

## Rethinking variogram modeling

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### ABSTRACT

Variogram modelling is a critical component of resource modeling, it provides an insight into the spatial continuity of a deposit as well as being a necessary component of all Kriging-based algorithms. Although important, it is a tedious, laborious, and difficult task which requires specialized knowledge from the modelers.

This paper will present a novel approach and software to variogram modeling that is constructed around automatic fitting. Auto-fitting is an optimization process in which a variogram model that matches the data is found algorithmically. Instead of adding the autofitting algorithm to the traditional modeling workflow, our approach redesigns the entire modeling workflow around the autofitting requirements. First, the application can work with several domains and grade attributes at once, it efficiently computes the experimental variograms in hundreds of directions for each combination of domains and attributes. These experimental variograms are then passed to an optimization process, the auto-fitting, that will search for the anisotropy, the ranges, the contributions, and the nugget of the 3D model. Once completed, the models are then presented in a dashboard where each model has a fitting error associated with it. The modeler can then quickly review each model and manually refine any models that are deemed unsatisfactory through a rich and interactive user interface. Through that visualization, the modeler can inspect the model fit quality in hundreds of directions to ensure that the model properly captures the anisotropy of the data.

The application also allows the updating of existing models when new data is added to a project. A modeler can then quickly update all the variogram models whenever new data becomes available ensuring that the resource model reflects the sampled data.

Finally, the application is completely parallelized and can be run on the desktop or natively on the cloud.