

MedFOR seminar

Remote sensing applications for forest inventory and forest management planning

Adrián Pascual Arranz

Early-stage researcher

University of Eastern Finland (UEF, Joensuu)



Instituto Universitario de Investigación
GESTIÓN FORESTAL SOSTENIBLE



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About the motivations

- Teaching: inspire students to be curious but critical learners who can think for themselves and nurture creative ideas. Methods and data analyses are important but your ability to understand them and explain the process to a fellow is even more important.
- Training: this is meant to be practical and oriented to the use of free software to handle pointclouds when processing, interpreting and modeling.
- Remote sensing is a timely research topic. Do not hesitate to get as much as possible from the course and from the lecturers if you want to get deep into the matter for your thesis or, why not, your PhD.
- Please, be critical and express your concerns during the seminar

Core of the seminar

Key 1: Identify problems

Key 2: Test solutions

Descriptive models

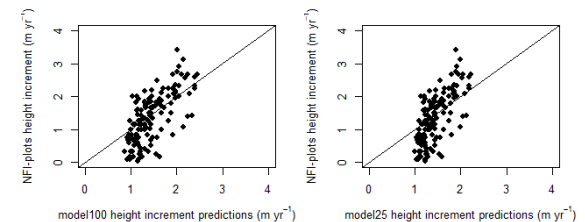
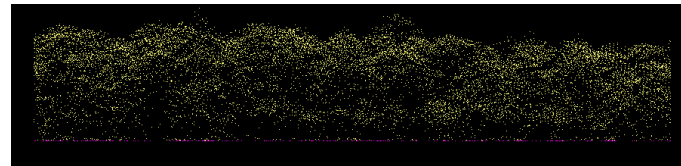
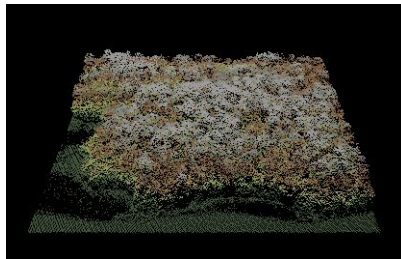
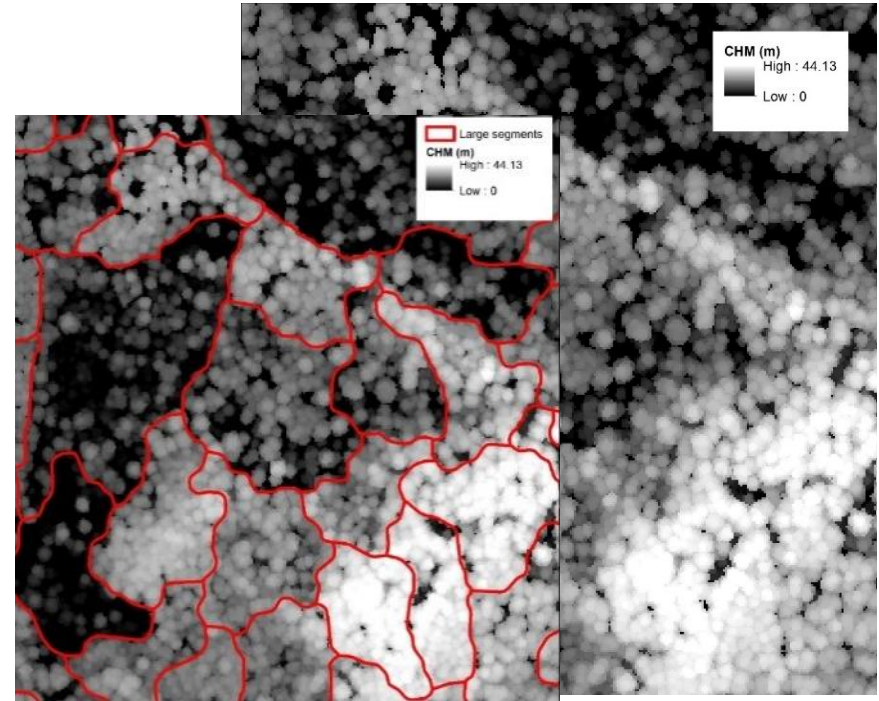
What's there? – patterns

