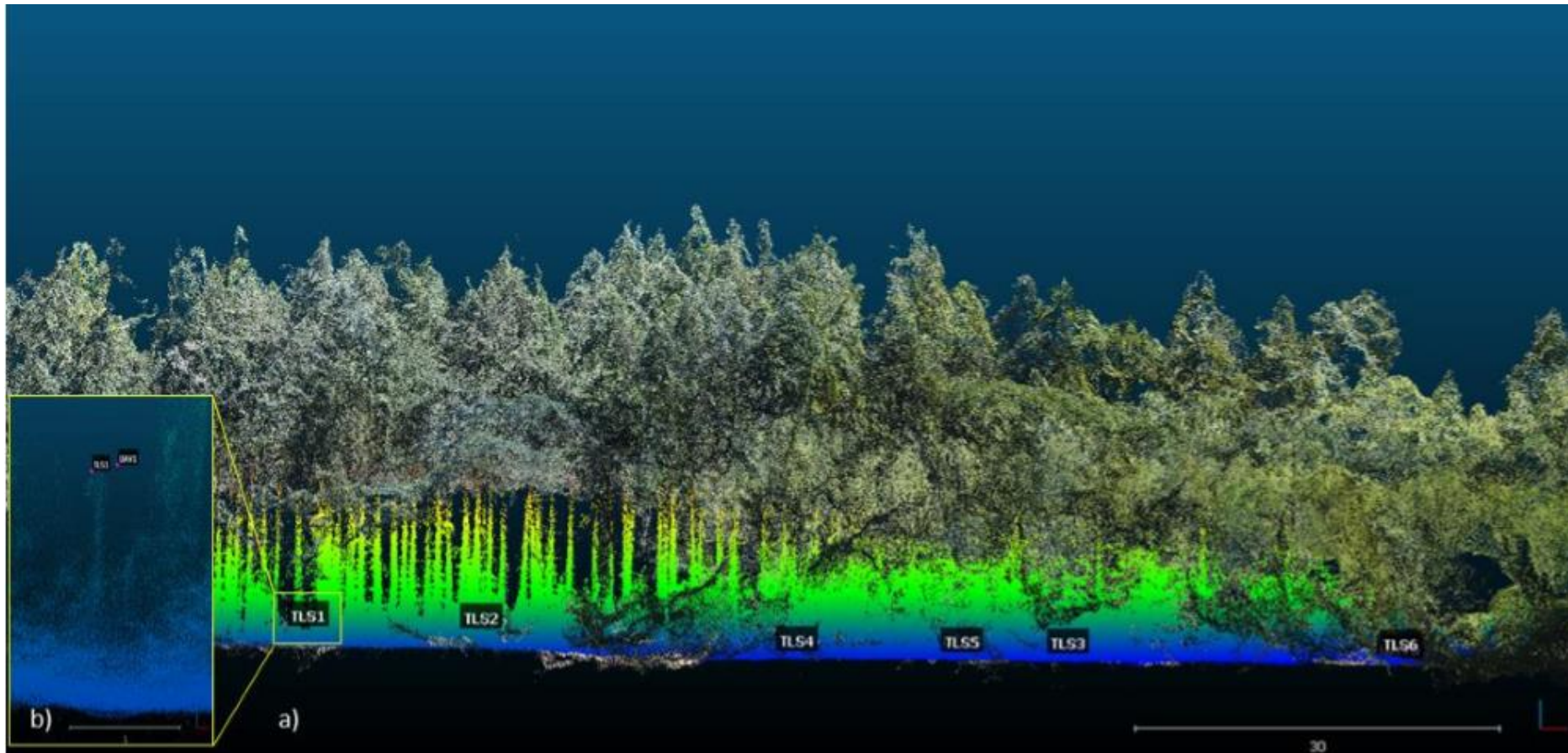


De toekomst van bosinventarisatie



Ing. Nico Spliethof
Ir. David Borgman

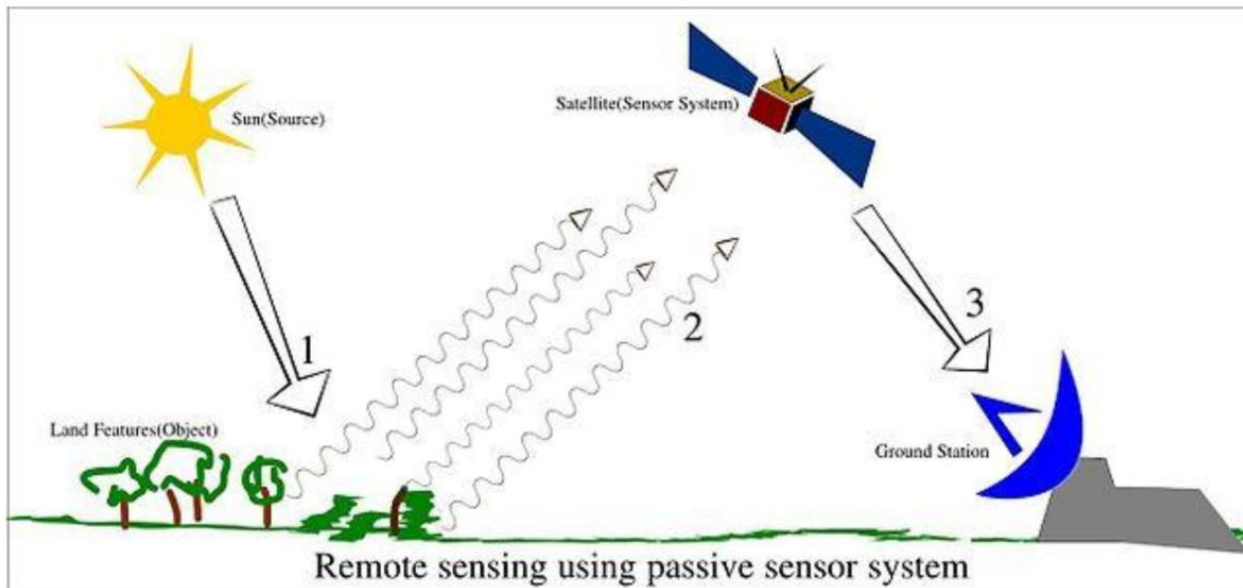
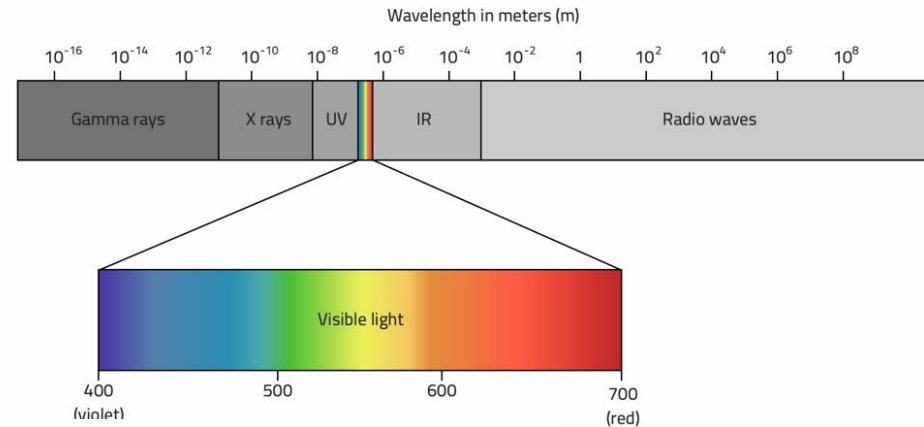
De toekomst van bosinventarisatie

1. Inleiding
2. Remote Sensing / Lichtspectrum
3. Laserscanning / LiDAR
4. Machine Learning, Deep Learning en Neural Networks
