

EFOP-3.6.1-16-2016-00004

COMPREHENSIVE DEVELOPMENTS AT THE UNIVERSITY OF PÉCS IN ORDER TO ACHIEVE INTELLIGENT SPECIALIZATION

RECENT APPLICATIONS OF REMOTE SENSING IN FORESTRY AT THE UNIVERSITY OF SOPRON

Kornél Czimmer – Gábor Brolly – Iván Barton

SCERIN-5 Capacity Building
Workshop, June 20-23, 2017.

SZÉCHENYI 2020



MAGYARORSZÁG
KORMÁNYA

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BEFEKTETÉS A JÖVŐBE

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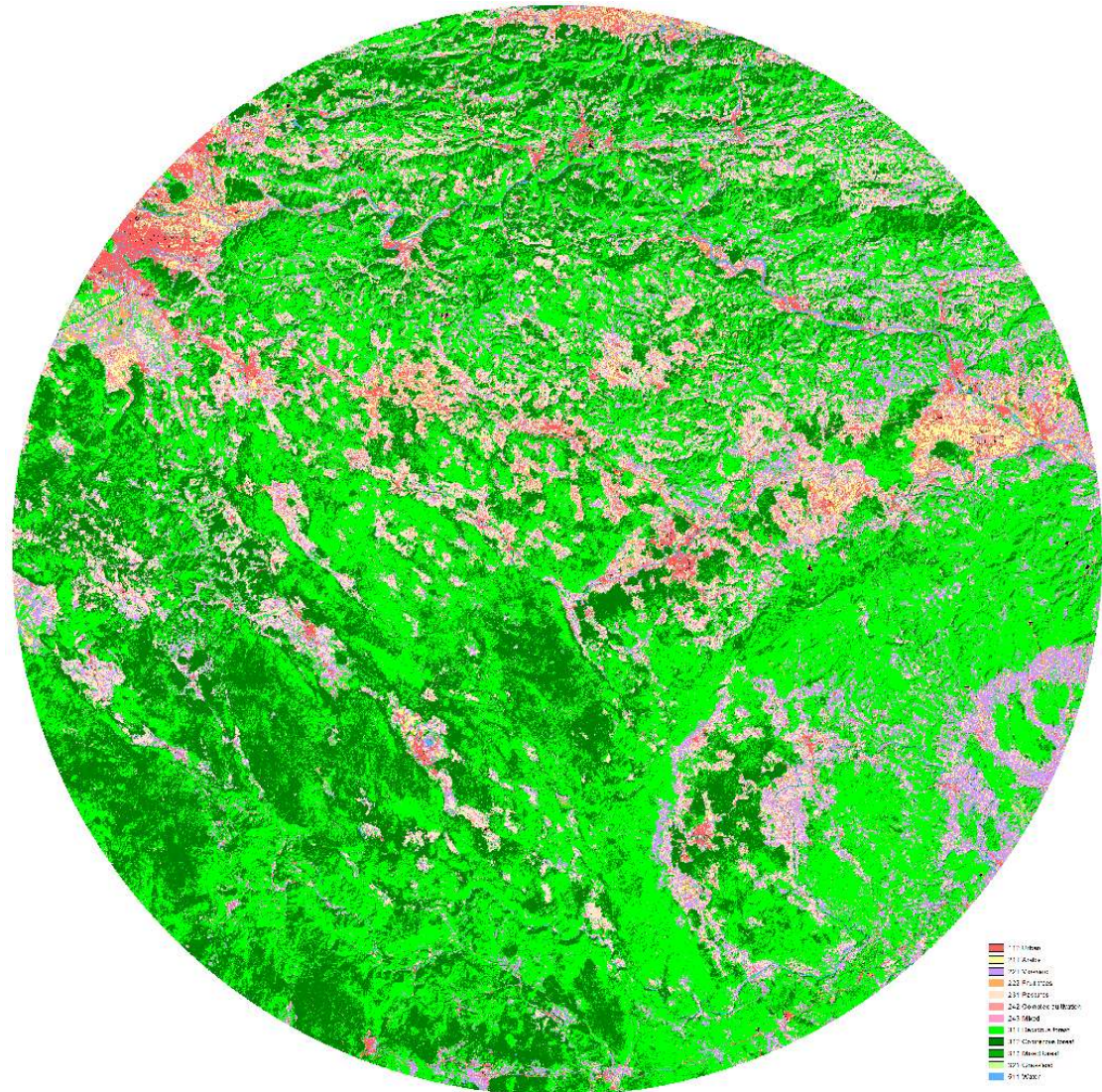
Introduction

- University of Sopron
- Faculty of Forestry
- Department of Surveying and Remote Sensing
- Educating forest engineers, environmental engineers, surveyors ...
- Numerous subjects: Surveying, Geodesy, GIS, Remote Sensing, Laser scanning, Programming ...



