Study project/master's thesis @HFM:

Finding optimal drifts for the external drift kriging

Problem description

While interpolating variables such as precipitation or temperature, the external drift kriging is used to interpolate their values at unknown locations using observations at some locations in and around the study area. Normally, elevation or its square root is used blindly as a drift. However, no tests are made to determine how elevation is related to a given drift variable at a given time step. Moreover, elevation is not the only variable that affects the behavior of other variables. Also, a drift variable is assumed to have a linear relationship with the variable of interest which may or may not be true. It needs to be verified how the drift transform should be to get an optimal result. This can be simply done by a leave-one-out test with the drift variable being transformed via an optimization procedure that maximizes the linear relationship between the variable of interest and the drift variable. Furthermore, the improvement brought on by new drift variables needs to be evaluated. This can be done by feeding the "better" interpolations to a model and then checking if the results of the model improve.

Steps

Following would be the plan: Interpolate at known points where observations were made by using neighbors and leaving a single one out using a known drift such elevation or its square root. Now, define a transform on the elevation whose parameters are unknown variables that need to be optimized using an automatic procedure. Define a leave-one-out procedure same as before where the transformed elevation will be used to interpolate a variable at a location where it is observed but using the neighbors only. The objective function would be to minimize the difference between the observed and the interpolated value. It may well be that the transform itself is a function of the northings and eastings or some other variables. Such matters need to be investigated. Compare the before and after precipitation volumes and temperatures for example. Compare the results of a rainfall-runoff model that uses the original and modified interpolations and decide if the improved drift also improves model results.

Requirements

The student is expected to have some background in rainfall-runoff modeling, statistics, geostatistics and programming in python as everything mentioned above is coded in it. The required background could be acquired before and/or during the study.

Contact

Interested students may write to me **(faizan.anwar@tum.de)** for further discussion. The work load can be adjusted depending on the student if they want to pursue a study project or a master's thesis.