## In DATA, We Trust – Navigating through the age of A.I. in the Mining Industry

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## ABSTRACT

The world is embracing a new form of industrial revolution – Industry 5.0; where machines enable humans to work faster and smarter by leveraging technologies like the Internet of Things, Big Data and Artificial Intelligence. Industry 5.0 builds upon the foundations of automation and efficiency established by Industry 4.0. The mining sector is a prime example of an industry rapidly adopting these tools to diagnose and analyse mining data; identifying resource opportunities, and optimizing performance.

The accessibility and analysis of extensive datasets have seen a significant increase, facilitated by custom sensors and powerful computing capabilities that provide valuable insights and operational guidance. These insights result from a combination of detailed simulation models (digital twins) and the analysis of operational data. Like any process model, understanding the process, equipment operation, and subsequent performance evolves through model development, experimentation, and benchmarking against similar operations. Despite the pragmatic and logical approach to analysis, the selection of the process flowsheet and equipment performance is heavily influenced by the available data obtained during the early project development phase and ongoing operation.

One of the key challenges to training the algorithms in the machine learning models is the availability of good data representing the ore body and reliance on working instrumentation that is properly calibrated to provide the correct process outputs. The mining block is a statistical inference based on the spatial location and orientation of the drilled core samples, while standard instrumentation is susceptible to drift or errors in data due to the demanding process conditions.

This paper explores the challenges of developing advanced Artificial Intelligence algorithms and the key areas and approaches taken to improve their prediction capabilities. It offers practical solutions to enhance predictability through various simulation techniques grounded in a broad metallurgical understanding of the process and mine development.