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Stochastic characterisation of a mining production system

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ABSTRACT

There are discrepancies between deterministic mine planning and the actual mining process due to geological uncertainties associated with mineral deposits and inherent production system variabilities. The misalignment between the planning process and the actual mine production process often leads to non-achievement of production outcomes. Stochastic mine planning has been developed to minimise these misalignments but it is computationally intense and requires constraint functions to operate effectively. However, the stochastic mine planning approaches in literature do not have an embedded process analysing the interactions between the Key Performance Indicators (KPIs) and the mine production activities.

This dissertation proposes an approach to study the interactions/correlations between KPIs used to measure the progress of a mining operation and the mining activities. The Multinomial Logistic Regression (MLR) approach is a non-linear and non-normal measurement method which can assist in understanding the behaviour of mine production activities when compared to assessed KPIs. The MLR model can also assist in establishing which production activities require maximisation or minimisation in attaining the desired KPIs.

This study shows that 71% of the KPIs for a case study in mining production system are influenced by the movements of the production activities in the mining process and the level of uncertainty on the forecasted KPIs is reduced through applying the MLR model. This method will help mining companies in assessing in the initial stages of mine planning the mine production activities that management should focus on to achieve desired KPIs by directing more effort and resources to these statistically significant activities.