Satellite RS

- Landsat 8 bases
- Biomass mapping
- Surveying Alternative Energy Potential in central Europe
- Numerous district



Satellite RS

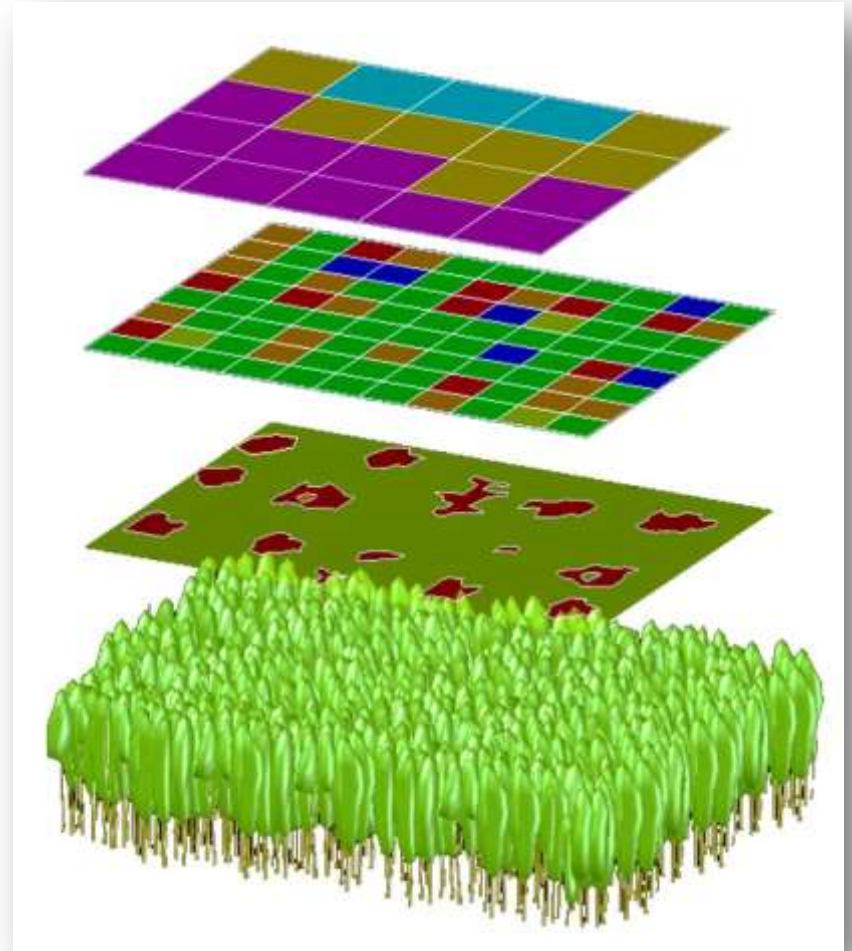
- Forest mapping using Spot images
- Object based image analysis with thematic layers
- Stand polygons from Hungarian Forest Stand Database
- Segmentation within stand polygons



Satellite RS

- Sentinel-2A based forest mapping
- Time series
- 20 m resolution: species, phenology, health
- 10 m resolution: forest cover at sub-pixel level
- 3D reference layer