5. Foto / Video apps
6. Uitdagingen
7. Blik vooruit
8. Vragen / discussie



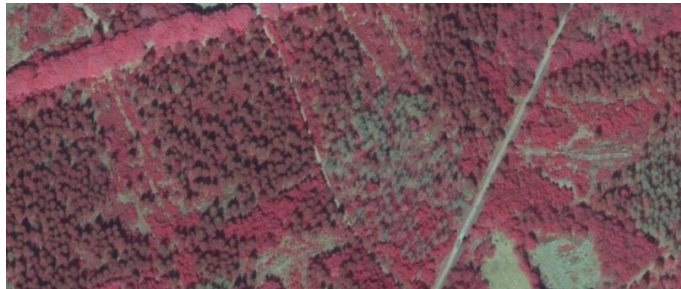
Het lichtspectrum en remote sensing

- Actief of Passief
 - Elektromagnetische straling
 - Delen uit het lichtspectrum

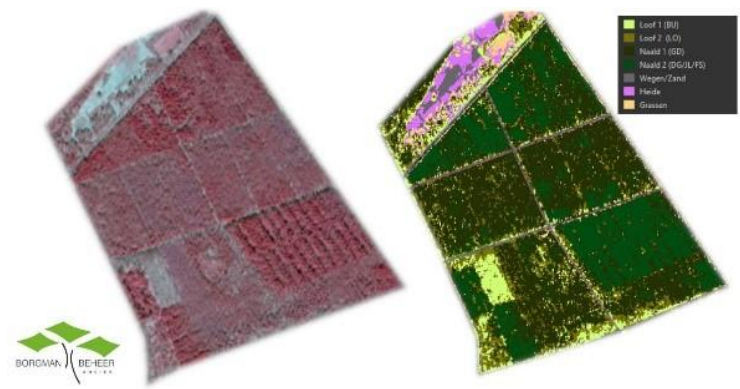
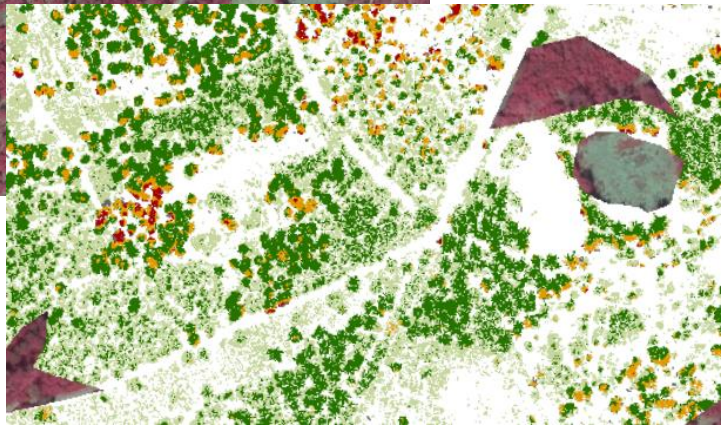
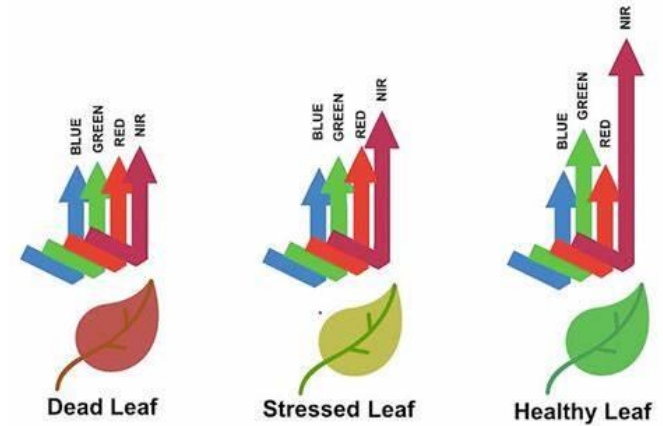


