How can I optimize my sampling design with Kartotrak

Kartotrak enables **sampling optimization**. This functionality is designed to refine sampling so that to improve map quality. It is based on a primary geostatistical analysis performed after a first sampling campaign.
New points are located on a regular grid for which you have to define a mesh size (and possibly an orientation). The location of these new measures answers to different criteria based on 2D maps:

- The **Mean Universal Kriging Variance:** this criterion corresponds to a **decrease of the geometrical uncertainties**. In this case, as it only depends on the data configuration and the spatial structure. Additional samples are expected to be located in the under-sampled areas.
- The **Mean of Confidence Intervals Width**: this criterion aims at **reducing uncertainties related to a confidence interval level** around kriging estimates. In comparison to the Mean Universal Kriging Variance, this parameter depends on the data configuration, the spatial structure and the dataset values. Additional points are expected to be located in areas with high variability.
- The **Mean of False Negative Declaration Probability**: this criterion aims at **reducing areas with a high risk level of false negative misclassification** (declare under a given threshold while the real value is above). Areas with a 50% or more probability of exceeding the threshold are considered to be above the threshold (the false positive declaration is not in the scope). If you select this criterion, you need to define of a threshold. The objective is double. It allows to better delineate the contamination extension and to minimize the risk of leaving in place contaminated soils (regarding a threshold).

Given the optimization criterion, two algorithms are available to determine the configuration of additional samples on the target grid:

- A **greedy algorithm**: it consists in a sequential method looking for the local optimum at each step. There is a little chance to get the global optimum but this algorithm proves to be quick and efficient in simple cases (limited number of additional points and simple 2D results).
- A **genetic algorithm**: this method is designed to mimic the process of natural evolution to find the optimal solution.

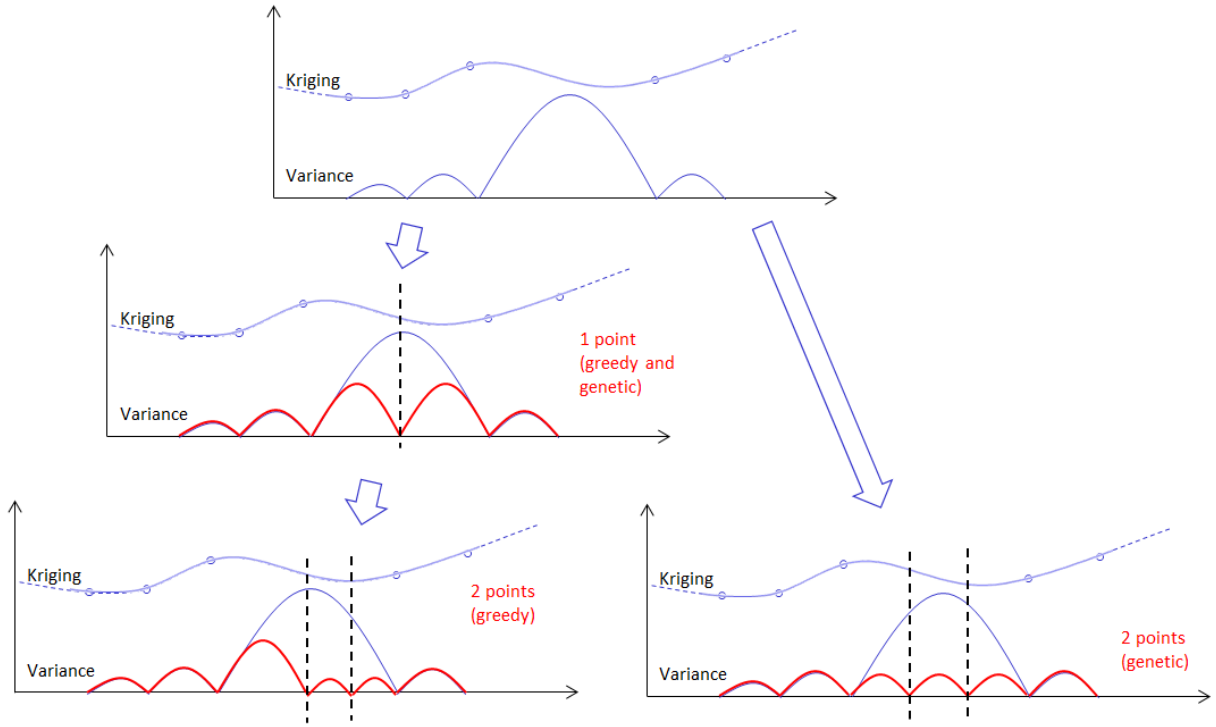
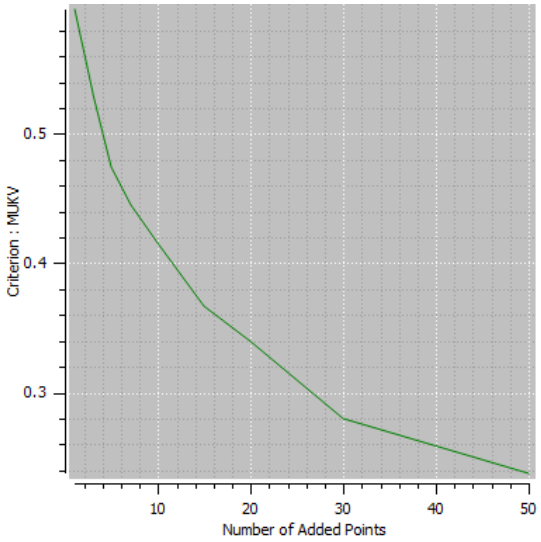


