# Crops and Orchard Damage and Status Assessment with Machine Learning and UAS Imagery

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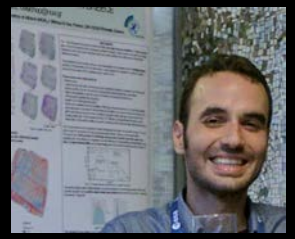
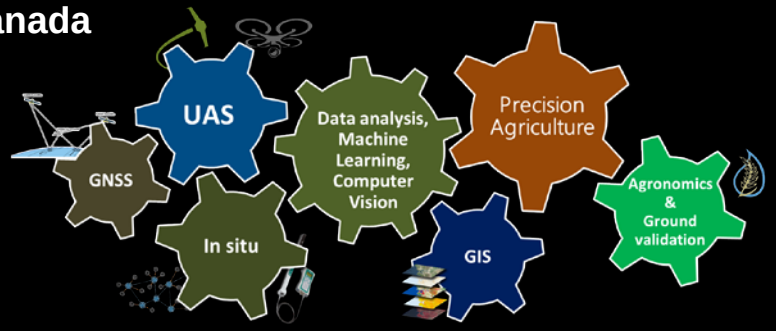


- **Crop insurance.**
- **Food security.**
- **Climate change.**
- **Variable input controlling.**
- **Natural resources, sustainability and public health; Agrochemicals and agroecology.**

## Study area: PEI, Canada




### *Overarching goal*

Develop state of the art machine learning (ML) pipelines for mapping crop and orchard status from images acquired by an optical multispectral camera on board an Unmanned Aircraft System (UAS).

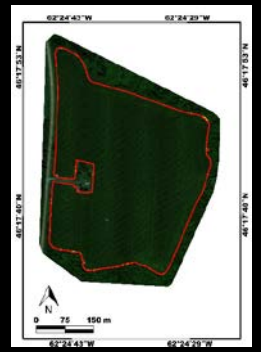
### ***Objectives***

**O1 -** Delineate bare soil field boundaries and areas before planting.
**O2 -** Delineate vegetated crop field boundaries and areas at critical growth stages.
**O3 -** Map crop lodging as one of the most serious damages, especially in cereal crops.
**O4 -** Evaluate the biophysical parameter of Green Area Index (GAI) for crops and orchards, as GAI is a robust indicator of crop stress and vigor.

## Sample classification & regression results

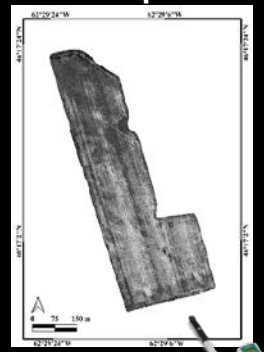
**O1 – ref1**

**O2 – ref2**

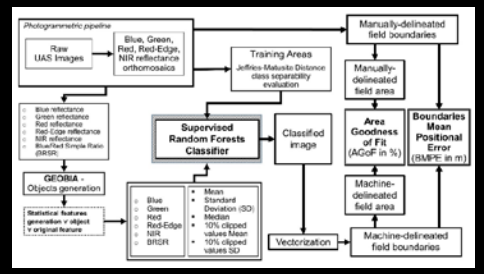


**O3 – in press**

**O4 – in press**



## Sample ML pipeline





- Vlachopoulos et al., "Delineation of bare soil field areas from Unmanned Aircraft System imagery with Mean Shift clustering and Random Forest classification," *Canadian Journal of Remote Sensing*, 2020, doi: 10.1080/07038992.2020.1763789
- Vlachopoulos et al., "Delineation of Crop Field Areas and Boundaries from UAS Imagery Using PBIA and GEOBIA with Random Forest Classification," *Remote Sensing*, vol. 12, no. 16, Art. no. 16, Jan. 2020, doi: 10.3390/rs12162640.


Decision Support Systems

### *Supervisors*

Prof. Brigitte Leblon
Prof. Jinfei Wang