



**Terra
solid**

POINT CLOUD INTELLIGENCE

**Making Sense of LiDAR: From Raw Point
Clouds to Smart Detection and Classification**

Dr. Anna Shcherbacheva

30.04.2026

Terrasolid and myself



Terrasolid

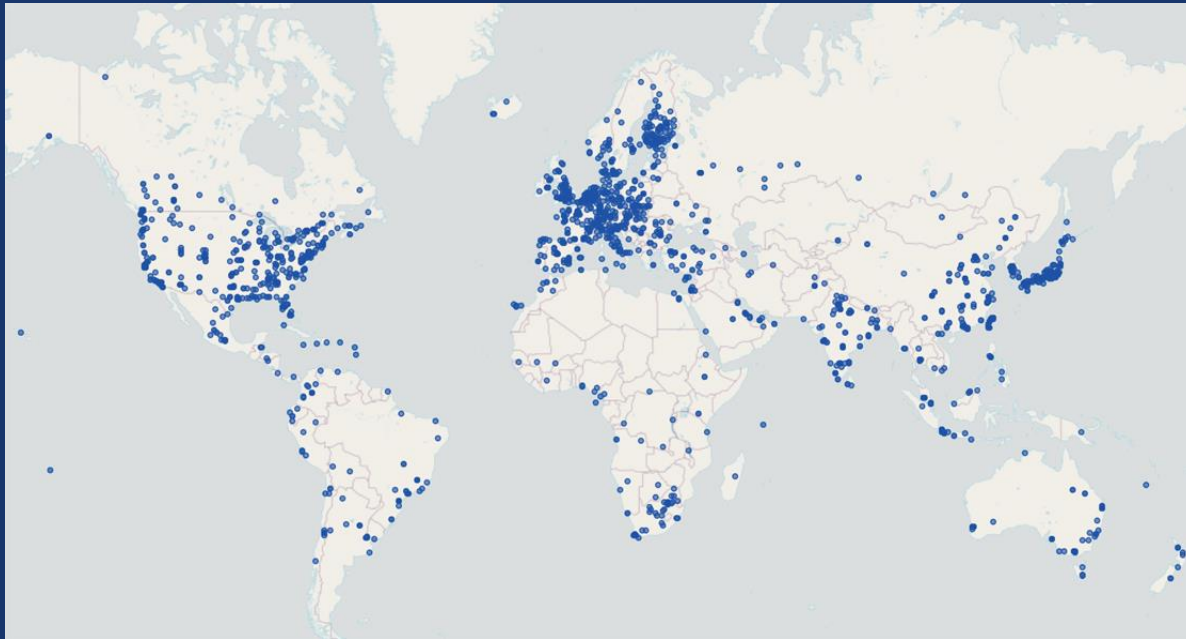
- 35+ years of software development
- Global presence - customers in over 100 countries
- Global market leader in aerial and mobile LiDAR point cloud processing

Anna Shcherbacheva

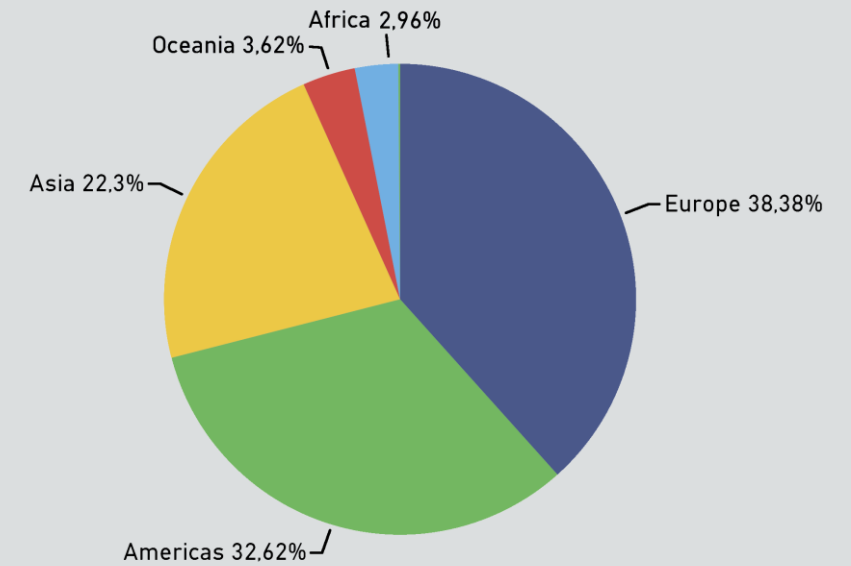
- PhD in Applied Mathematics and Computer Science, 2019
- GSW 2023 Best Paper Award
- Geospatial World Rising Star 2026
- Over 6 years in Machine Learning and AI development
- 2.5+ years at Terrasolid



