

## Improving Grade Control Turnaround Times with In-Pit Hyperspectral Assaying

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**Abstract :** As critical commodities become more scarce, significant time and resources have been used to better understand complicated ore bodies and extract their full potential. These challenging ore bodies provide several pain points for geologists and engineers to overcome, poor handling of these issues flows down stream to the processing plant affecting throughput rates and recovery. Many open cut mines utilise blast hole drilling to extract additional information to feed back into the modelling process. This method requires samples to be collected during or after blast hole drilling. Samples are then sent for assay with turnaround times varying from 1 to 12 days. This method is time consuming, costly, requires human exposure on the bench and collects elemental data only. To address this challenge, research has been undertaken to utilise hyperspectral imaging across a broad spectrum to scan samples, collars or take down hole measurements for minerals and moisture content and grade abundances. Automation of this process using unmanned vehicles and on-board processing reduces human in pit exposure to ensure ongoing safety. On-board processing allows data to be integrated into modelling workflows with immediacy. The preliminary results demonstrate numerous direct and indirect benefits from this new technology, including rapid and accurate grade estimates, moisture content and mineralogy. These benefits allow for faster geo modelling updates, better informed mine scheduling and improved downstream blending and processing practices. The paper presents recommendations for implementation of the technology in open cut mining environments.

**Keywords :** grade control, hyperspectral scanning, artificial intelligence, autonomous mining, machine learning

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