Het lichtspectrum en remote sensing

- *RGB + NIR*
 - *Spectral Indices* (bijv. NDVI)
 - Beeldclassificatie



$$NDVI = \frac{(NIR - VIS)}{(NIR + VIS)}$$



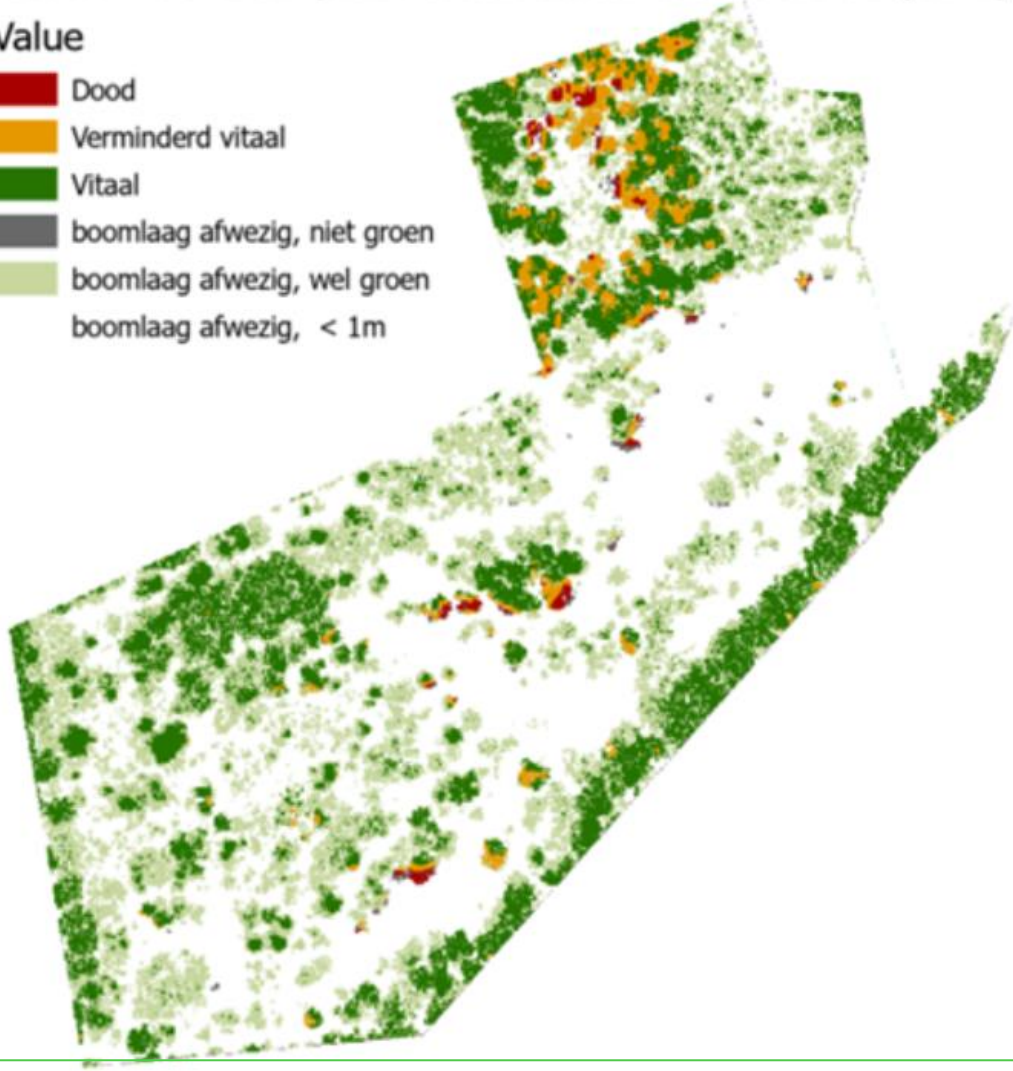
Bronnen:
firewatchteam.com 2023
N. Spliethof 2022 – Borgman Beheer Advies

