Application of causal models in strategic mine planning for maximum return.

G. Asamoah, J. Liu and R.K. Asamoah

1.PhD Candidate, University of South Australia, 5095. gloria.asamoah@mymail.unisa.edu.au
2.Associate Professor, University of South Australia, 5095. Jixue.Liu@unisa.edu.au
3.Senior Research Fellow, University of South Australia, 5095. Richmond.Asamoah@unisa.edu.au

Keywords: causal models, mining investment, cashflow, machine learning

The integration and application of causal machine learning models in mineral extraction processes has always been a major problem in the mining industry due to the uncertainties in the geological models such as grade variations, geotechnical issues, mine operations challenges, and metal price fluctuations**.** Current conventional mine planning models such as stochastic models have been applied extensively in simulating the uncertainties and the risk factor in the mining project, but the complexity and computational challenges result in poor interpretation of outcomes. There are currently contradictory views on the model that are effective for the mining industry. Paucity of knowledge, therefore, exists on the specific machine learning model that can be practically applied for mining investments, considering all the dynamic planning parameters, in an efficacious manner for maximum return. The key research questions and hypothesis are: (i) How effective is causal models compared with the other conventional mine planning techniques to obtain high cashflows and maximize output, taking keynote of historical realisations? (ii) Which model best describes the application of causal models considering the dynamic planning parameters under specific conditions, for mining investments (iii) What fundamental principles limit the transition of most mining companies/operations from the conventional mine planning methods to causal models (iv) How can the limitation be eliminated for improved returns. The objective of this study is to investigate the application of causal model in simulating uncertainties in strategic mine planning for maximum return while addressing the above research questions. Links to relevant literature will be highlighted.