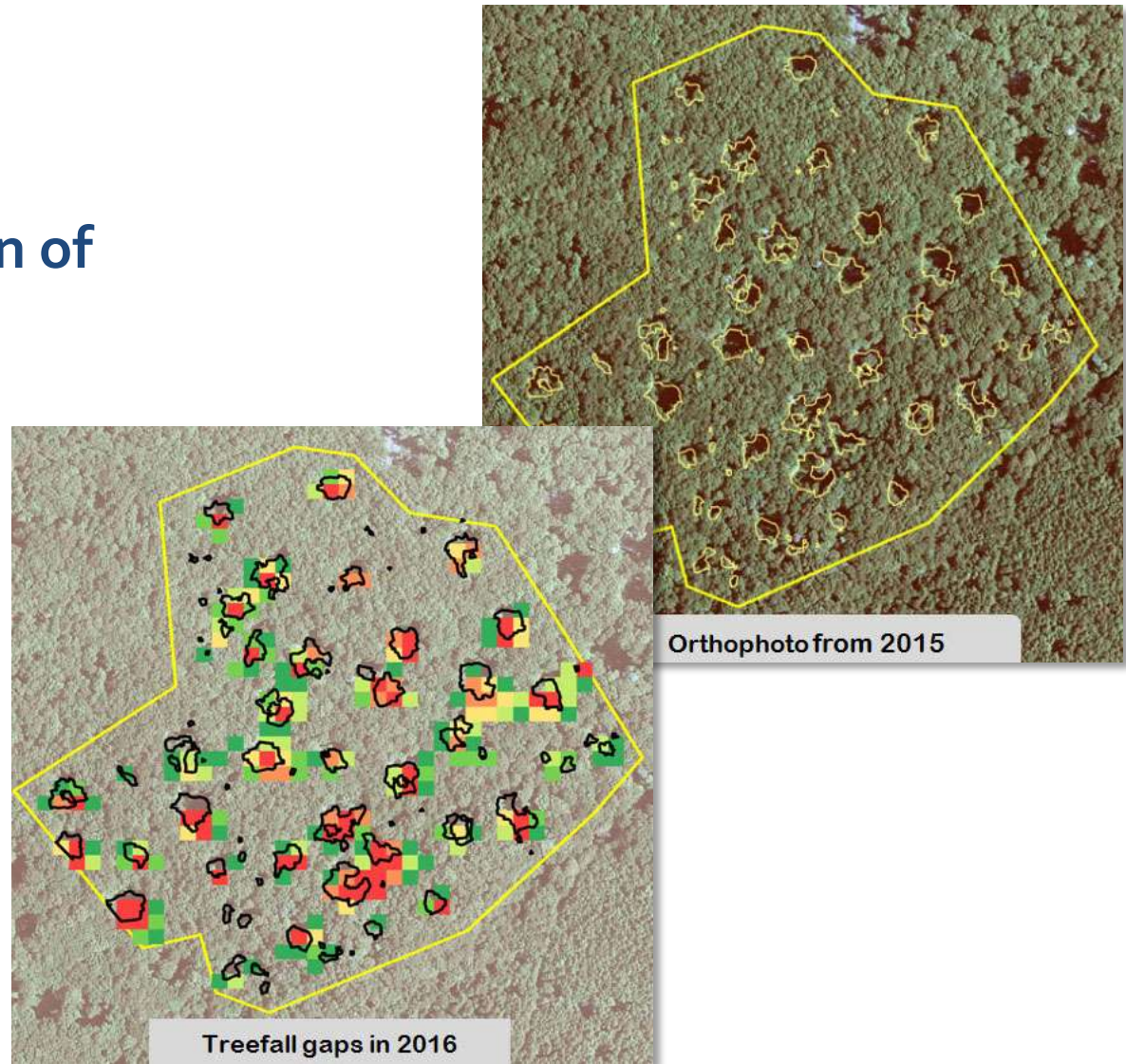
(I. Barton)



Satellite RS

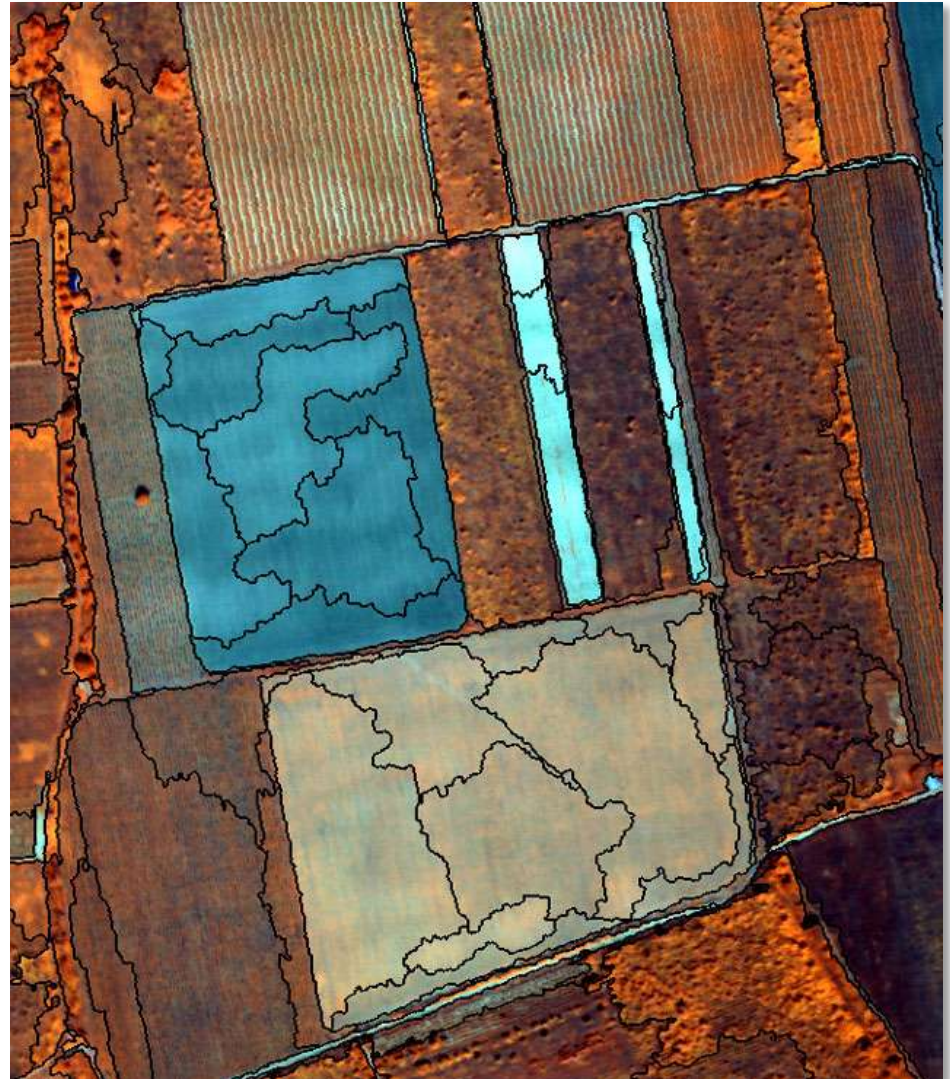
- Treefall gap mapping
- Subpixel classification of Sentinel-2A images
- Aerial images serve as reference