Het lichtspectrum en remote sensing

AHN4 <6 meter plus Reclassified Green NDVI (eindproduct)

Value

-  Dood
-  Verminderd vitaal
-  Vitaal
-  boomlaag afwezig, niet groen
-  boomlaag afwezig, wel groen
-  boomlaag afwezig, < 1m



Het lichtspectrum en remote sensing

Legenda

Compartimenten

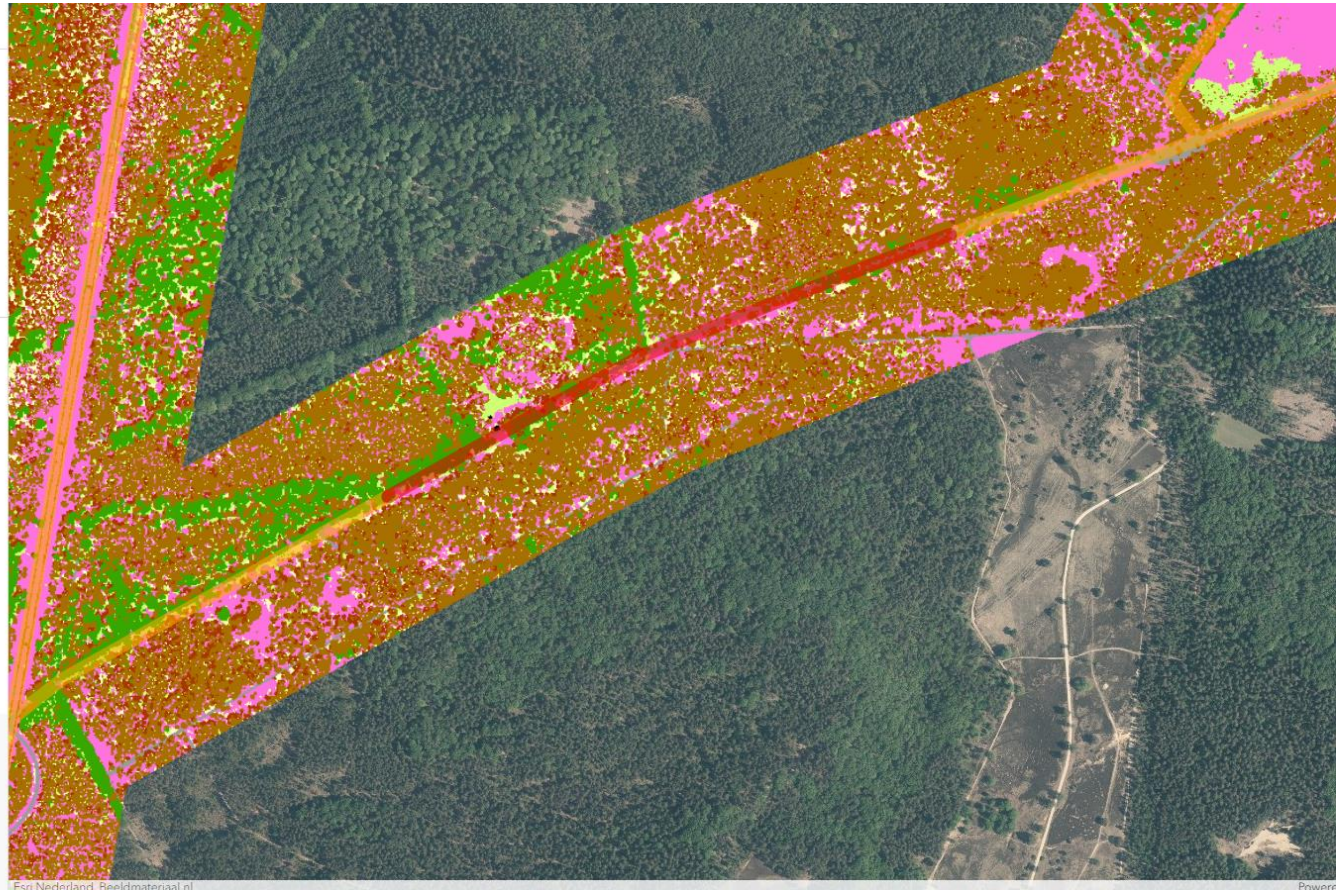
Compartimenten Gesegmenteerd

- In behandeling
- Open (te beoordelen)
- Overig, zie opmerking
- Voldoet
- Voldoet gedeeltelijk
- Voldoet niet

PGLD22_Vegetatielaag

Classificatie_Merged

- Naald 1
- Naald 2
- Loof 1
- Loof 2
- Heide en grassen 3
- Grassen / Lage vegetatie
- Kale grond
- Water
- Wegen
- Bebouwing
- Dode bomen

