

Analysis of model fidelity between exploration and blast-hole based models: A cross-validation style testing

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ABSTRACT

Autonomous Gaussian Process (GP) was used to develop three dimensional spatial models for grade estimation using geochemical assays. The integration of data and knowledge from several sources is vital for robust estimation of expected tonnages in mining and needs to be re-estimated in areas of change after a boundary update has been conducted. Data fusion techniques have been extensively employed on multisensory environments with the aim of fusing and aggregating data from different sensors.

This study analyses potential biases between exploration and blast hole geochemical data using cross validation style testing. The cross validation compares an approximation of the value for each of the blast holes, where each blast-hole is computed from the blocks in a model that it intersects. Hyperparameters such as length scales in x, y and z directions, amplitude and noise, for a GP were learnt using exploration only data, blast hole only data and both exploration and blast hole data as training samples. The hyperparameters learnt with the corresponding data were then used to inference into blocks.

Geochemical fusion modelling was performed on a typical Hammersley Ranges iron ore deposit. The dynamics of the resulting models for each of the data source were evaluated through analysis of histograms and spatial scatter plots. Block inferences away from the exploration holes resulted in significant differences in the exploration only block model in some area where blast-holes are more informative. The resulting model shows that the fusion, unsurprisingly, improves the estimates in areas where blast hole data is available.

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