CUSTOMER LOCATIONS



REVENUE BY REGION 2025

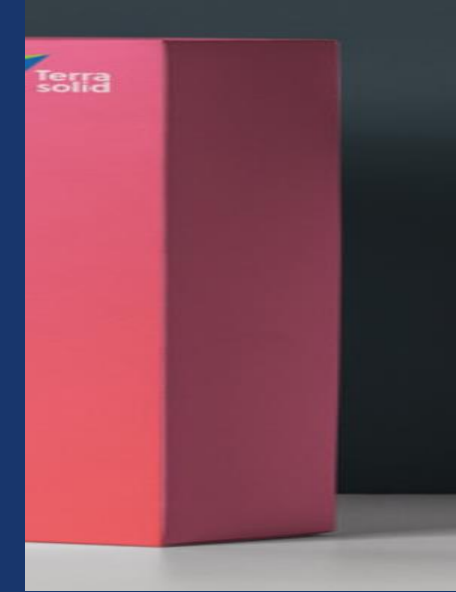
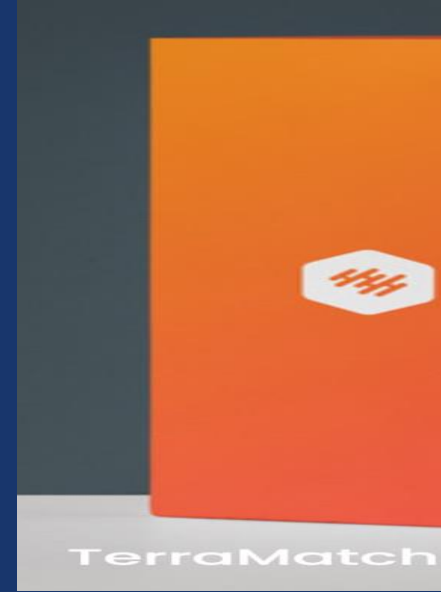
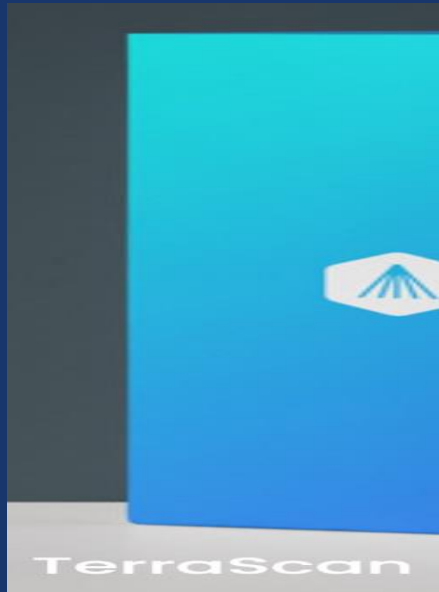