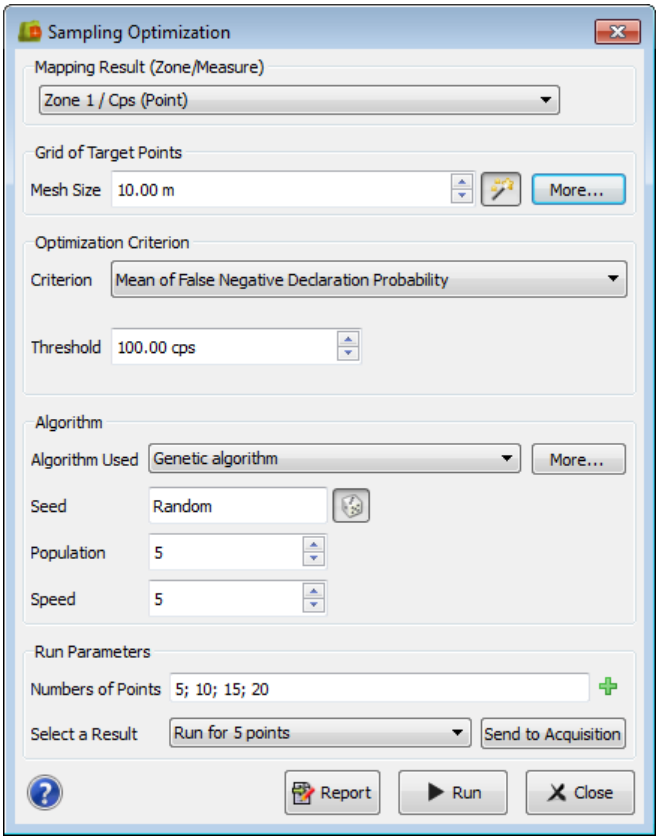
Illustration of the two algorithms

Several sets of points can be tested through a multi-run option. The result is displayed via a curve showing the evolution of the criterion depending on the number of added samples. It is helpful to identify the existence of sills.



Multi-run result: decrease of the criterion depending of the number of added points

By selecting the result of a run, new added points will be visible on the Map and associated coordinates will be sent in the acquisition data table.



Sampling Optimization interface