How Golder Implemented Machine Learning to Predict Rock Classification and Reduce Costs for Mine Permitting
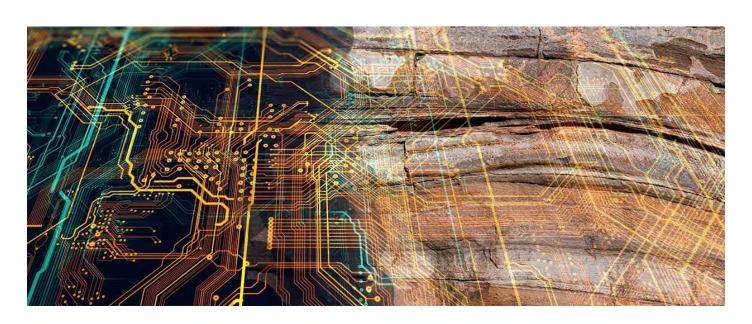

Project Info

Client	Location
Confidential.	Central USA

Description

As larger datasets become increasingly common, many companies struggle to manage and analyze it to their advantage. Artificial intelligence (AI) and its sub-field Machine Learning (ML), can help. Machine Learning takes data samples, processes them through statistical analysis programs, and predicts future outcomes.

This strategy can be extremely valuable to companies in the environmental sector. It can save time and money on a wide set of applications, from mine material management to evaluating locations for well-monitoring stations.

For example, the Golder team worked with a client to explore how ML could assist with material classification and regulatory requirements for permitting. The client's waste-material segregation process had been wasting time and money. The process was intended to separate waste into three

classes: benign, moderate, and special handling. Although the client had a rich dataset with their assay database, they were only using two or three parameters to segregate and sort. Aside from the upfront time spent sorting so much material, the client was forced to spend additional time resorting materials that had been incorrectly classified. To top it off, excessive amounts of time and money were devoted to processing benign materials that had been misclassified as special handling.

Golder's subject-matter experts (SMEs) worked with the client to use their assay database with ML tools to identify more useful parameters for sorting other than the current ones they were using. The solution created predictive insights with outstanding results. The client saw that ML can provide insights in how to better manage their material, which can lead to substantial financial savings for the company.

The same client retained Golder SMEs to help reduce the time and costs associated with obtaining mining permits. Often a cripplingly long and expensive ordeal, the permit process usually involves massive expenditures on exploration and reporting, to include geological mapping, geochemical and geophysical surveys and so forth.

With Golder's help, the client developed a stockpile and associated cover system to minimize ground and surface water impacts from a sulfide-bearing overburden project. In conjunction with this, Golder performed water balance, infiltration modelling, and geochemical impact assessments to optimize cover design, and assist with permitting in a challenging regulatory climate.

Among the technical challenges were changing groundwater flow conditions and the need to account for a damaged rock zone in the pit shell (which provided storage). Various tools were used, such as Hydrologic Evaluation of Landfill Performance (HELP) for the water balance and infiltration modelling, The Geochemist's Workbench for geochemical modelling of sulfide overburden materials, and GoldSim for mass balance modelling. The impact assessment evaluated operational conditions through the end of mining to include post-closure scenarios.

Current permitting in the client's region remains challenging, so permit costs can quickly become excessive. The latest partnership between Golder and this client involves the use of ML to predict the neutralization potential for mine expansion. The plan is to take existing data to create a model that predicts neutralization potential, thus saving costs on lab tests. Golder SMEs will be working closely with the client and regulatory bodies as planning begins to ensure all requirements are met.

These are just some examples of the work that Golder has been doing in environmental projects with Machine Learning. Given its predictive power and ability to provide savings in both time and money, more companies are expected to adopt this solution for their data.