Check out the events where you can find us





THE INDUSTRY STANDARD SOFTWARE FOR POINT CLOUD AND IMAGERY PROCESSING

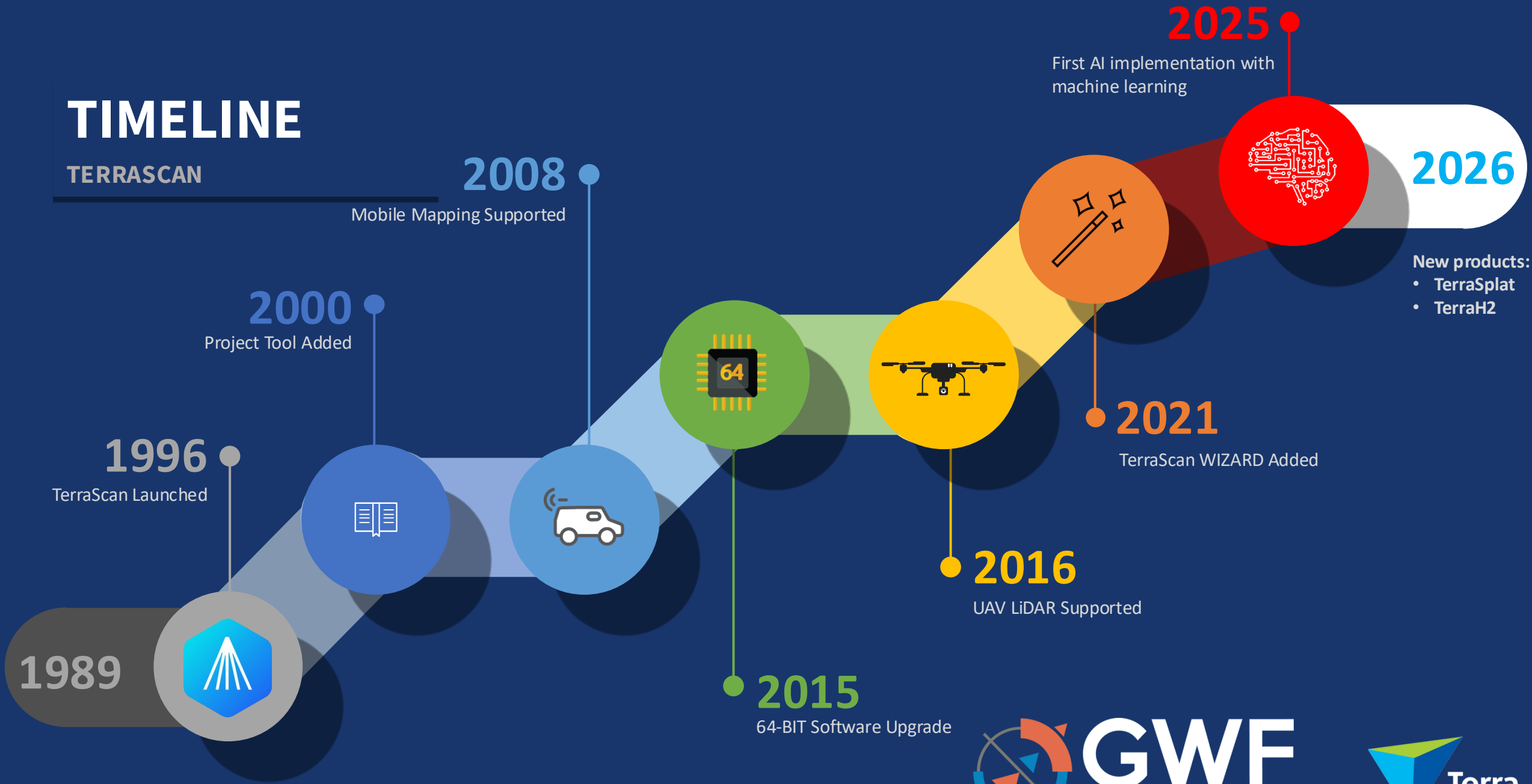


Works on platforms:



TIMELINE

TERRASCAN



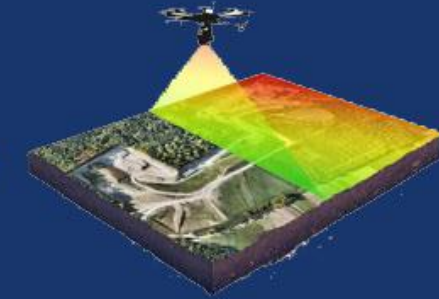
ALL POINT CLOUDS

**NO MATTER THE SOURCE
NO MATTER THE SENSOR
NO MATTER THE DATA SIZE**

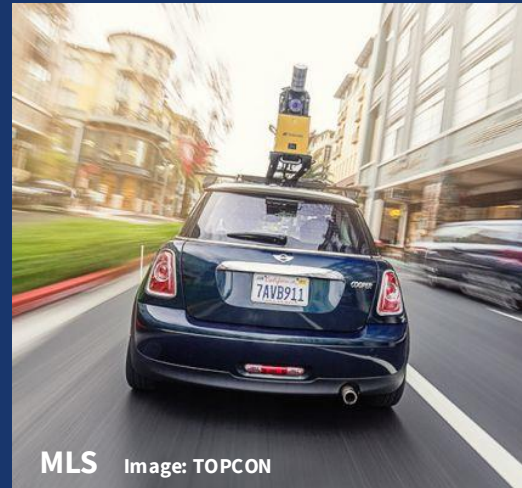


PHOTOGRAMMETRY

Image: Wingtra



LASER SCANNING

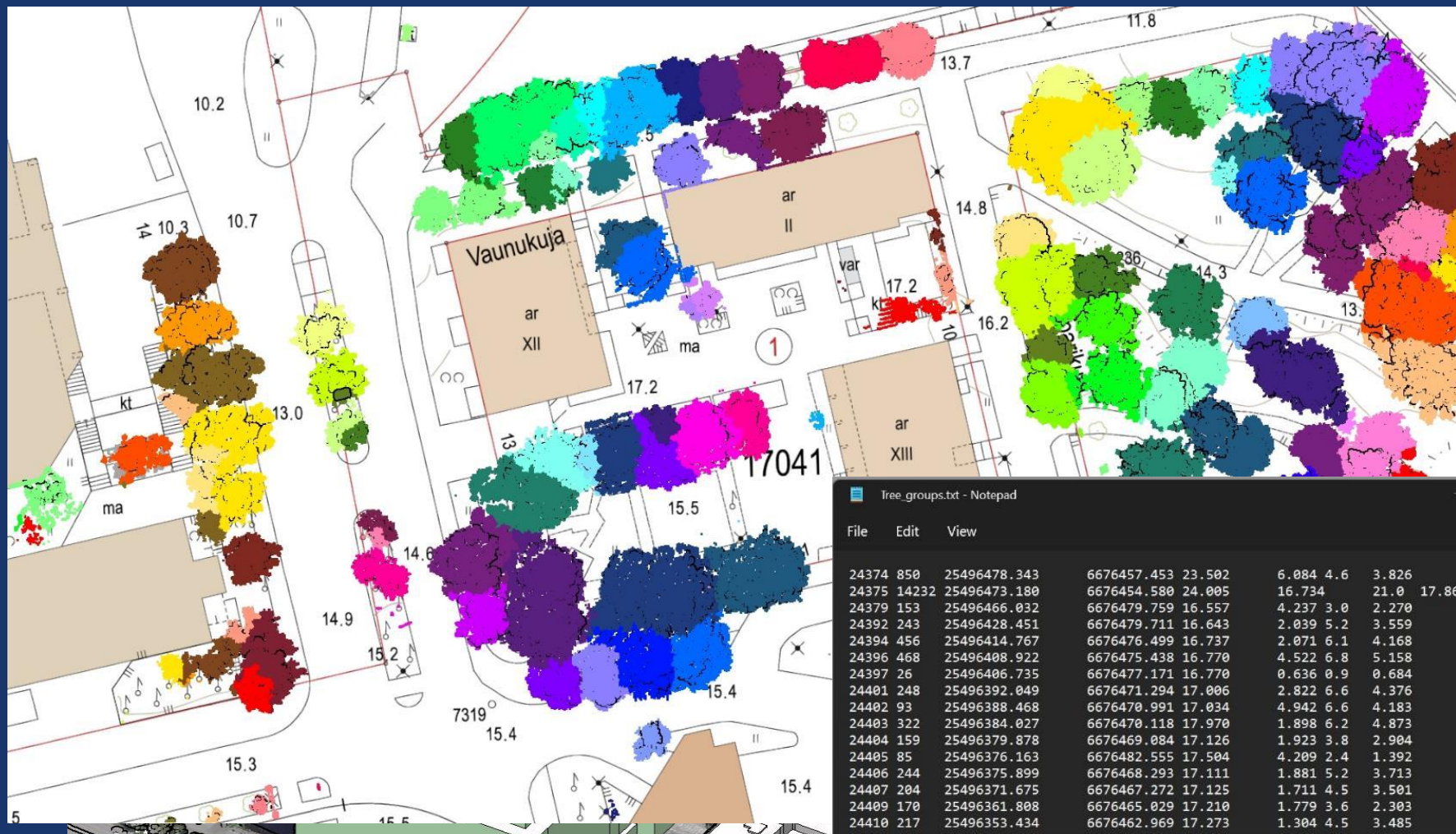


- Point cloud itself
 - ✓ Versatile classification
 - ✓ Overlap cleaning
 - ✓ Quality colorization
- Vectorization/object detection

- ✓ Buildings
- ✓ Trees
- ✓ Poles
- ✓ Wires
- ✓ Cars
- ✓ Others depending on data

- DTM/DSM

- ✓ Flood analysis
- ✓ Storm water analysis
- ✓ Contours and point Z values



Reasons for monitoring change detection

- **Climate monitoring**
- **Ecosystem monitoring**
- **Forest economy**
- **Urban planning and urban infrastructure monitoring**
- **Defence operations**

Example: Trees Help Reduce Stress and Anxiety



Source: Human Health Benefits of City Trees & Forests: Rapid Review of Research Publications with Practical Application. Published in October 2024. Developed with support from the Climate Change and Health Office at Health Canada. Author: Kathleen L. Wolf, Ph.D. Research Social Scientist, University of Washington, Seattle, USA

Time scales

Remote Sensing of Environment 305 (2024) 114083

Contents lists available at ScienceDirect

Remote Sensing of Environment

journal homepage: www.elsevier.com/locate/rse

A study of annual tree-wise LiDAR intensity patterns of boreal species observed using a hyper-temporal laser scanning time series

Anna Shcherbacheva^{a,1}, Mariana B. Campos^{a,1}, Yunsheng Wang^{a,*}, Xinlian Liang^c, Antero Kukko^a, Juha Hyypä^a, Samuli Junntila^{b,c}, Anna Lintunen^{b,d}, Ilkka Korpela^b, Eetu Puttonen^a

