



Euroopan unionin
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NextGenerationEU

ARTISDIG: Creating structurally realistic country-wide tree maps

Towards a digital twin of biodiversity

VTT

A?
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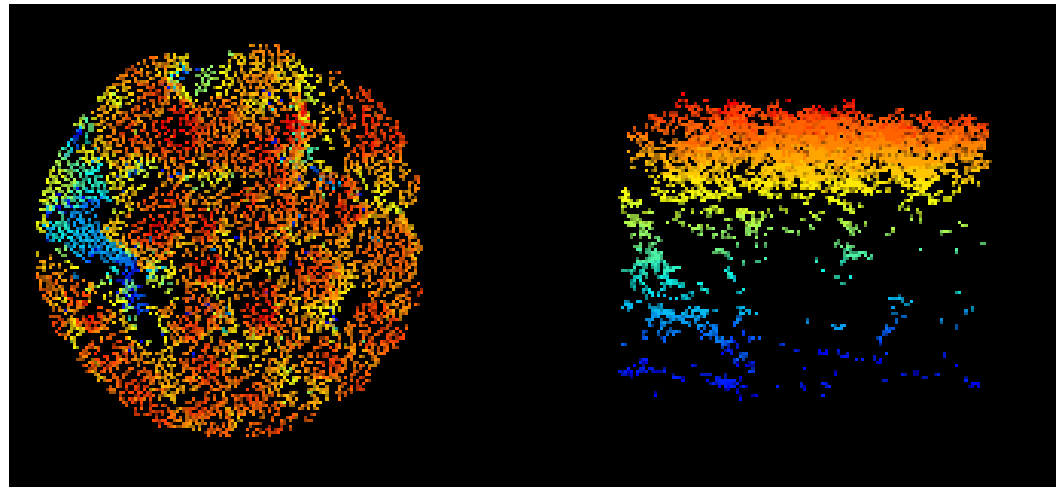
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Background

- Goal:
 - The overall objective of **ARTISDIG** (*Artificial Intelligence for Twinning the Diversity, Productivity and Spectral Signature of Forests*) was to develop scientific methods to integrate Boreal forest biodiversity in the **Digital Twin of the Earth (DTE)**.
 - By "Digital Twin" we mean a real-time high-precision representation.
- Why?
 - Effective nature conservation requires detailed understanding of where the most biodiverse areas are located. EU directives will require conservation of large areas.
 - Forest productivity, biodiversity, and structure are closely linked to each other.

Challenges

- Data:
 - Remote sensing (laser scanning, satellites) can be used to map vast areas, but tend to miss a lot of trees hiding under the canopy.
 - Ground measurements are too resource intensive for country-wide mapping.



Challenges

- Biodiversity:
 - There is no clear definition of biodiversity.
 - There is a consensus that aspects of it include
 - Stem density and spatial pattern of trees
 - Height, diameter, and volume distribution
 - Species composition
 - **Every tree counts: smallest trees are also important!**



PROBLEM:

How do we build a digital twin of
biodiversity if we cannot define it?

SOLUTION:

Twin the
whole
structure.

