

Probabilistic Resource Modeling with Geostatistics and Python

Centre for Computational Geostatistics (CCG)

What. A four day intensive course going through the steps of surface, boundary, rock type/facies and multivariate property modeling for probabilistic resources. The worked example is based on real data and is suitable for Mining and Petroleum (and other) applications. All software, data, notebooks and a full worked solution will be provided to participants.

Dates and Location. May 14-17, 2018 at the University of Alberta in Edmonton, Alberta. An appropriate centrally located accessible room has been reserved for the class.

Background. The generation of geostatistical resource models has become commonplace. The CCG has been developing methodology and software for probabilistic resources for 20 years. This course presents the steps to construct realizations of surfaces, boundaries, categorical variables and multiple continuous variables for probabilistic resources. The focus is on essential theory, implementation details and practice. Each participant will have the opportunity to perform the entire workflow in a series of python notebooks. Participants will benefit from completing an integrated workflow with software they take with them. The latest proven techniques will be used. See Outline below.

Who Should Attend. This course is primarily intended for geoscientists, engineers and others with an interest in learning how to quantify resource uncertainty and build geostatistical models with python and the latest tools. Relative newcomers to resource modeling will benefit from the overview and going through all of the steps in a probabilistic resource model. Experienced professionals will benefit from exposure to the latest modeling techniques and software.

Instructor. Clayton Deutsch will coordinate the course, be present for the duration and deliver most lectures. Dr. Deutsch leads the CCG and is a Professor in the School of Mining and Petroleum Engineering at the University of Alberta. Dr. Deutsch holds the Alberta Chamber of Resources Industry Chair in Mining Engineering and the Canada Research Chair in Uncertainty Management.

Cost and Registration. The course will be administered by Clayton V. Deutsch Consultants Ltd. Registration fees will offset course preparation, professional time and an honorarium to the extensive support that will be provided by senior students and associates:

General	Regular Registration	CAD \$2000
	Early Registration (before March31)	CAD \$1750
CCG Member	Regular Registration	CAD \$1500
	Early Registration (before March31)	CAD \$1250

Contact cdeutsch@ualberta.ca for registration details and any questions regarding the course.

Outline. The following series of lectures and practice sessions will be presented. A common set of data will be used for all practice sessions. Participants will have an opportunity to practice and will also be provided with the full solution set. Participants can bring their own data to play with and for questions.

Monday	8:30 – 9:15	Introduction to Probabilistic Resource Assessment
	9:15 – 10:00	Stationarity: Surfaces, Boundaries, Rock Types
	10:30 – 11:15	Data Transformation, Declustering and Trends
	11:15 – 12:00	Variogram Calculation, Interpretation and Modeling
	1:00 – 1:45	Introduction to Python, CCG Programs and other Tools
	1:45 – 2:30	Practice: Computer Setup
	3:00 – 3:45	Practice: Python, Data, File and Program Management
	3:45 – 4:30	Practice: Visualization with Pygeostat and Paraview
Tuesday	8:30 – 9:15	Surface Modeling with Uncertainty
	9:15 – 10:00	Practice: Surface Modeling
	10:30 – 11:15	Thickness and Tabular Modeling with Uncertainty
	11:15 – 12:00	Practice: Thickness Modeling
	1:00 – 1:45	Boundary Modeling with Uncertainty
	1:45 – 2:30	Practice: Boundary Modeling
	3:00 – 3:45	Complex Multiple Overlapping Geometry Modeling
	3:45 – 4:30	Practice: Geometry Modeling
Wednesday	8:30 – 9:15	Categorical Variable Definition and Trend Modeling
	9:15 – 10:00	Practice: Categorical Trend Modeling
	10:30 – 11:15	Hierarchical Truncated PluriGaussian (HTPG) Modeling
	11:15 – 12:00	Practice: HTPG Modeling I
	1:00 – 1:45	HTPG Modeling Setup and Implementation
	1:45 – 2:30	Practice: HTPG Modeling II
	3:00 – 3:45	PPMT Transform for Multivariate Property Modeling
	3:45 – 4:30	Practice: PPMT Modeling I
Thursday	8:30 – 9:15	PPMT Modeling Setup and Implementation
	9:15 – 10:00	Practice: PPMT Modeling II
	10:30 – 11:15	Model Assembly and Post Processing
	11:15 – 12:00	Practice: Model Post Processing
	1:00 – 1:45	Model Coordinates, Regridding and Rescaling
	1:45 – 2:30	Practice: Model Manipulation and Reporting
	3:00 – 3:45	Discussion and Help Session for Participant Problems
	3:45 – 4:30	Application of Probabilistic Resources

Some Details on the Software. The modeling project will be executed in a series of Python Jupyter notebooks on a Windows machine (ideally the participant's laptop, but laptops are available). The open source Anaconda Python distribution will be used with ParaView as the open source visualization application. CCG programs and the Pygeostat package will be used. Installation and setup is straightforward. Detailed instructions on software installation, the data, exercise notebooks and the working solution will be sent before the class. Prereading and computer preparation will be suggested