(Poster presentation:
Iván Barton)



Airborne RS

- Object based image analysis of hyperspectral images
- Detection of fine details
- Capability of mapping tree species not just species groups



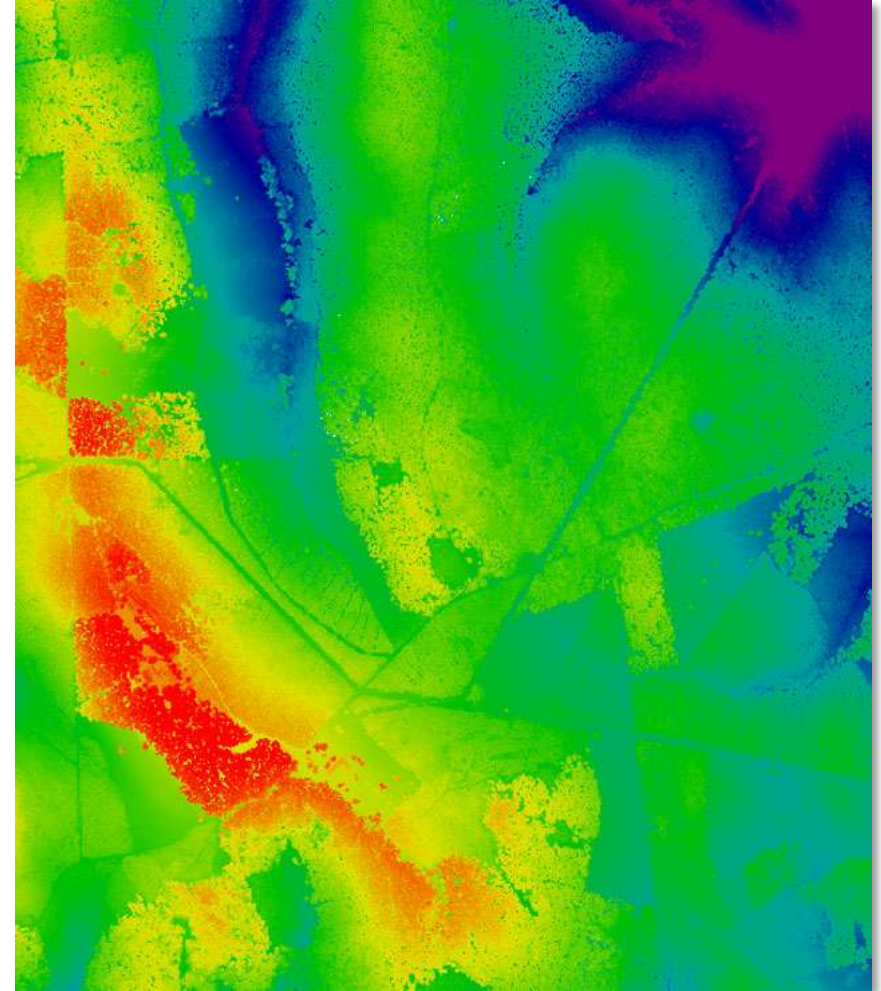
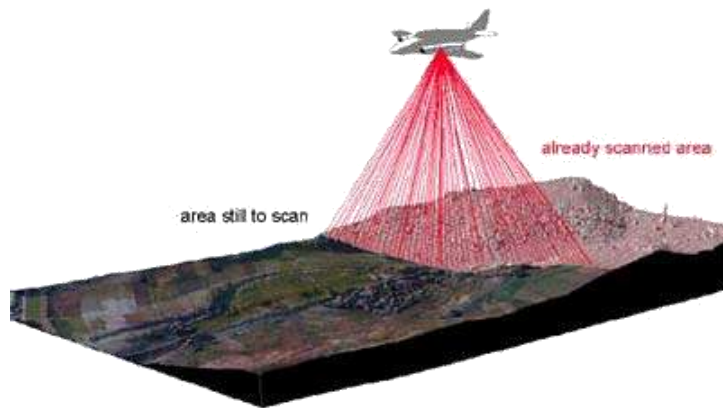
Airborne Laser Scanning

