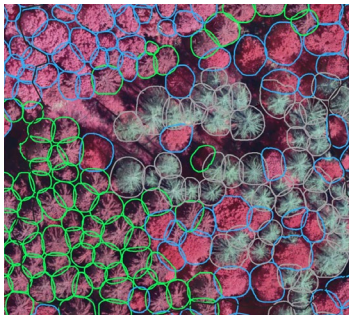
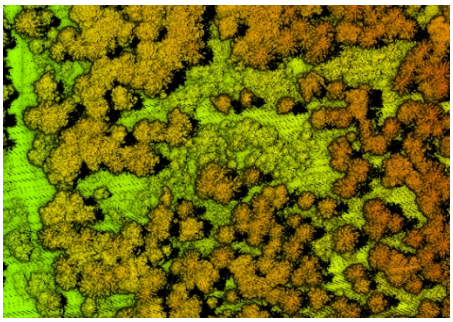
NATIONALPARK Bayerischer Wald
www.nationalpark-bayerischer-wald.de

Master's Thesis

In the Bavarian Forest National Park, Department National Park Monitoring und Animal Management

AI-based single tree detection in the Bavarian Forest National Park


With about 25.000 ha, the Bavarian Forest National Park is Germanys biggest and oldest national park, mostly covered by forests, that are allowed to develop naturally. Forest structure, biodiversity and developments are monitored over long periods of time from the ground along many monitoring areas and inventory plots. In addition, many remote sensing data sets were acquired, especially focusing on airplane and drone-based imaging and laser scanning, providing datasets of high accuracy suitable for effective monitoring on large scales.

Hereby, automated single tree detection offers the possibility to do so on the tree level. With current advances in AI for object detection, single trees and their properties (e.g. height, species, biomass, etc.) can be derived on large scales effectively and with high accuracy from airborne remote sensing data. In a currently ongoing project, all single trees in the national park are derived for three time steps (2012, 2017 and 2023) providing more than ten years of forest history. To do so, the national park administration has set up a performant infrastructure to train and test AI models for this specific task which can be transferred to other datasets and regions as well.

A potential focus for a Master's thesis could be the evaluation and comparison of these time steps to identify and quantify structural changes — such as tree mortality, regeneration, and growth — using change detection methods based on AI-derived single-tree data. The analysis of these temporal differences could further contribute to understanding forest dynamics, disturbance impacts, and climate-related changes in the natural forest development of the park. Ground-based datasets from manual forest inventories and monitoring plots, containing detailed tree-level information from different forest types and development stages, are available to validate and test the accuracy of the automated workflow. Additionally, terrestrial and drone-based laser scanning data can be incorporated to refine the models and to assess detection performance under varying forest structures.

If you want to work on one of these tasks and therefore directly influence the future of forest monitoring practices in the national park and beyond, please contact us.

We offer

- Qualified supervision and good working conditions in an international research team
- Insights into forest and wildlife monitoring and related projects in the Bavarian Forest National Park
- Independent work on a highly relevant and current research topic
- Free accommodation in one of the national parks' guesthouses

We expect

- Strong interest and motivation regarding remote sensing data analysis and forest ecosystems
- Ability to work independently, structured and solution-oriented
- Experience in working with geospatial data via GIS tools and R and/or Python
- Advanced German and English language skills
- Optional: Experience in AI tools for object detection and big data management

Duration: Flexible start date from now on
Location: Bavarian Forest National Park administration, 94481 Grafenau
Please send application or any questions to: Jakob Ebenbeck (jakob.ebenbeck@npv-bw.bayern.de)