What's happening? – processes

Spatial and temporal interactions

Measurements, monitoring

Statistical models



Programme

- 12-hour seminar including three lab exercises devoted to download, process and interpret LiDAR information when conducting ALS-based forest inventory
- First, we will go through basic principles of remote sensing (RS) and airborne laser scanning in particular (ALS) explaining step by step how to create the inputs to conduct forest inventory based on LiDAR data.
- We will explore the use of area-based approach (ABA) and individual tree detection (ITD) in forest inventory. For this you need to install a bunch of free-software tools

Programme

• Tuesday

- Principles of LiDAR and Airborne Laser Scanning
- Terminology & Theory
- Factors to considering when capturing information
- Pointclouds, the outcome
- Real case examples of ALS-based workflow
- Publicly available resources
- **Lab exercise**

• Wednesday

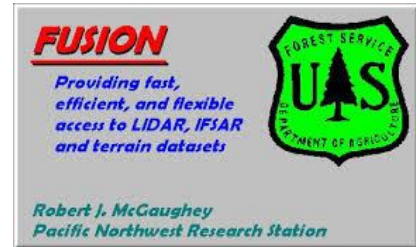
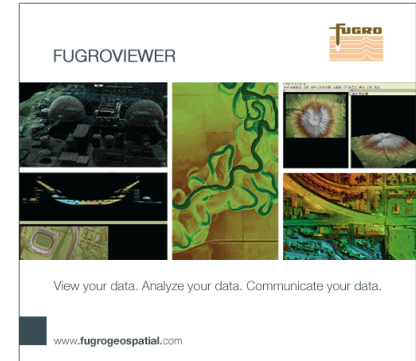
- ALS-based Forest inventory: the area-based (ABA) approach: Part 3
- Theoretical principles
- Estimation and prediction of area-based forest attributes: examples
- **Lab exercise**
- Improving the method: Enhanced Area Based Approach (EABA) and segment-based planning
- Introduction to Individual Tree Detection methods (ITD)
- **Lab exercise**

• Thursday

- ALS-based forest management planning
- How to maximise LiDAR data into spatial forest problems
- How to generate dynamic treatment units along a forest plan
- Cell-based versus segment based forest planning
- Timely research topics using ALS data
- Monitoring changes: a case study on *Pinus radiata* plantations
- Discussion and thoughts on the seminar & ALS-based studies

Programme

- R and RStudio
- <https://www.r-project.org/>
- <https://www.rstudio.com/products/rstudio/download/#download>
- FugroViewer
- <https://www.fugro.com/about-fugro/our-expertise/technology/fugroviewer>
- FUSION
- <http://forsys.cfr.washington.edu/fusion/fusionlatest.html>
- Lastools
- <https://rapidlasso.com/lastools/>
- QGIS
- <https://www.qgis.org/es/site/>



Programme

- We will use **R** and **Rstudio** to read LiDAR data as well as to build model relationships between measured information (sample plots) and LiDAR-derived information. **Fugro** is a powerful visualization tool to explore our pointcloud or e.g., transform it from .las to asci format. **FUSION** and **Lastools** will be used iteratively to process the LiDAR, derived useful information (e.g., DTM or CHM) and computed pointcloud statistics over the area of interest (plot or tree level). Then, we will use **QGIS** to extrapolate our model predictions and visualize e.g., CHM as a raster file.
- Tools overlap one another and some tasks can be done with more than one tool. Expertise determines the suitability of each. Develop your expertise!

Programme

- On Thursday, we will explore the use of ALS-based forest inventory when it comes to formulate spatially explicit forest problem formulations.
- This framework has been my field of research during the last three years. The main idea to my PhD is how to create management units based on timely forest inventory information and oriented to meet simultaneous management goals.
- One example: <http://www.mdpi.com/1999-4907/7/10/220>
- Lastly, we will discuss about the possibility to use ALS data to describe but also to monitor changes using multi-temporal datasets

Expectations

- Raise the awareness of existing tools and techniques based on ALS data
- Provide students basis for decision-making and career orienting
- Some motivation: remote sensing together with advanced modeling techniques are timely multidisciplinary methods in research but also in business.
- Fresh ideas boost innovation and generate value no matter if you goal is to publish scientific papers on forest inventory or expand you business.