Key Concepts

Studio RM Geostats Module
AGENDA

Rapid Presentation GV

Key Concepts behind the GGS Module

Questions & Answers
GV: LEADER IN GEOSTATISTICS

Independent software vendor
Founded in 1986
The only geostatistics pure-player
Works hand-in-hand with the Fontainbleau Center for Geostatistics
Helps mining companies to meet their resource estimation & risk assessment challenges

30+YEARS
expertise

DATAMINE
GEOVARIANCES | COMPLETE GEOSTATISTICS-BASED SOLUTION

- **Software**
  - technical support included

- **Consulting**
  - mentoring & technical assistance

- **Training**
  - software use & methodologies
GEOVARIANCES PRODUCT STRATEGY
IMPORTANCE OF THE PARTNERSHIP
KEY CONCEPTS

1. AUTOFIT
2. KNA
3. MULTIVARIATE
4. CHANGE OF SUPPORT
5. LUC
AUTOFIT

• Minimize the distance between the model and the experimental variogram curves

• Based on a gradient descent method
AUTOFIT

The distances are weighted:

- Weight increases with nb of pairs
- Weight decreases with lag distance
AUTOFIT

The distances are weighted:

• Weight increases with nb of pairs
• Weight decreases with lag distance
KNA

1. Objective Optimisation of Neighbourhood Searches

2. Fight Conditional Bias

3. Improve mapping and ore/waste allocation decisions

4. Defend parameters choices (internal/external audit)
KNA

1. Conditional bias
   slope of regression $E[Z|Z^*]$

2. Precision
   estimation variance or standard deviation

3. Adequacy of the data configuration
   weight assigned to the mean in SK

4. Smoothness
   dispersion variance of the kriged estimates $\text{Var}[Z^*]$
KNA

- Waste as ore
- Ore as waste
- Mill ore
- Dump waste
- Waste as ore

Real grade $Z$

Estimated grade $Z^*$

- Correctly classified
- Incorrectly classified
MULTIVARIATE

1. Multi-element assays
2. Top, bottom and thickness of a layer
3. Thickness, accumulation and 2D grade
4. Geophysical data (e.g. quality logging in coal)
5. Mix of data sources (DDH explo/production BH)
6. Improve Domaining Decision
MULTIVARIATE

Improve the estimation of one variable thanks to other variable(s)

a) Coal estimation: over-sampled variable (structural thickness) vs quality variables (ash, RD, YLD etc.)

b) Iron Ore, Bauxite, PGE, Au-Cu, Pb-Zn-Ag

c) Precious Metals (under sampled deleterious or environmental variables will benefit from link with key variables)
MULTIVARIATE

Improve the consistencies between the estimations of different variables

a) Top, Bottom, Thickness of a layer (avoid cross-overs)
b) Respect stœchiometric relationship (ensure ratios between elements are maintained, e.g. iron ore estimation)
c) When density plays a role and/or key variables have high level of correlation (0.6-0.9) the precision of estimates can be improved
CHANGE OF SUPPORT AND LUC

Point Data

Data distribution

Variogram

Application of the DGM

SMU distribution

Q,T,M

Block support
CHANGE OF SUPPORT AND LUC

$Z_C$
CHANGE OF SUPPORT AND LUC

Mass percentage at a given cut-off.

Ex: \( T = 15.16 \% \)
CHANGE OF SUPPORT AND LUC

Metal mass percentage at a given cut-off.

Ex: $Q = 0.0097\%$
CHANGE OF SUPPORT AND LUC
CHANGE OF SUPPORT AND LUC
\[ \rho_{v_1v_2} = 0.10 \]
\[ \rho_{v_1v_3} = 0.85 \]
KEY CONCEPTS

1. AUTOFIT
2. KNA
3. MULTIVARIATE
4. LMUC
5. More to Come
THANK YOU