



## M.Sc. Topic

Smart analysis of fluvial ecosystems with airborne lidar data and machine learning

## Background

The Inn is one of the most heavily impaired rivers in Germany, and the preservation of its remaining ecosystem is of paramount importance to multiple stakeholders. In this context, many efforts were made in the last decade to maintain and restore the last near-census natural reach of the Inn in Bavaria.

In the process of collecting data, so-called lidar (Light Detection and Ranging) flights were made with the primary goal of creating a detailed digital terrain model (DEM) of the Inn. The full potential of the data is only used to a fraction and lidar data contains much more information than just terrain elevation to build a DEM. For instance, lidar data include information about spectral reflection intensity or waveform of objects, which enables to draw conclusions about the material and size of single objects.

This master thesis builds a random forest model to recognize sediment grain size classes based on lidar and field data, which serve as training datasets. Existing codes provide a solid basis for exciting data experiments and innovative conclusions.

## Thesis Overview

1. Literature review on lidar techniques, data types, and machine learning (notably random forest) for landscape recognition (remote sensing).
2. Familiarize with existing code and training (field) data.
3. Establish cluster analysis and generate predictors (e.g., topography or green intensity).
4. Build and run predictive machine learning model using random forest.
5. Interpret the results (i.e., the so-called *confusion matrix*) and draw relevant conclusions.

## Desirable Skills

- Understand hydro-morphodynamics processes and numerical modelling approaches (deterministic approach)
- Basic knowledge of the *Python* programming language and strong commitment to enhance programming skills
- Interest in data science (prior knowledge is a plus)



**Apply now!**

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The thesis can be written in German or English.

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