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Modeling Field Strength and RQD to Interpret Potentially Poor Ground Conditions in Southwest Wau Graben, Papua New Guinea

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Machine learning is creating value within multiple facets of the mining industry, especially when utilizing larger data sets to augment predictions of parameters that are characterized by small or incomplete data. The authors will introduce deep learning tools like convolution neural networks, how datasets of disparate size and characteristics are combined together as inputs into neural networks, and the results of these methods applied to geotechnical modeling. The authors present the results from a vein-stockwork gold-silver epithermal deposit in the Morobe Granodiorite of the Wau Graben in Papua New Guinea. They demonstrate how statistically significant non-linear correlated elements from assays and lithology are used as pathfinders for field strength (FS) and RQD to categorize each block as potentially poor ground conditions (PPGC). The PPGC threshold for both parameters were RQD <25% or field strength = soil, 0, 1 designations. KNN baseline models for RQD and field strength were created to (1) understand the complexity of the modeling task and (2) to create a performance benchmark against which the neural network methods would be evaluated. The results of this baseline demonstrated that geostatistic-esque interpolation method resulted in an 81% error rate in FS correctly diagnosing PPGC while RQD had a 79% false positive rate of indicating PPGC. Modeling each parameter separately and using the resulting block models to assign a PPGC classification to each block was a more accurate result than a singular block model predicting a PPGC value directly. The block model evaluation method, due to the sparse dataset, was to spatially split the data where 10% of the dataset was kept aside as a blind test set. It is demonstrated that alteration logging (propylitic (PR), potassic (K), sericitic (SE)) with RQD and FS as inputs identified over 55% of PPGC events, far exceeding the KNN baseline.