



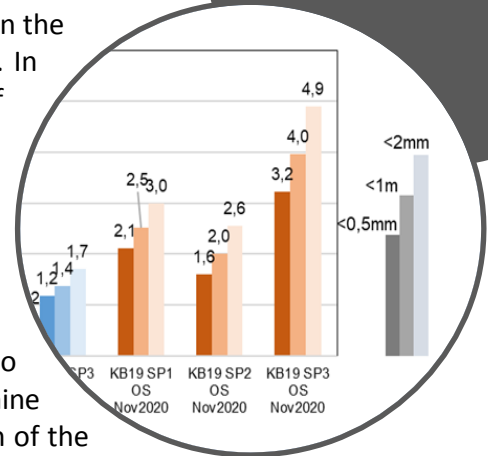
M.Sc. Topic

A.I. Data Analysis of Vertical River Connectivity

Background

To plan river restoration projects, it is crucial to consider the three-dimensional connectivity of river ecosystems. While many research projects focus on longitudinal and lateral connectivity, the vertical connection between the river channel and its hyporheic zone has only been poorly studied. In addition, the role of powerful numerical models in the design of river ecosystems has become increasingly important in recent years, but objective parametric descriptions of fluvial landscapes are lacking. This study is embedded in a research project that focuses on the restoration of connectivity in rivers. It combines the lack of recognition of vertical connectivity with the lack of parametric descriptions and aims to define key parameters by applying a principal component analysis (PCA). PCA is a technique to reduce n-dimensional data to k-dimensional data to speed up machine learning. After running a PCA, it is possible to investigate how much of the variance in original (n) datasets remains in the resulting (k) datasets (keeping the variance between 90% and 99% is a common goal). The student will use existing data from field measurements and numerical modeling of the Inn River (Germany) and identify relevant datasets before developing a Python scheme for PCA. The results of this study will be the baseline for further analyses with the objective of parametric morphodynamic optimization of fluvial landscapes.

A.I. Data Analysis of Vertical River Connectivity



Thesis Overview

1. Review literature on (vertical) connectivity in rivers and familiarize with Python programming and Principal Component Analysis (PCA).
2. Examine existing measurement and numerical modeling data of the Inn River and identify suitable parameters and datasets.
3. Develop a Python scheme to perform a PCA of vertical connectivity parameters and apply it to the Inn River.
4. Analyze the results with regards to the correlation of individual parameters. Identify key parameters describing vertical connectivity and possible improvements of the Python scheme.



Apply now!

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The thesis can be written in German or English.

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