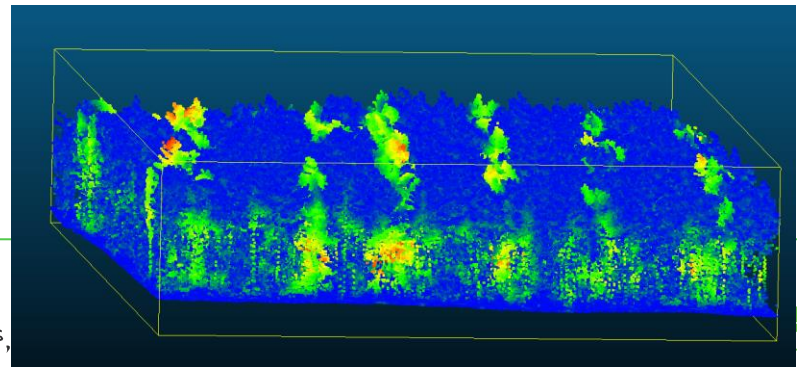
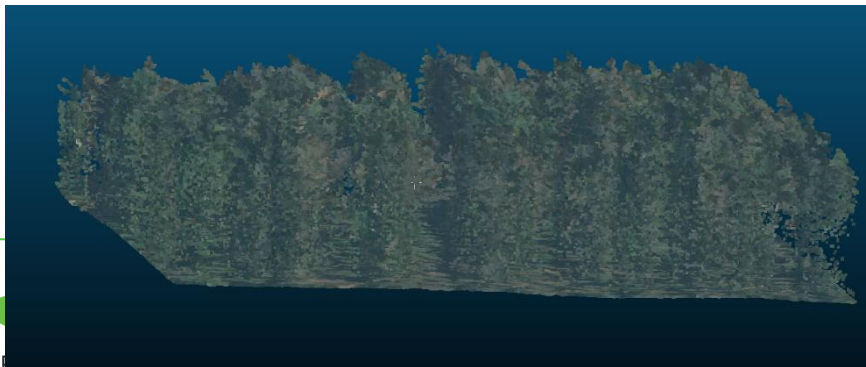
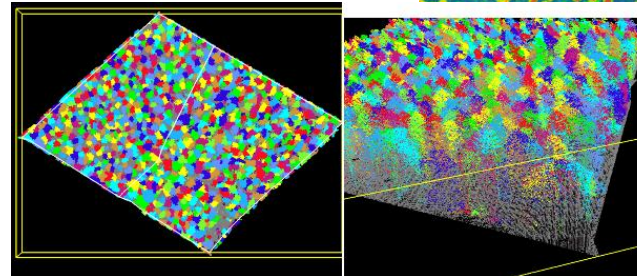
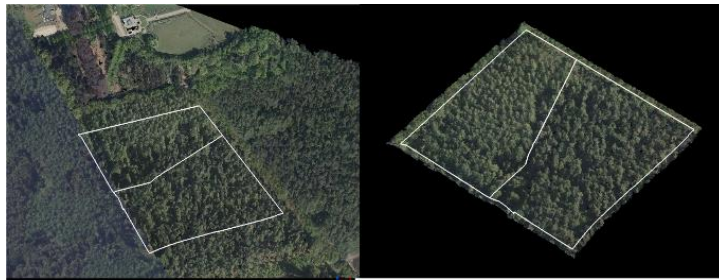
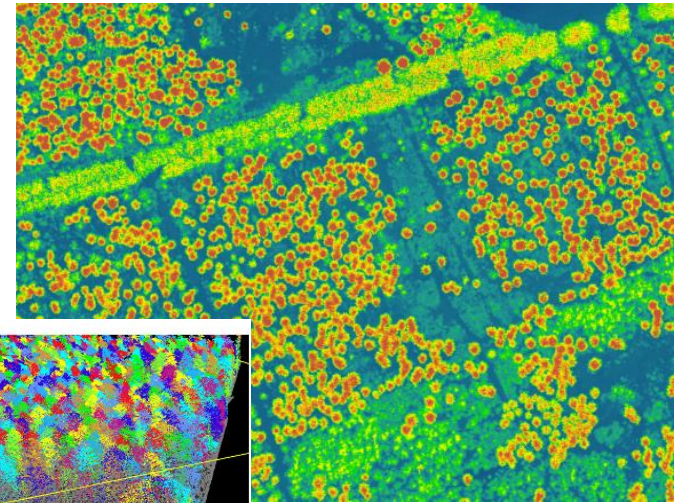


