LOOP: PROBABILISTIC THREE DIMENSIONAL GEOLOGICAL MODELING

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One of the greatest challenges facing modern society is to reduce our impact on the environment. To do this we need to improve our management of the natural resources used for renewable and sustainable technologies (critical metals, base metals and water). We need to be able to make informed decisions about the subsurface, by understanding the subsurface geometry of geological features. We need to be able to make geologically consistent predictions (models) about the sub-surface geology at multiple scales. Geologically consistent models at the mine scale should equate to better understanding of natural resources and consequently a more economic and sustainable way of producing the required resources for a greener future with increased recovery rates and reduced amount of resources required and waste produced.

We present the current state of the Loop project, an open-source interoperable, integrative, probabilistic 3D geological modelling platform. Loop applies new algorithms to use all structural geological data (e.g. fault kinematics, fold axial surfaces, fold axes, deformational overprinting relationship) in the modelling process. These new algorithms require estimates of geologically relevant parameters (fault displacement, fold wavelength, intrusion shape etc). Estimating these parameters is not trivial and the solutions are usually non-unique. We propose using Bayesian inference to investigate these parameters using localised geological and geophysical inversions of specific structures.