AI-Powered Modeling on the Mining and Exploration Industry

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Delivering on the UN Sustainable Development Goals and transitioning to a low-carbon global economy requires technologies that utilize a wide range of minerals in vast quantities. Unfortunately, as the world's need for minerals is greater than ever, discovery rates have dropped and discovery costs have risen. In addition, the timeline from discovery to mine development has grown longer and most new mines fail to achieve design production in the early years, resulting in a delayed return on investment and a global shortfall in the minerals needed for the green energy transition. Multiple factors contribute to these trends, however, the issue of inadequate geoscience data collection and analysis stands out as a major contributor, since it leads to poor characterization of mineral deposit properties and their associated uncertainty. This creates a poor understanding of downside risk and upside potential, suboptimal mine and mill design, and generally degraded decision making.

Fortunately, more accurate, consistent, high-resolution and near real-time geoscience data collection has become available using advanced multi-sensor scanning technology that captures RGB, XRF, LIBS, hyperspectral, petrophysical, and LiDAR data, among others. Simultaneously, rapid advances in AI-powered modeling solutions permit effective integration of these data in geology, grade, geometallurgical, geotechnical, and recovery modeling of a deposit, significantly improving the holistic characterization of a mineral resource to facilitate improved decision making throughout its life cycle. Our industry is rapidly adopting these technologies, which are transforming how we collect and interact with geoscience data across the entire exploration and mining value chain.

This presentation will summarize the referenced technologies, presenting examples and case studies that illustrate their application across a range of deposit types. It will conclude with a discussion of how we as geoscientists can combine foundational geoscience knowledge with the data from these technologies to improve exploration, deposit evaluation, and mining outcomes.