Esri Nederland, Beeldmateriaal.nl

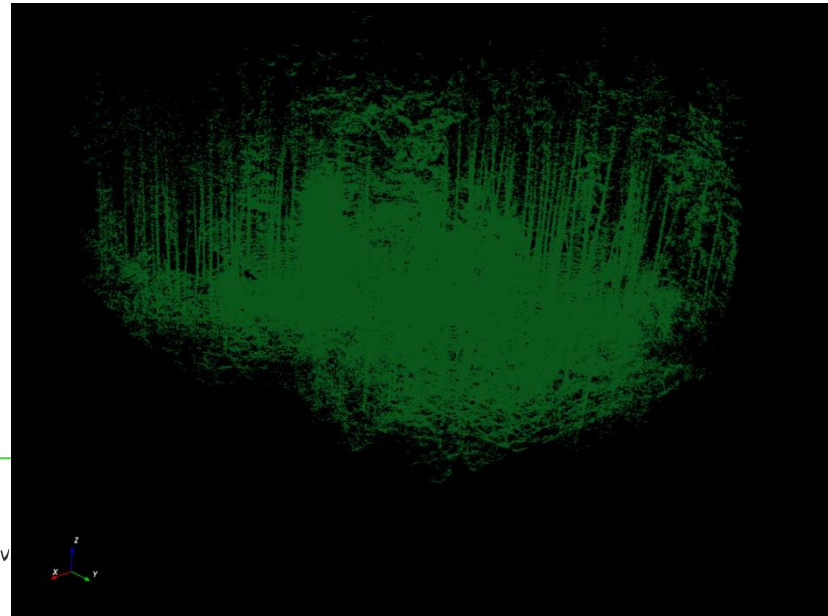
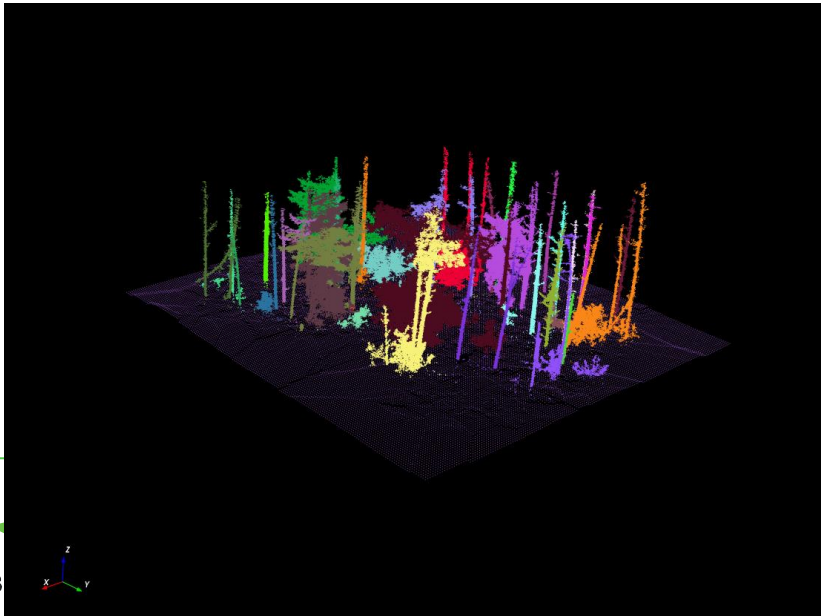
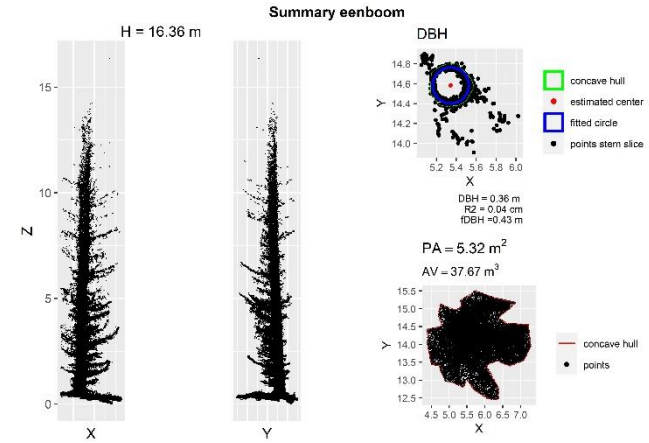
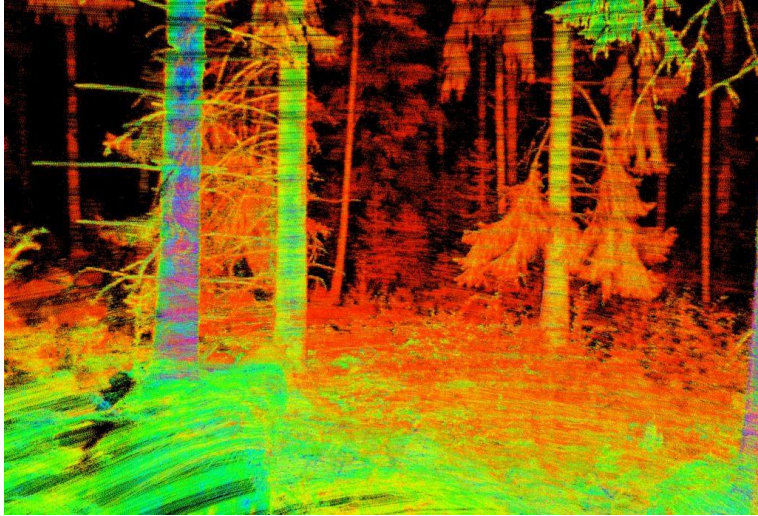
Power

LiDAR (Laserscanning)

