

Geostatistics for Mining Engineers and Geologists



Integrating Various Data

 Combine all available data (ore grades, geology, contaminant or trace elements information, geophysics) in one single database for geologically oriented processing.

Getting the Best Sampling

 Assess the impact of sampling patterns on the reduction of uncertainty in resource evaluation.

Building a Robust and Accurate Block Model

- Achieve detailed domain analysis using advanced coding of data and block models.
- Reveal the **spatial distribution** of the mineralization and **correlations** between grades with advanced variographic analysis of your data.
- Build your **block model** using the kriging method suited to your deposit and data characteristics.
- Refine your block model with a consistent geological model to control the metal distribution.

Assessing the Risks

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- Explore the grade distribution characteristics with the conditional simulations. Numerous equiprobable grade values are provided giving information on the variability of the block model.
- Identify the grade realizations which best represent the whole grade variability to characterize the risk attached to a project due to resource uncertainty.
- Improve grade control using the appropriate simulation technique to investigate the production sampling pattern.



Among different criteria measuring the kriging efficiency, the kriging variance is a good indicator for discriminating different drilling patterns and optimizing drilling mesh dimensions.



Soft or hard boundaries may be defined for accurate geological or production domaining.



00 Prob (♥ > 800 ppm) 200 100 50 100 100 100 100 100 200 280

In-depth data analysis allows to identify outliers and anisotropies.

Mine planning can be refined by introducing pessimistic and optimistic scenarios into the model.



Adjusting the Selective Mining Unit (SMU)

Evaluate the recoverable resources (ore, metal quantities) from the Grade-Tonnage curves according to SMU size and economic grade cut-off.



Various techniques are used to check the Block Support Effect: Uniform Conditioning (multivariate), Global Correction (through the anamorphosis function), conditional simulations.

Evaluating the Information Effect

 Anticipate the ore/waste decision at the feasibility stage to avoid misclassification at the production stage using non-linear techniques.

Classifying the Resources

- Obtain reliable classification of the resources into measured, indicated or inferred categories from Confidence Intervals computations.
- Compare grades sampled at the plant facility with predicted grades for reconciliation.



Estimated grades on blocks are compared to grade values at the plant facility, accounting for polygons, i.e. blasts.

Automating the Geostatistical Process

Set up routine production workflow using batch facilities. Day-to-day production samples are easily integrated to quickly update grade estimates and enhance mine planning.

ISATIS from Exploration to Production



Exploration

- Global resource estimation
- Drilling pattern optimisation
- Geostatistical insight on the geological representation
- Uncertainty assessment

Feasibility

- Local recoverable resource estimation
- Sensitivity of project profitability to SMU dimensions
- Grade-Tonnage curves
- Evaluation of the information effect on the ore recovery at the future production stage
- Resource classification

Production

- Grade Control
- Grade Reconciliation
- Routine estimation update