^a Department of Photogrammetry and Remote Sensing, Finnish Geospatial Research Institute, National Land Survey of Finland, Vuorimiehentie 5, 02150 Espoo, Finland
^b Department of Forest Sciences, Faculty of Agriculture and Forestry, University of Helsinki, Helsinki 00014, Finland
^c School of Forest Sciences, University of Eastern Finland, Yliopistokatu 2, FI-80100 Joensuu, P.O. Box 111, Finland
^d Institute for Atmospheric and Earth System Research, University of Helsinki, Gustaf Hallsböörin katu 2, 00560 Helsinki, P.O. Box 64, Finland
^{*} State Key Laboratory of Information Engineering in Surveying, Mapping and Remote Sensing, Wuhan University, 430072 Wuhan, China

ARTICLE INFO

Editor: Marie Weiss

Keywords:
Lidar
Time series
Phenological changes
Reflectance pattern
Supervised machine learning
Species classification

ABSTRACT

This study introduces the annual tree-wise intensity patterns of three boreal tree species, silver birch (*Betula pendula* Roth.), Scots pine (*Pinus sylvestris* L.), and Norway spruce (*Picea abies* H. Karst.), observed from a long-term hyper-temporal point cloud dataset collected with a permanent laser scanning (LiDAR) station. An annual LiDAR intensity pattern refers to the trend of variations of tree-wise calibrated LiDAR intensity values over the course of a year, primarily linked to species-specific phenological characteristics. Such pattern was discovered from hyper-temporal (76 observations between April 2020 and April 2021) high resolution (0.01 m 3D point spacing at 100 m distance) point cloud observations acquired using a single wavelength (1550 nm) static LiDAR system installed at the study site. The study includes field experiments to assess the accuracy of species classification, and the results show that the accuracy of species classification using high-resolution data is high, except for winter phenology. The phenological dynamics, are robust and species-specific. When the spatial resolution was reduced to 5 points/m², the average accuracy of species classification among the three studied species reached 85% when using bi-temporal data from spring and autumn. Our analysis further indicates that arranging data acquisition with a two-week variability in late autumn and late spring could yield higher accuracy in species classification. Furthermore, our study revealed the importance of subcanopy information for species classification, specifically in distinguishing different coniferous species. When limited to upper canopy data (as in simulated airborne LiDAR scenarios), achieving a tree species classification accuracy of over 80% required either high point density (e.g. 8000 points/m²) combined with bi-temporal collection in a year, or low point density (5 points/m²) with a dense time series (e.g., 76 time points within a year), which showcased the possibility to compensate low spatial resolution with high temporal resolution, and vice versa, in capturing species-specific phenological characteristics of trees.

In national forest inventories scanning happens ones in 1-2 years: handy for topographic change detection

