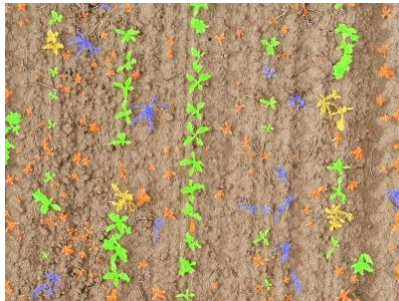


**Topic/Title (Norwegian) Ugrasdeteksjon ved bruk av dronebilder**

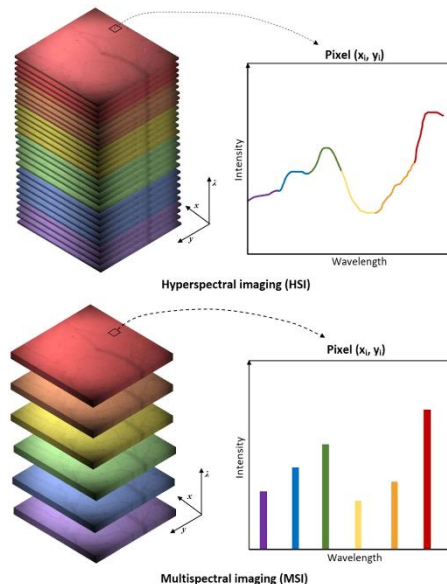
**Topic/Title (English) Weed Detection based on Drone Imagery**



2 Weed classification (Pretto et.al.)



3 DJI P4 Multispectral



1 Hyperspectral and multispectral imaging (Giannoni, et.al.)

## Summary

A sustainable arena within Smart Farming and green innovation is established at NMBU (2021-24), <https://www.nmbu.no/prosjekter/node/42982> , and [https://eduumb.sharepoint.com/sites/mittnmbu\\_org\\_realtek/SitePages/Presentasjon-om-smart-farming%2C-allm%C3%B8te-18.08.aspx](https://eduumb.sharepoint.com/sites/mittnmbu_org_realtek/SitePages/Presentasjon-om-smart-farming%2C-allm%C3%B8te-18.08.aspx) for a presentation about the platform. Please also note the information about the Green Innovation Student LAB included in the platform.

One research project is targeted to find efficient methods to detect and map weeds in cereal fields. A promising technology for this task are unmanned aerial vehicles (UAV), also referred to as drones, in conjunction with multispectral or hyperspectral imaging sensors. Digital image processing and machine learning are used to analyze the data in order to generate weed maps for site-specific weed management or gaining better understanding of weed dynamics.

Master students can work on a sub-task that fits in the overall project. The detailed topic could be defined based on the student's pre-knowledge and own interests. Possible topics include:

- Spectral analysis of a single weed species in early growth stages
- Efficient segmentation methods to split plants and soil
- Deep-learning model for single or multiple weed species

The work will include experimental field work at some time within the growth season between April and October. Financial support for field work might be possible.

The topic is targeted students that are interested in working with drone imagery and machine learning techniques. Some background in data science is an advantage, but also knowledge of



Bachelor or Master thesis BIOVIT 2021/22

weed/crop biology or agronomy might be beneficial. We have advanced equipment that might be used for carrying out field experiments, e.g.:

- DJI P4 Multispectral, light drone with integrated 5-band multispectral sensor
- DJI Matrice 300 RTK, industrial-grade drone with multiple sensor options
- DJI s1000, drone for heavy payloads (hyperspectral camera/lidar)
- Agrowing Quad lens, 10-band multispectral sensor with high resolution
- HySpex Mjolnir, hyperspectral camera
- Velodyne PUCK, lidar

**Subject area** (keywords)

Weed detection, remote sensing, smart farming, machine learning, multispectral/hyperspectral sensors, pesticide mitigation

**Language thesis** (Norwegian and/or English)

Norwegian or English

**Bachelor or Master thesis**

**Master thesis is recommended due to cooperation with REALTEK students (5 years master)**

**Credits**

**30**

**Project/company**

**Included in the Smart Farming consortium**

**Please contact**

Robert Braunschweig, PhD candidate, REALTEK

Possible co-supervisors:

professor Ingunn Burud, REALTEK (imaging)

professor Nils Bjugstad, REALTEK (precision agriculture)

professor Morten Lillemo, BIOVIT (plant science)

The topic is interdisciplinary and includes imaging, GIS, data science, agricultural engineering in addition to plant, soil and fertilizer science. Thus, it is a requirement that at least one student joins from REALTEK (imaging, data science, geomatics, engineering, robotics). The Smart Farming platform may support the students by some funding highlighting the cooperation of students from different faculties like BIOVIT, MINA, REALTEK and others.