MSc thesis: UAV data, machine learning, modelling – applications in forestry and agriculture.

We have large amounts of UAV and field data over agricultural fields and forests collected within different project that can be used for MSc theses. There are several potential research questions to answer and different methodologies can be applied depending on interest. Even if a thesis is individual work, it possible to collaborate with other student(s) that are working with similar methods and data but with different research questions.

Forest data

In 2022 we did a series of 11 flights with multispectral and RGB camera from May to November over the nature reserve Mulatorp in Blekinge: https://www.lansstyrelsen.se/blekinge/besoksmal/naturreservat/mulatorp.html

The area consists of mostly coniferous forest with some deciduous trees. There is an ongoing bark beetle outbreak in the area and the main purpose of the flights is to study how early a bark beetle attacked tree can be detected but there are several possible directions for one or more master students. We have presented an initial study at the Agile conference 2023: https://agile-online.org/images/conferences/2023/documents/posters/8.pdf

Potential research questions: How early can bark beetle attacked trees be detected? How accurately can machine learning models for segmentation (e.g. https://segment-anything.com/) delineate individual trees?

It is also possible to study phenology and spectral properties and compare different tree species in the area and train machine learning models to classify tree species.

Agriculture

UAV-collected data is becoming an effective and convenient tool to evaluate crop growth and estimate final yield for assisting in farm managements and improving crop production. In 2022 and 2023 we did a series of flights with multispectral and RGB camera over agricultural fields with different crops (winter wheat, barley, sugar beet, potato). In addition, during these two agricultural seasons, we carried out ground measurements of various biophysical variables such as LAI, biomass, height, crop yields, etc. as well as spectral data and soil moisture.

The data opens up possibilities to answer several research questions so if you are interested please contact us and we can discuss potential master thesis projects. Some potential research questions:

Can UAV data be useful for monitoring crop growth? How can UAV data be used to estimate crop biophysical variables such as LAI during the growing season and for different Crop?

Can machine learning models be developed to accurately predict crop yields based on UAV data, ground measurements? How does the accuracy of these predictions vary during the growing season and across different crop types? When is the best time to forecast yield for each crop?