Anna Shcherbacheva

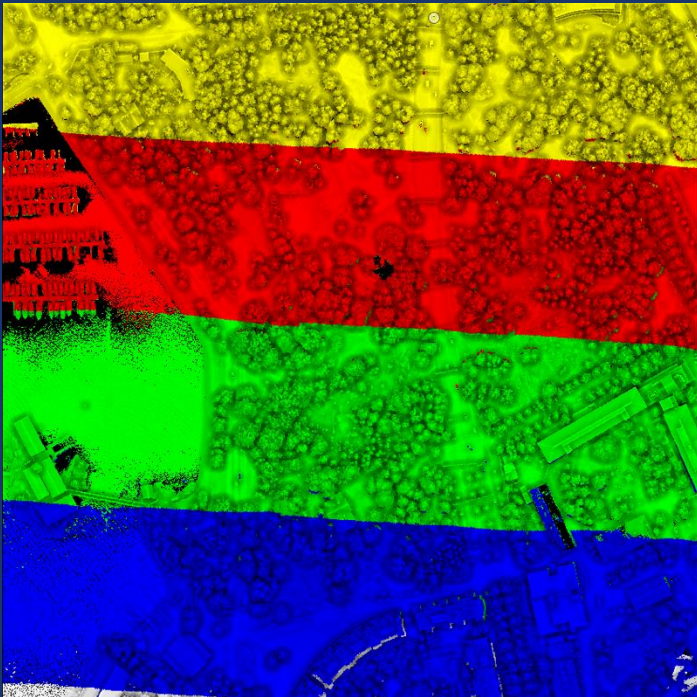
two scans per week

Change detection

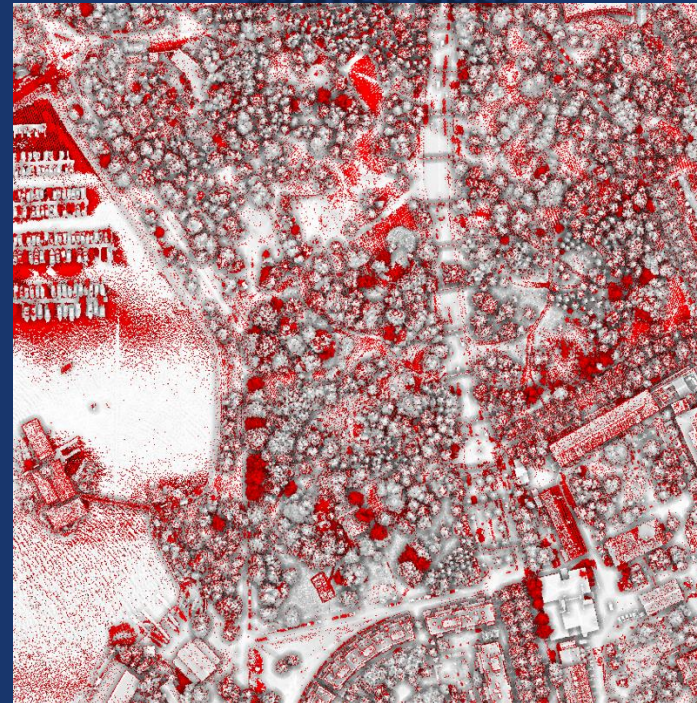


TerraScan

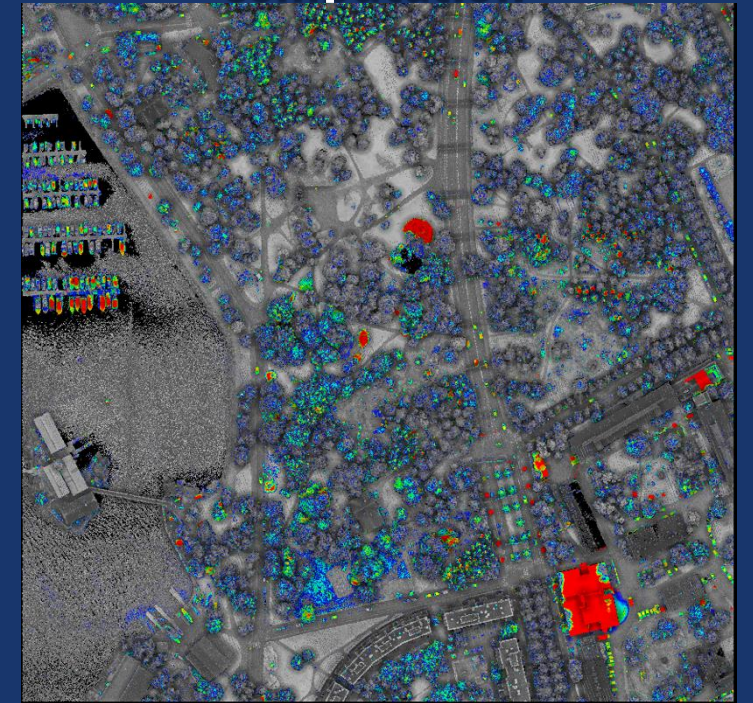
1. Fly lines targeting and referencing