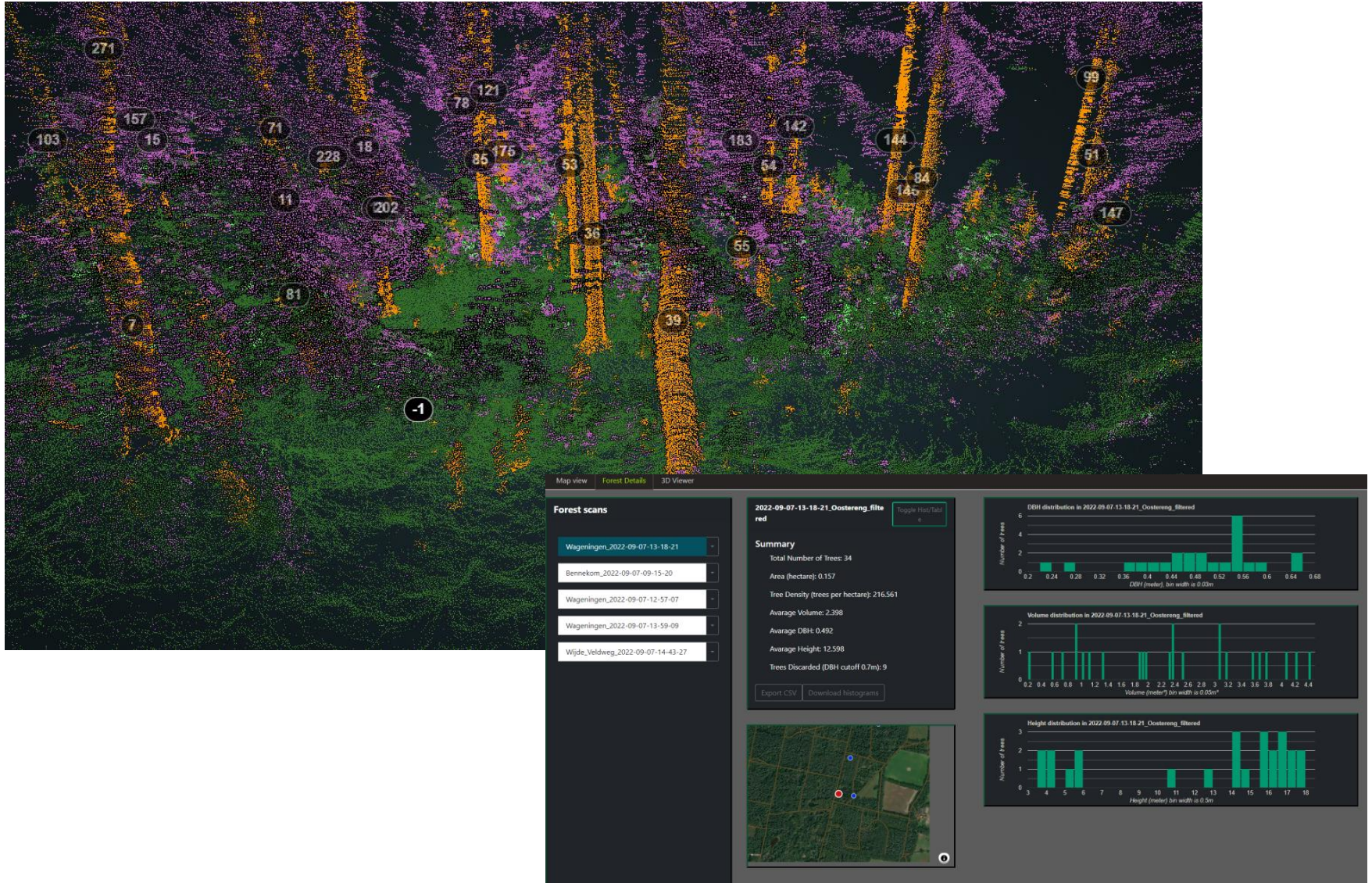
- *Actieve Sensor*
- (3D) X, Y & Z
- Airborne of Terrestrial



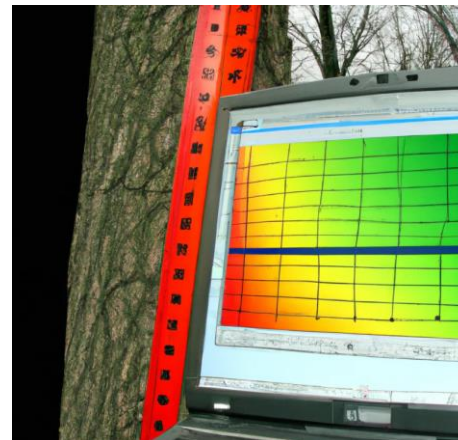
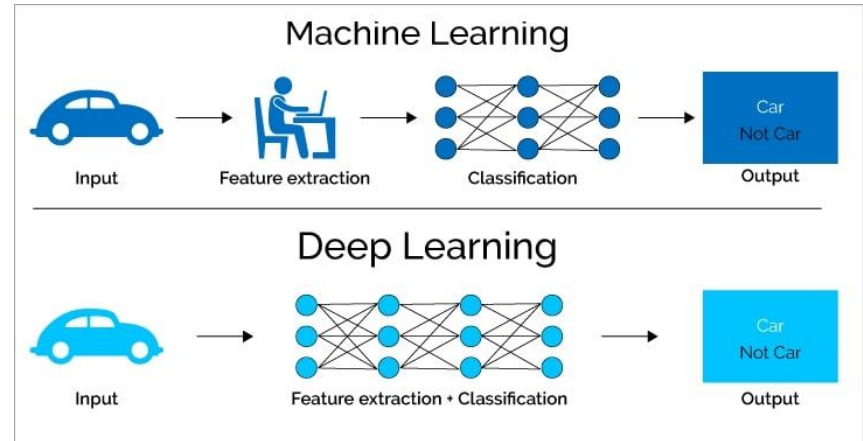
LiDAR (Laserscanning)



