Exploration data – analytics, uncertainty and security

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June Hill, Ryan Fraser, Juerg Hauser, Jess Robertson, Carsten Laukamp, Yulia Uvarova, David Cole et al...
Cover – the Australian challenge
UNCOVER initiative
AMIRA P1162 – over 30 sponsors
Unlocking Australia’s hidden potential

SCER report from the Resources Ministers

Note: Major defined as >1 m oz Au, >1 mt Cu, >100 kt Ni or equivalent
Excludes Bulk Minerals such as Coal, Bauxite and Iron Ore

Sources: MinEx Consulting August 2010
Geoscience Australia
Inverting multiple survey lines jointly for a spatially coherent interface

The true value of a Bayesian perspective lies in predictive applications such as groundwater modelling and depositional simulations.

Inverting for interfaces and associated uncertainties

Uncertainty in water availability

Water table uncertainty

Nuggety gold is spatially discontinuous; difficult to predict orebody boundaries from assay results of small samples (1/2 core).

- We need to find a suitable proxy for mineralisation that we can map instead
- We need to automate the use of the proxy for large data bases.
Slice through 3D model:
Probability isosurface of FAV suggests the presence of previously unrecognised steep structures connecting major shear zones.
Method

multiscale spatial domains
*(make rectangular shapes)*

from

continuous wavelet transform
*(convolve wavelet with signal over range of scales)*

using

2\textsuperscript{nd} derivative of Gaussian wavelet
*(smooth & locate inflection points)*
Data Portal, analytics, virtual labs

Woodcock and Fraser et al.
Map of TOFR Sb distribution in the Kalgoorlie District

Note the scale of the hydrothermal footprint! Scott Halley Mineral Mapping
Futures for exploration data science.

• Smart sampling and prediction – based on uncertainty and active sampling based approaches to the problem in real time.

• Smart drill program planning – less metres same result

• Prediction of horizons under cover based on uncertainty, geological facies / layer simulations and inversions

• Data sharing – blockchain approach to data security, preserve sensitive data, produce new level of exploration product

• Industry data sharing portal, reflect future shifts in culture and societal expectations – proactive not reactive.
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