Mapping forest tree species in high resolution UAV-based RGB-imagery by means of convolutional neural networks

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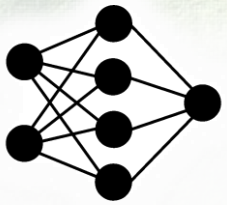
Data

- **RGB**-imagery from consumer-grade UAVs
- Spatial **resolution < 2 cm**
- **Mixed coniferous** and **mixed deciduous** forests

- **51 plots** á 1 ha
- **14 classes** (9 species, 3 genera, deadwood, forest floor)
- **Visual interpretation** based on full forest inventory data

Deep Learning



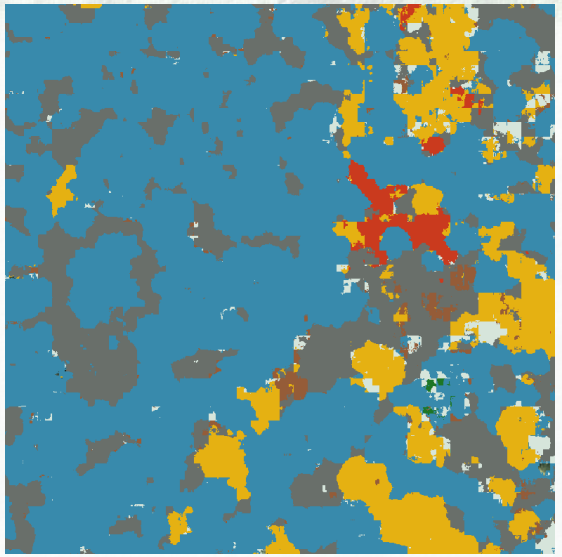
- **U-Net** CNN architecture
- Semantic **segmentation**
- Test **several models**
- Independent, pixel-based **evaluation** using **F1-Score**

TensorFlow

Keras

Sharing is encouraged

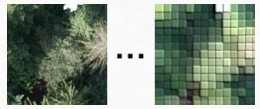
Key findings + Results



	F1
Picea abies	0.93
Fagus sylvatica	0.90
Abies alba	0.86
Pseudotsuga menziesii	0.89
Pinus sylvestris	0.91
Acer spp.	0.80
Fraxinus excelsior	0.87
Larix decidua	0.83
Quercus spp.	0.58
Carpinus betulus	0.38
Tilia spp.	0.50
Betula pendula	0.27
Forest floor	0.83
Deadwood	0.72
Mean	**0.73**

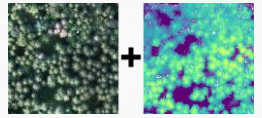
✗ LiDAR
✗ hyperspectral
✓ RGB

- High accuracy
- End-to-end learning



- High spatial resolution essential

- Trade-offs in tile size



- No clear benefit of additional height information

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