

Exploring the Digital Terrain: The Power of Geospatial Technology and GeoAI in Modern Mining

Aune Kamosh¹

¹QKR Navachab Gold Mine, Namibia University of Science and Technology, Windhoek, Namibia

The mining industry, traditionally rooted in fieldwork and manual data analysis, is undergoing a profound transformation through the integration of advanced geospatial technologies and artificial intelligence. GeoAI, the fusion of geospatial science and AI, is empowering mining companies to navigate the complexities of mineral exploration with unprecedented accuracy, efficiency, and sustainability.

At the core of this technological shift is geospatial technology, which provides the tools to map, analyze, and monitor the Earth's surface and subsurface in real-time. Satellite imagery, drone-based data collection, LiDAR scanning, and hyperspectral imaging are now integral to the exploration process. These technologies offer high-resolution mapping and allow for detailed analysis of vast, often remote, areas. By combining these data sources, geospatial technology creates a comprehensive digital model of the terrain, enabling geologists to identify promising mineral-rich zones more efficiently and with greater precision than ever before.

In parallel, GeoAI is revolutionizing how this data is interpreted. Artificial intelligence algorithms, trained on historical and real-time exploration data, are capable of detecting hidden patterns in geological formations, predicting the likelihood of mineral deposits, and suggesting optimal drilling locations. Machine learning enhances the decision-making process by automating data analysis and reducing human error, while also enabling more accurate predictions of mineral behavior and resource volumes.

These innovations are not only transforming mineral discovery but also improving sustainability efforts in mining. The combination of real-time geospatial monitoring, predictive modeling, and AI-driven analysis is helping to reduce environmental impact, optimize resource extraction, and minimize operational costs. Through smarter, more data-driven methods, the industry can address the growing demand for minerals while balancing the need for responsible, ethical, and efficient mining practices.

This presentation will explore the evolving role of GeoAI and geospatial technologies in the mining sector, reshaping the entire lifecycle of mineral exploration.