NLS
FINNISH GEOSPATIAL
RESEARCH INSTITUTE
FGI

On separability of boreal tree species in multispectral lidar data

Milla Laurikkala

30.6.2021

Advisor: D.Sc. Antero Kukko

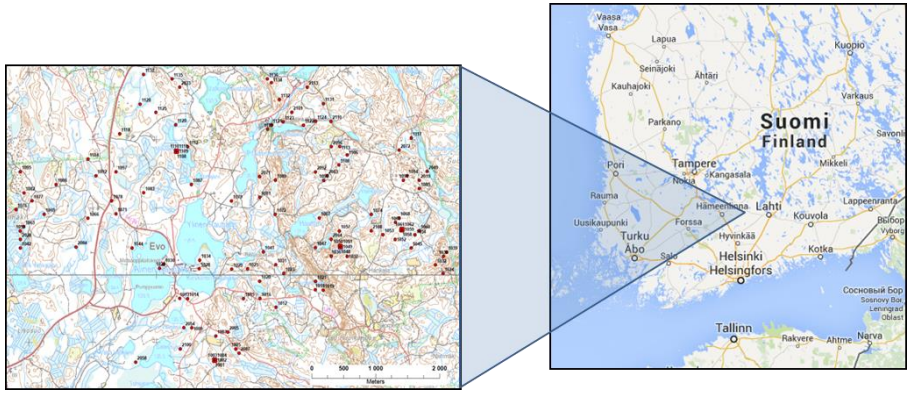
Supervisor: Prof. Pauliina Ilmonen

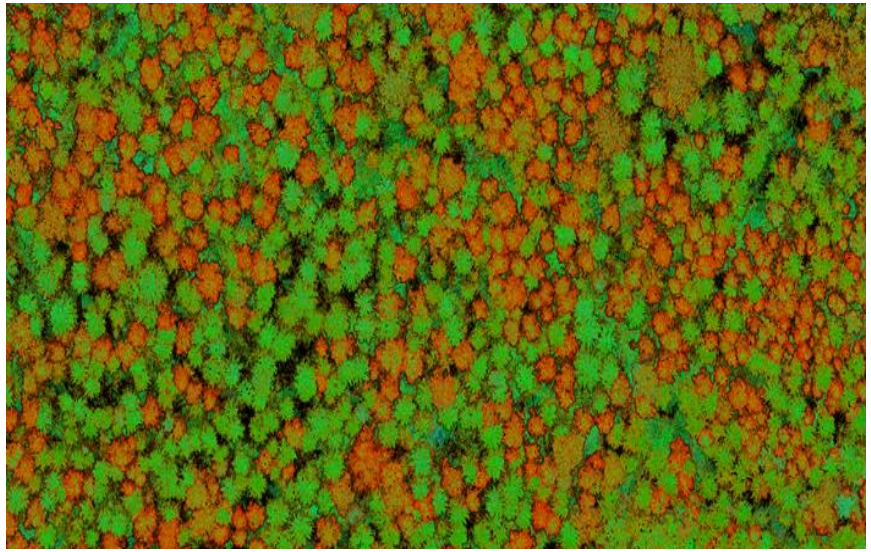
Background

- Accurate information of tree species is vital for sustainable forest management, inventory and protection
  - Time consuming and expensive to obtain visually, and even impossible for large areas
- Detection of dead or infested trees before visible signs might help fight pathogens
- High-density 3D data can be obtained effectively using MS-ALS
  - Some studies have already explored tree species identification from ALS data

Data

- Multispectral airborne laser scanning data from Evo
  - Reference data with species information available
  - Two or three wavelengths
- Point clouds with geometric and intensity information
  - 3D locations of reflections
  - Intensity of returned beams





Objectives

- Develop tools for separating tree species in multispectral ALS data
  - Separate different species, dead and infested trees
  - Extracting features from individual trees
  - Analysis on which features are best for species classification, focus on spectral features
- Test tools with different classification methods

Tools and methods

- MATLAB
  - FGI code repositories
- Naïve Bayes
- Support vector machine
- Random forest

Schedule

- Reading the materials, getting familiar with the topic 06/2021
- Presentation of the topic 30.6.2021
- Writing the thesis 06/2021-08/2021
- Developing the methods and codes 07/2021 – 08/2021
- Finished results and thesis by 09/2021

References and material

- Yu, X., Hyyppä, J., Litkey, P., Kaartinen, H., Vastaranta, M., Holopainen, M. Single-sensor solution to tree species classification using multispectral airborne laser scanning. Remote Sensing 2017, *9*(2):108; doi:10.3390/rs9020108
- A. Axelsson, E. Lindberg, and H. Olsson. Exploring multispectral ALS data for tree species classification. Remote Sensing 2018, 10(2):183; https://doi.org/10.3390/rs10020183.
- J. Hyyppä, X. Yu, H Kaartinen, A. Kukko, A. Jaakkola, X. Liang, Y. Wang,M. Holopainen, M. Vastaranta, and H. Hyyppä. Forest inventory using laser scanning. In J. Shan and C.K. Toth, editors, Topographic Laser Ranging and Scanning: Principles and Processing, Second Edition, pages 379–412. CRC Press, Boca Raton, 2017
- S. Deng, M. Katoh, X. Yu, J. Hyyppä, and T. Gao. Comparison of tree species classifications at the individual tree level by combining ALS data and RGB images using different algorithms. Remote Sensing 2016, 8(12):1034; https://doi.org/10.3390/rs8121034

NLS FINNISH GEOSPATIAL RESEARCH INSTITUTE FGI