2. Reading reference and source data



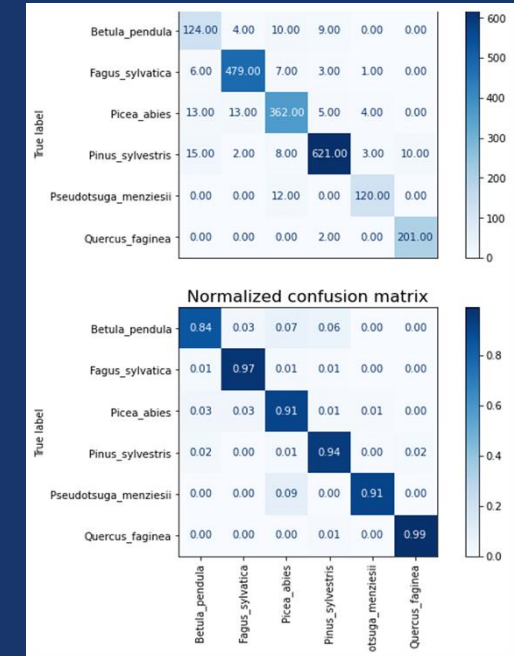
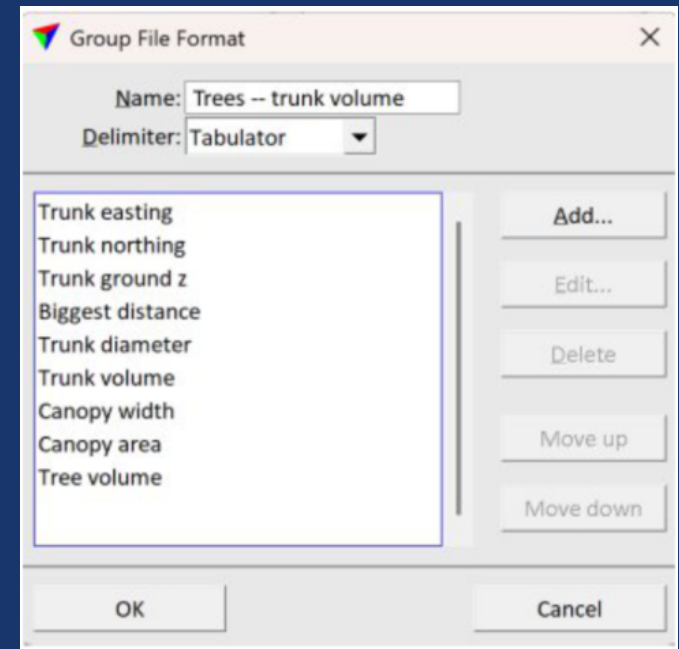
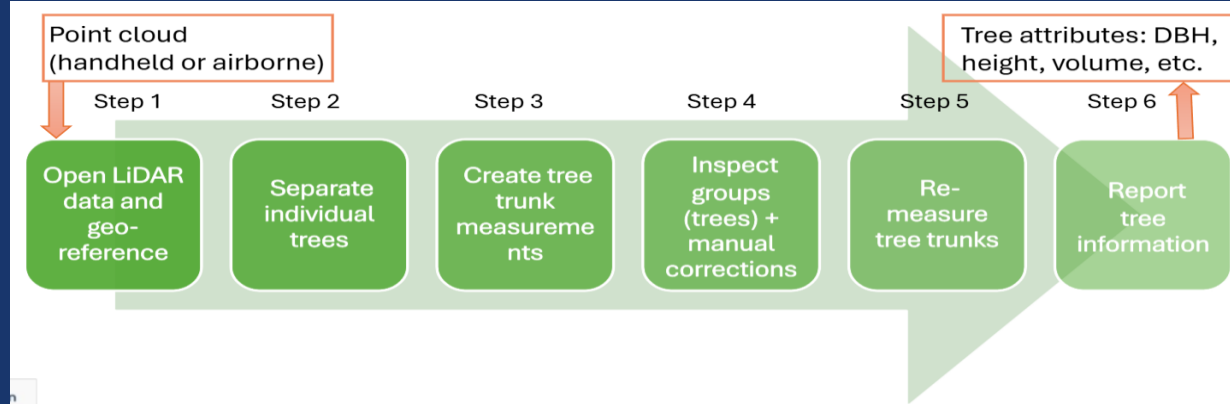
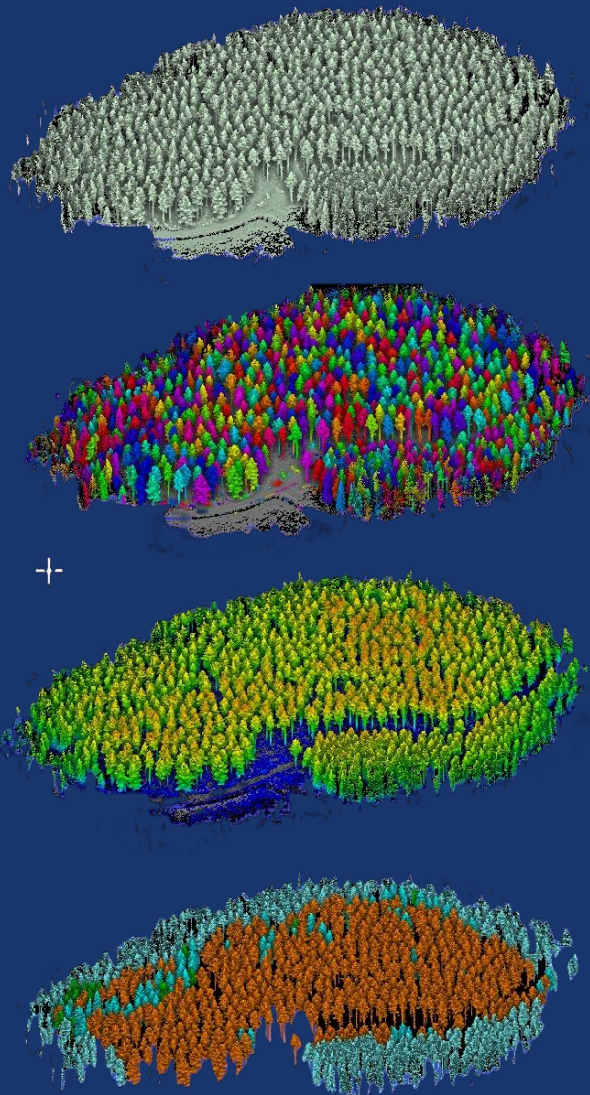
3. Distance computation