- Vegetation mapping and building extraction using LIDAR data only
- Full waveform data
- Object based image approach
- Height, density and texture features
- Rule based classification



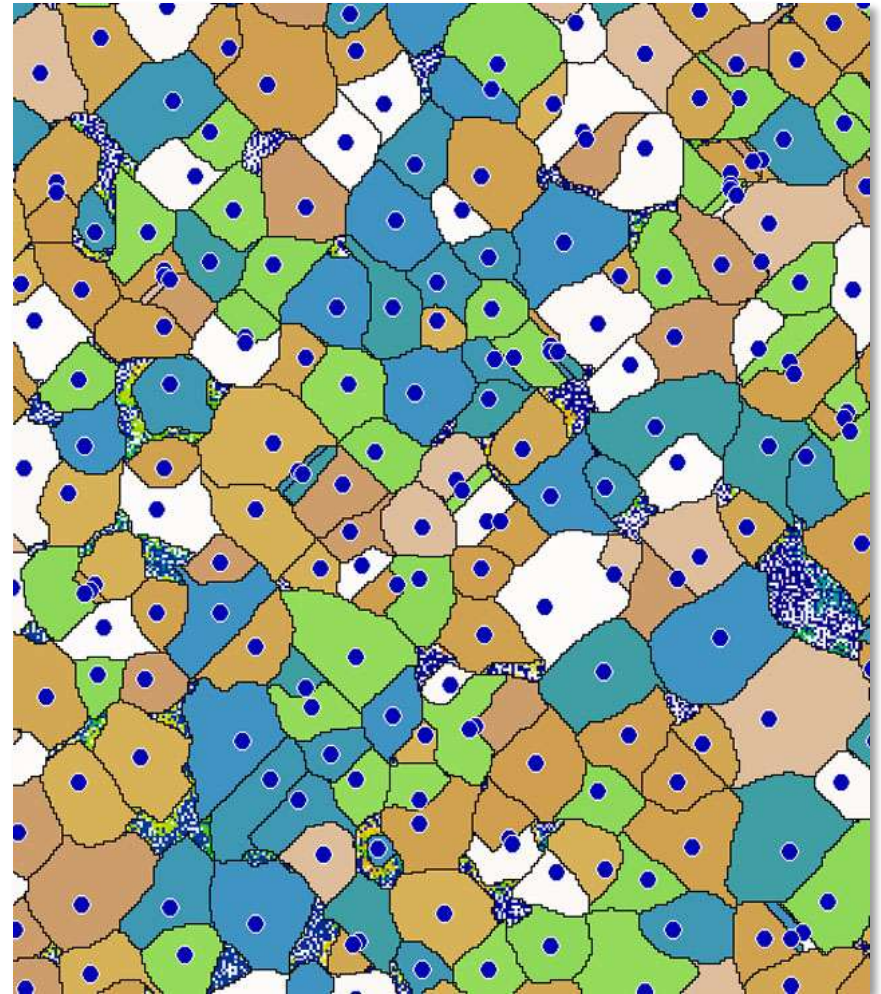
Airborne Laser Scanning

- Software development
- Surface Extraction
- Basic statistics
- Percentile based layers
- Relative height based layers



