Virtual Mine Geologist - Who needs a real one when AI can do the job?

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ABSTRACT

The key skills for a competent geologist are observation, documentation, analytical thought and the ability to communicate. These attributes have served the geological world for the past two centuries since the field of geology was separated out from natural philosophy.

The advent of artificial intelligence and machine learning has matured to the point where observation and analysis can replace manual processes and deliver credible results. Direct measurements via sensors can detect spectra of mineral species and photograph in visible and non-visible wavelengths.

Analysis using machine learning techniques trained using known data sets can determine rock type classification, rock density, quantification of grade/quality attributes, mineral alteration, weathering and geotechnical attributes such as rock quality. Using these interpreted geological criteria, 3D domain models with spatial attributes will be built and fed as dig plans to automated mining equipment.

The mine or resource geologist will change roles from a primary data collector to that of a system integrator and/or data/process manager. The workflow and calibration of the sensors and machine learning algorithms will control this data-driven world. Benefits include automated data validation, auditable processes, consistent outcomes and integration into the digital mine platform.

Case histories will be presented showcasing several aspects of the virtual mine geologist and the future world, including discussion of the challenges that need to be overcome for acceptance of a virtual geologist.