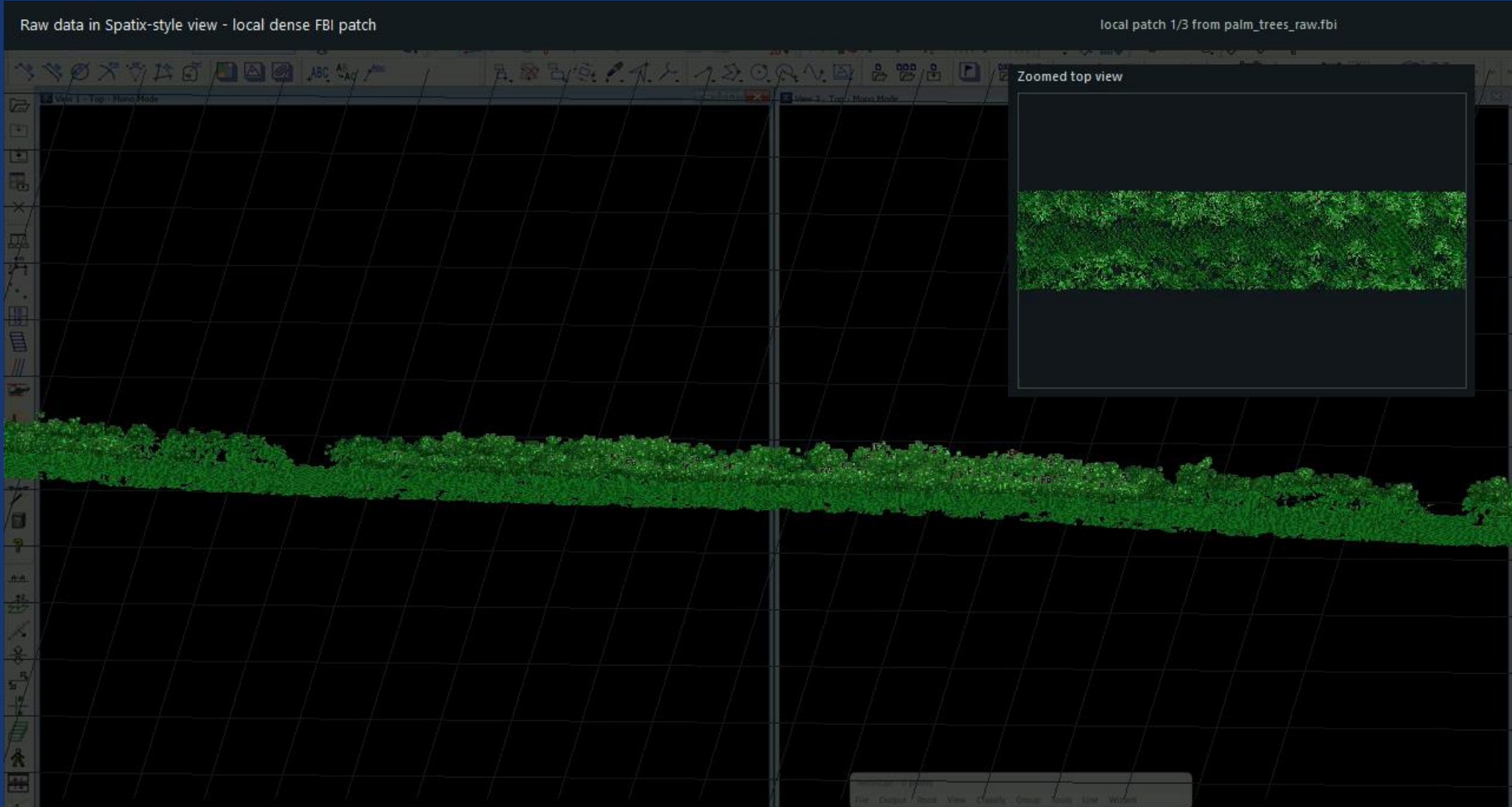
Tree inventory in



TerraScan



5
β
1
8
/
2
0
2
6



Raw data: textured green local patch, rotating and translating to reveal individual palm crowns

Summary

- **TerraScan can process data from any sensors**
- **UAV, Mobile, Terrestrial - many platforms, one solution**
- **Unified workflow for DTM/DSM, classification and vectorization**
- **Forestry, Urban planning, Mining, Roads, Bathymetry applications.**
- **Change detection helps monitoring in construction and forestry applications**
- **Machine Learning tool box aids with Tree Species and urban objects (building customized model).**



POINT CLOUD INTELLIGENCE

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**Thank you!
Questions?**

Anna Shcherbacheva



Check Terrasolid Events!