# Where do we lack information? MPS realizations can tell you where to drill!

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The importance of handling uncertainty of data and being able to present the ambiguity of Geo-models of any kind have got more and more attention the last couple of years.
The same way it is important for a Geo-modeler to understand the uncertainty and limitations of data to make an adequate Geo-Model, it is important for a decision maker to understand the uncertainty and limitations of a Geo-model to perform adequate decisions. Whether the Geo-Model is made to manage infrastructure projects or nature resources like oil, gas, or groundwater, being able to understand the uncertainty and limitations of a Geo-model potentially have great economic value.

One way of presenting the uncertainty and ambiguity of a Geo-Model is to present a suite of Geo-Models instead of just one. Due to the underdetermined nature of the inverse problem to be solve (Making a Geo-Model is an inverse problem), several solutions will all fit the available data and information about the problem. Multiple-Point Statistics is an overall methodology representing a series of simulation algorithms all utilizing the available information (geophysics, boreholes, background knowledge, etc.) to produce a series of Geo-Model realizations all fitting the available information.
Generating many of these realizations allow for any kind of statistical computations to be made – What is the probability of having sand at a specific location and depth, what is the probability that location A and B are sitting in fully connected clay layer, etc.

Depending on the available data and background knowledge you have, these Geo-Models can be more or less informative. Some questions might be answered based on the available models, others might not be answered with a satisfying confidence. To achieve a higher level of certainty in your Geo-Models more information need to be added.

In this presentation we present a methodology where we utilize a series of Geo-Model realizations to tell us where we should obtain more data – e.g. drill another borehole.
This is done by first computing the entropy of our models. In turn this entropy model is convolved with a Gaussian Kernel to obtain a cumulative entropy-model. As entropy is a measure of the inverse amount of information we now, not only have a measure of where our Geo-model(s) is most uncertain, but also where we should add more information to our model (e.g. by drilling) in order to reduce the uncertainty the most.