Airborne Laser Scanning

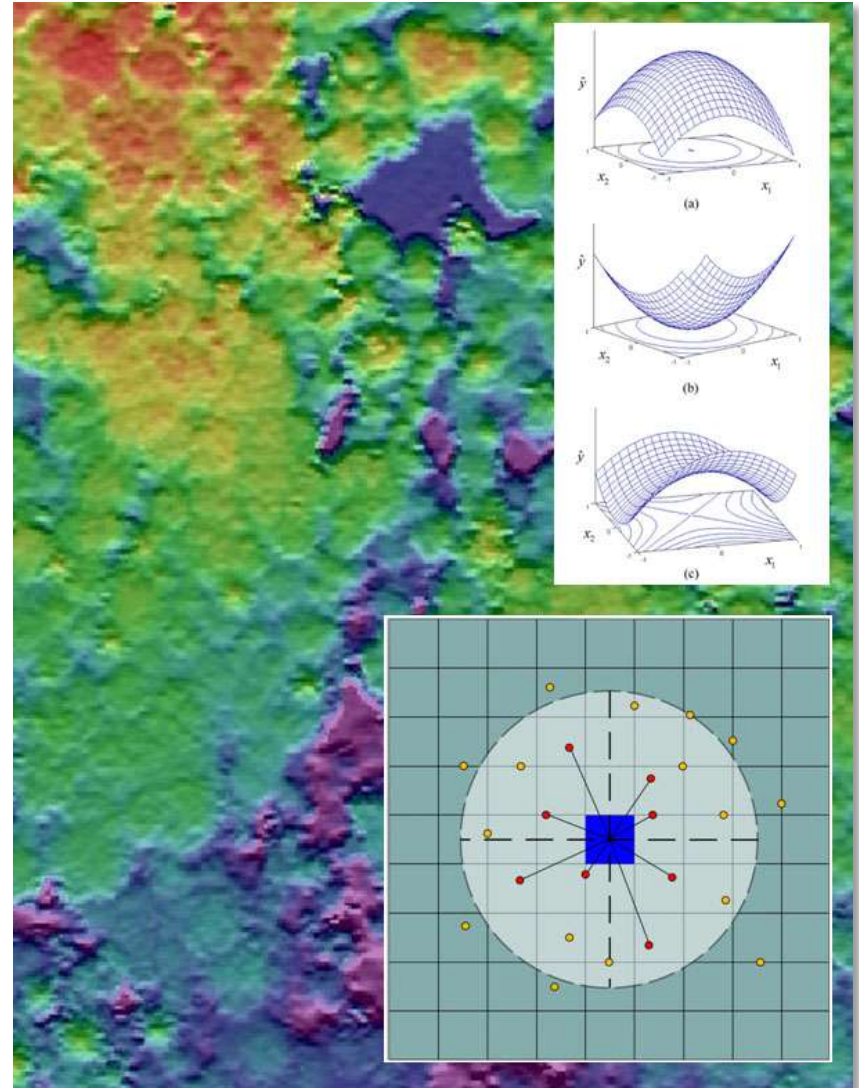
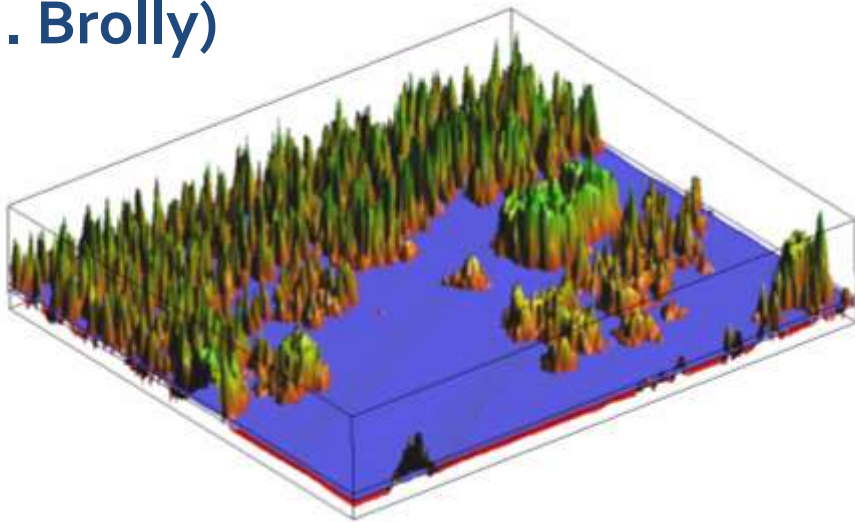
- Software development
- Tree Extraction (iterative assignment from local maximum points)
- Tree crown diameter
- Tree height
- Number of trees
- Crown closure
- Volume estimation on the basis of the above parameters



Airborne Laser Scanning

- Software development
- Crown surface modeling with local polynoms
- Alternative method

(G. Brolly)



Close range RS

- Software development
- Basal area estimation
- Camera calibration
- Machine learning
- Tree trunk recognition
- Tree species classification based on tree bark color and texture