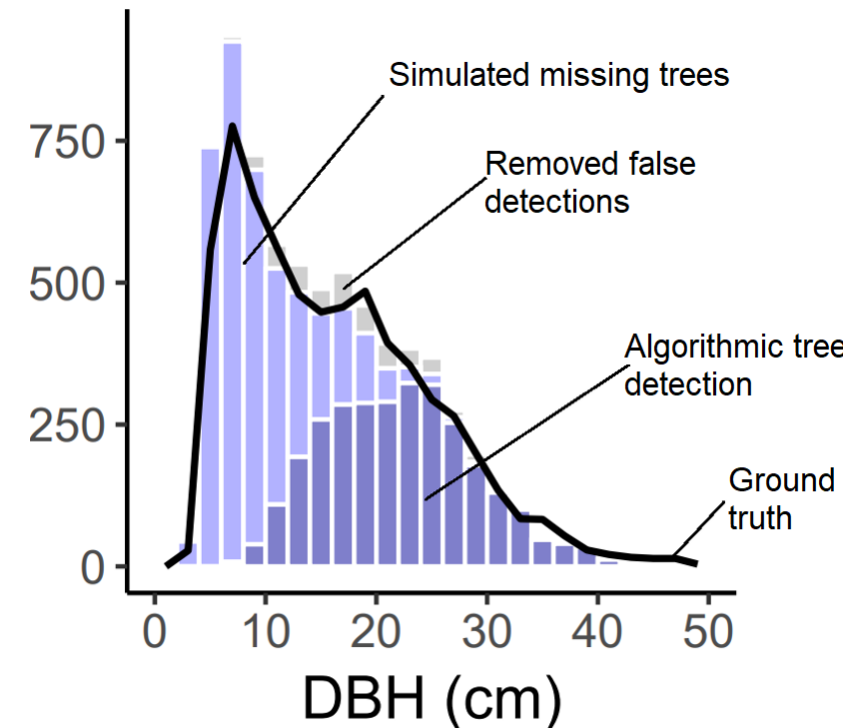
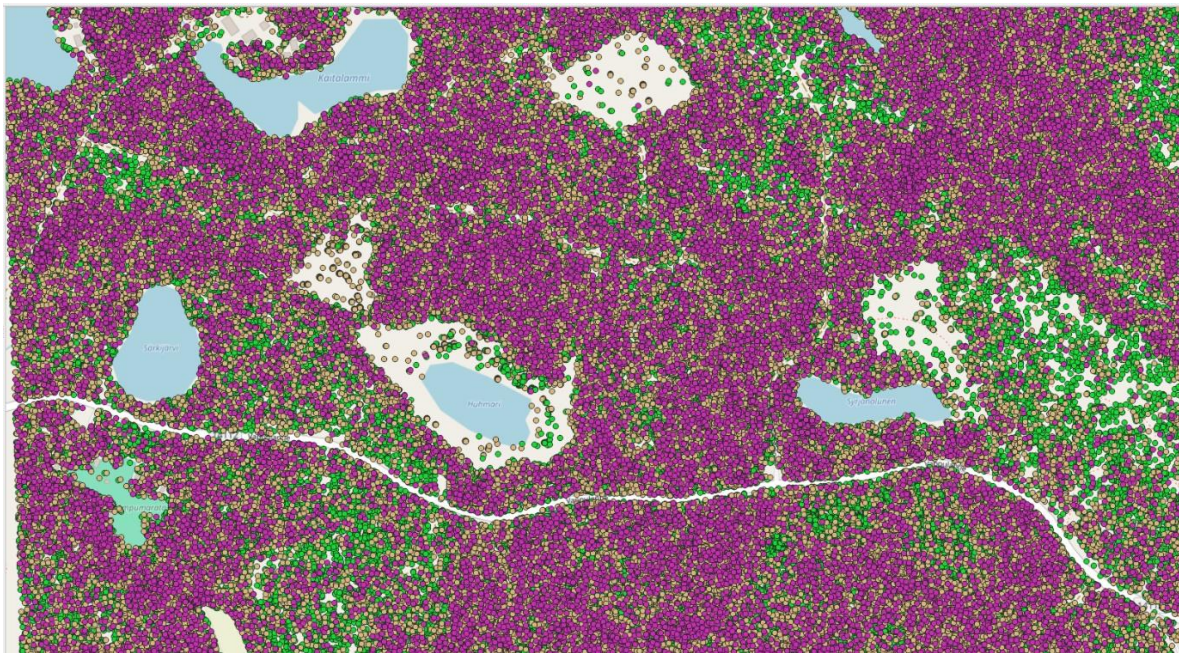
Create a representative tree map by

1. Algorithmically finding the largest trees.
2. Simulating small trees to compensate for the missed trees.
3. Remove likely false detections.

