

Machine learning and resource geology

M.F. Gazley¹, S.H. Hood², R. Sterk³

1.
Principal Geochemist, RSC Mining and Mineral Exploration, Wellington, New Zealand.
MAusIMM. Email: m.gazley@rscmme.com
2.
PhD Student, University of Tasmania – TMVC (The Mining Value Chain), Hobart, Tasmania, Australia. Email: shawn.hood@utas.edu.au
3.
Principal Resource Geologist, RSC Mining and Mineral Exploration, Perth, Australia.
FAusIMM (CP). Email: r.sterk@rscmme.com

ABSTRACT

A general definition for artificial intelligence (AI) is the machine-based reproduction of tasks inspired by, or conventionally accomplished by, humans using their natural intelligence. The form of AI applied to mineral exploration is called “Domain Specific” AI; it is task-oriented and includes decades-old approaches to software automation and statistical modelling. Machine learning (ML) is a subfield of AI and is defined as any computer program that improves its performance at some task through experience or iteration. In this contribution we discuss how ML is well established (but little understood) in many resource modelling quarters, and review ways that it can be used to facilitate the regular tasks associated with resource modelling. Specialties of ML relevant to resource geology include pattern recognition (e.g., for domaining for data through clustering) and non-linear regression (e.g., for grade estimation).

Resource geologists are a type of Domain Expert (in ML parlance) who have knowledge of both geological scenarios (ore deposits) and geostatistics. To estimate resources, resource geologists leverage an abundance of geoscience data (usually assays, complimented by relevant geological information and/or maps or 3-D models) to interpret deposits.

There is practical value for resource geologists to merge ML with their domain expertise during resource estimations. For example, to produce domains with stationary grade populations or to domain geometallurgical volumes. Such tasks are typically undertaken when producing resource models. However, by using ML approaches, these tasks can be automated and made more objective, repeatable, and efficient.