Close range RS

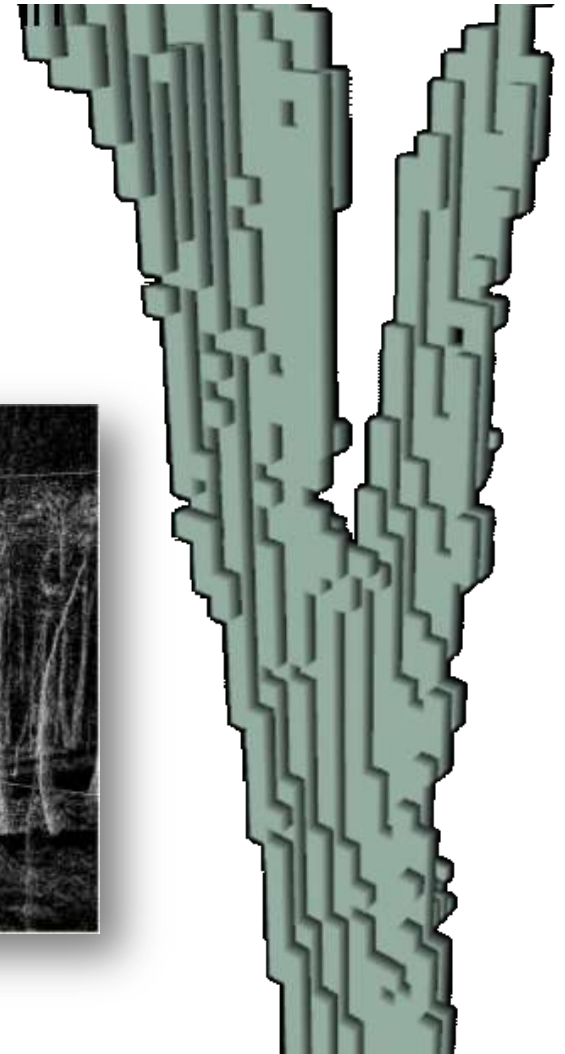
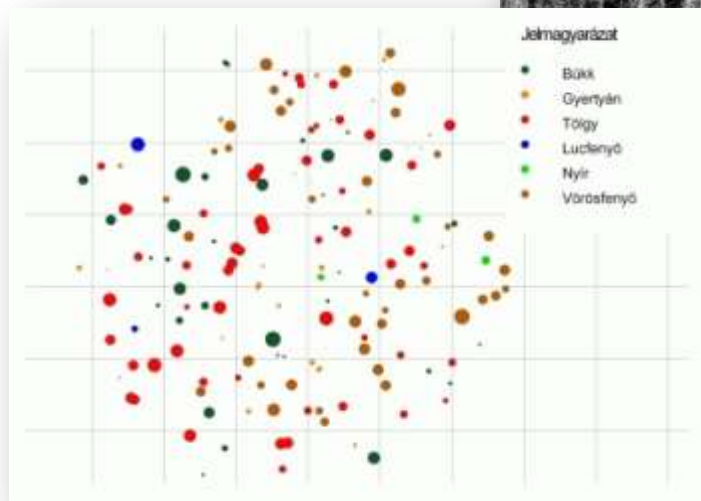
- Software development
- Woodpile volume estimation
- Camera calibration
- Machine learning
- Recognizing cutting surface
- Feature extraction
- Volume calculation
- Log height required



Terrestrial Laser Scanning

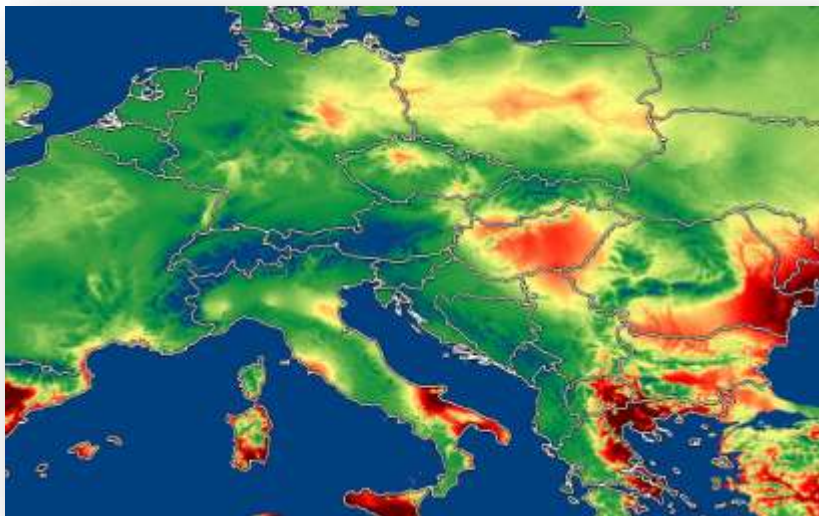
- Software development
- Voxel based approach
- Single Tree modeling

(G. Brolly)

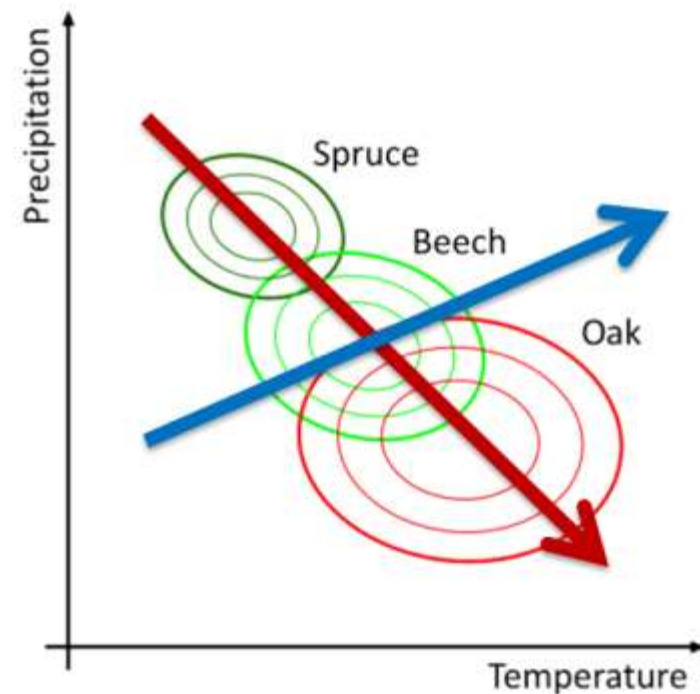


Climate Modeling

- Modeling the future of Hungarian forests
- Image processing methods
- Training: current climate
- Projection: future climate