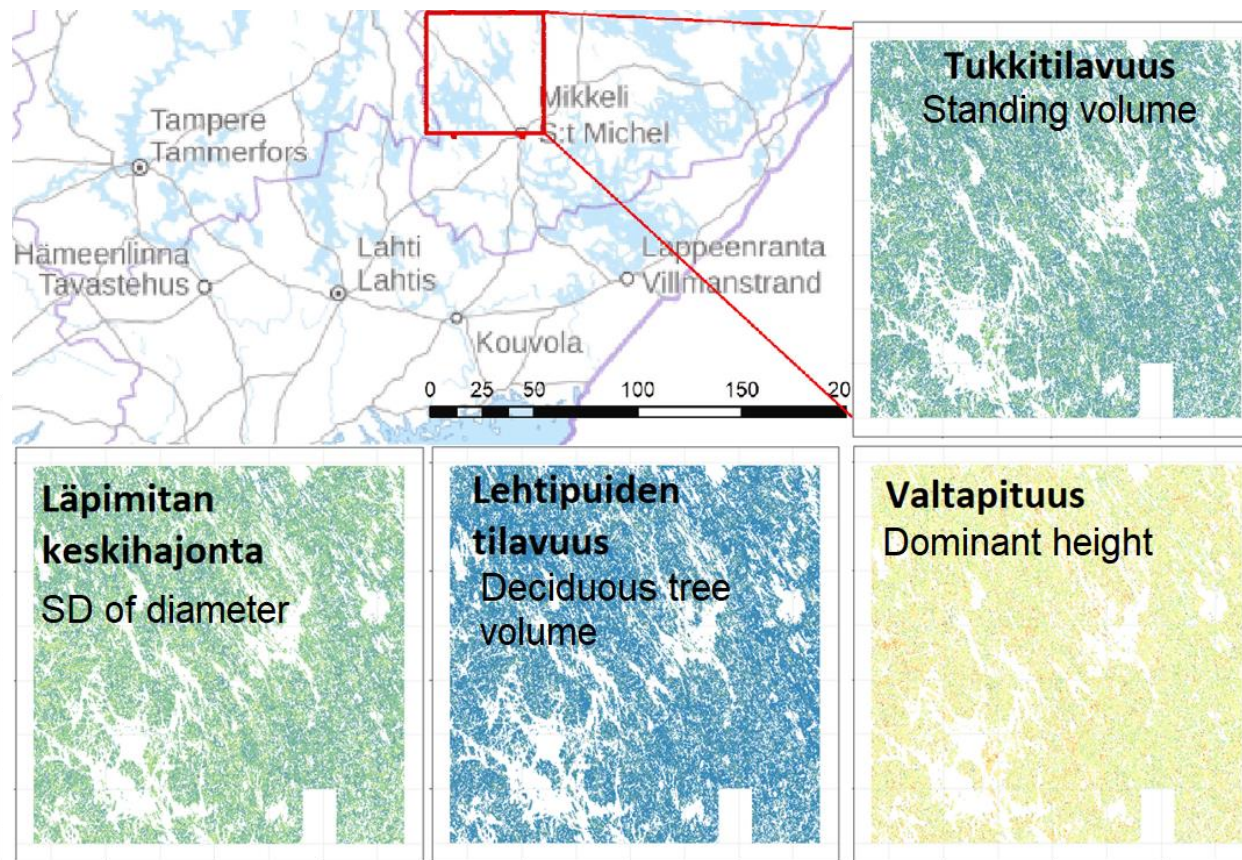
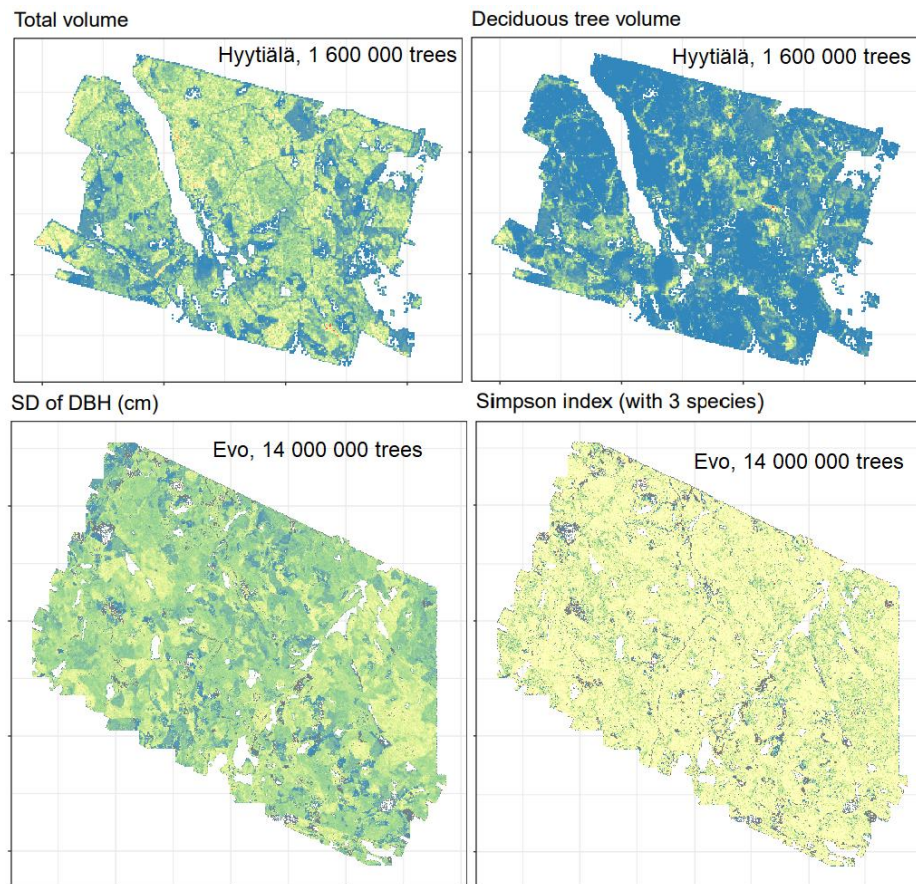
Goal is to create a tree map with correct number of trees of representative size and species with realistic spatial pattern. Any arbitrary index can be calculated from this map!

Results

- Individual trees (~234 000 in this area) **by species (green=pine, yellow=spruce, purple=deciduous).**



Large-scale maps



Over 3000 sq. km and over 100 million trees

What next?

Currently working with international collaborators to expand across the Boreal zone.

Rare species and dead trees.

Looking for any available laser scanning data or ground measurements to improve our models.

Thank you!