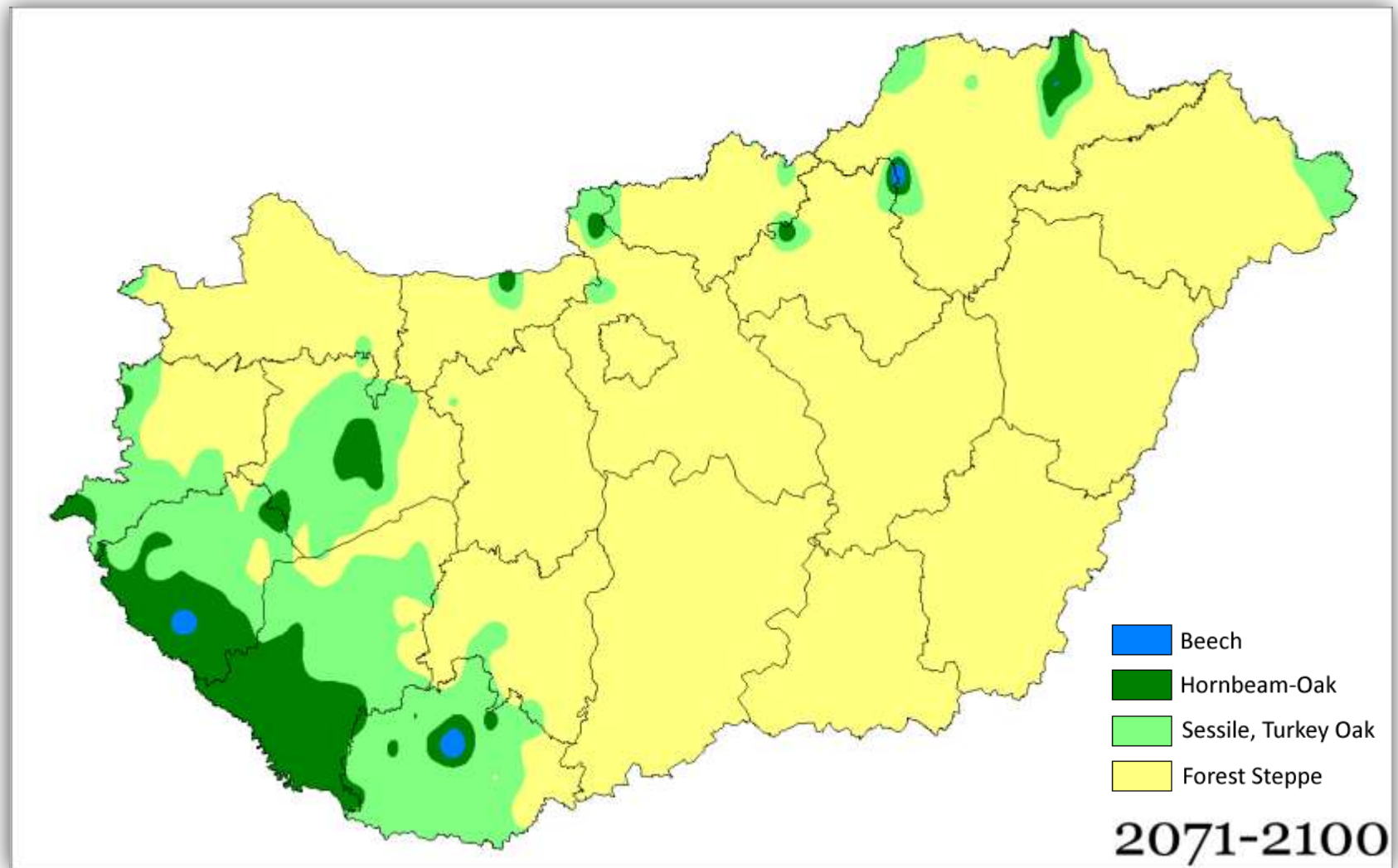


$$p(\underline{x}|\underline{\omega}_i) = \frac{1}{(2\pi)^{n/2} |\text{COV}_i|^{1/2}} \exp\left(-\frac{1}{2}(\underline{x} - \underline{m}_i)^T \cdot \text{COV}_i^{-1} \cdot (\underline{x} - \underline{m}_i)\right)$$
$$\ln P(i) - \frac{1}{2} \ln |\text{COV}_i| - \frac{1}{2}(\underline{x} - \underline{m}_i)^T \cdot \text{COV}_i^{-1} \cdot (\underline{x} - \underline{m}_i)$$



SCERIN-5 Capacity Building Workshop, June 20-23, 2017. Pécs

Recent Application of Remote Sensing in Forestry at the University of Sopron



THANK YOU FOR THE ATTENTION!

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