LiDAR (Laserscanning)



Machine Learning, Deep Learning of Neural Networks

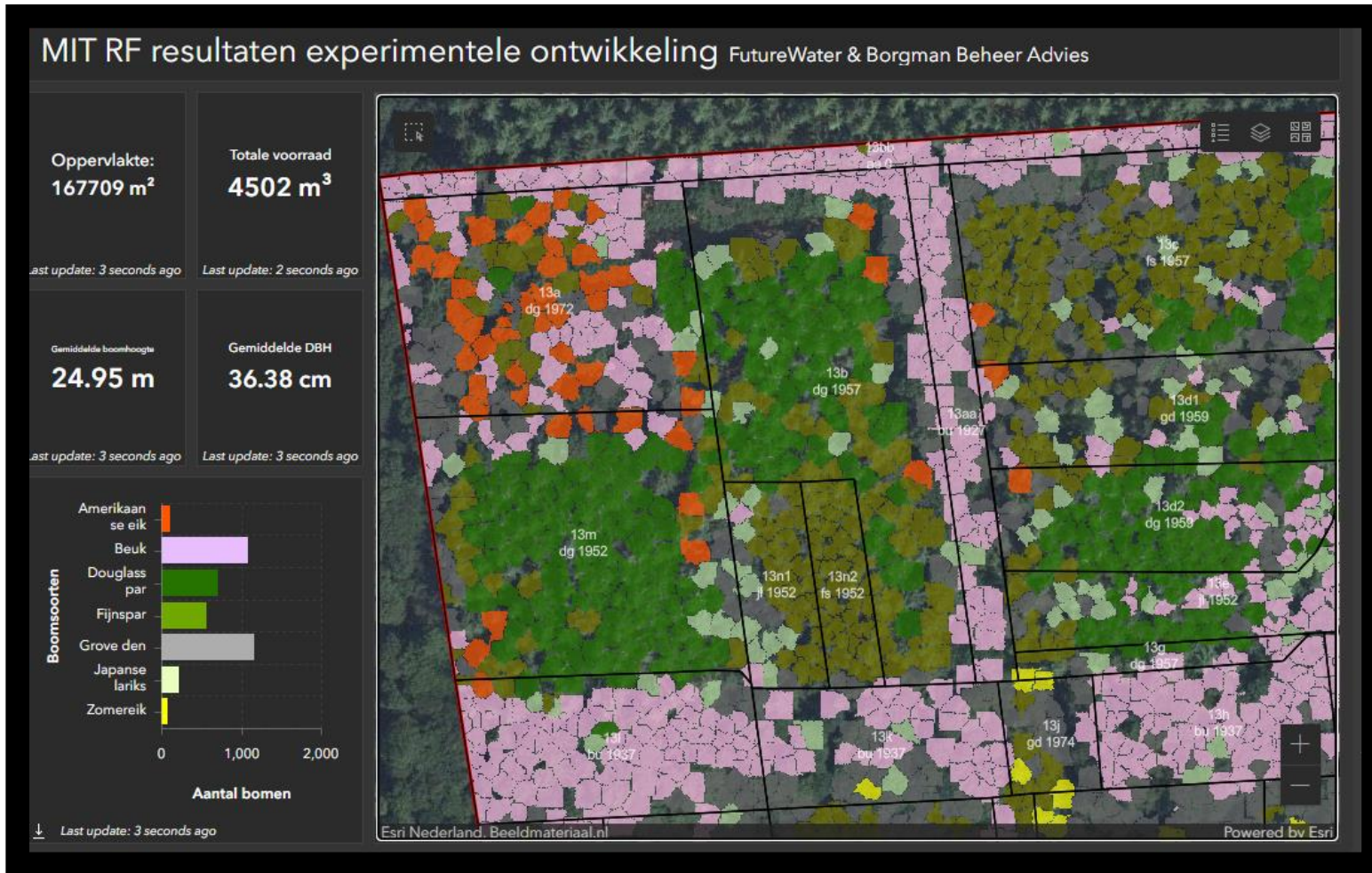


levity.ai/ 2023

DALL-E

N. Spliethof 2022 – Borgman Beheer Advies

Machine Learning, Deep Learning of Neural Networks



Bron: N. Spliethof 2022 – Borgman Beheer Advies



Machine Learning, Deep Learning of Neural Networks

Interannual variation of gross primary production detected from optimal convolutional neural network at multi-timescale water stress

Open Access

The development of a convolutional neural network for the automatic detection of Northern white *Colinus virginianus* covey calls

Open Access

Convolutional neural network architecture designed for the automated survey of seabird colonies

Open Access

Automated detection of bird roosts using NEXRAD radar data and Convolutional Neural Networks

Open Access

Automated identification of avian vocalizations with deep convolutional neural networks

Open Access

Remote sensing liana infestation in an aseasonal tropical forest: addressing mismatch in spatial units of analyses

Open Access

Machine learning to detect marine animals in UAV imagery: effect of morphology, spacing, behaviour and habitat

Open Access

Deep learning for coastal resource conservation: automating detection of shellfish reefs

Open Access

Identifying plant species in kettle holes using UAV images and deep learning techniques

Open Access

Using very-high-resolution satellite imagery and deep learning to detect and count African elephants in heterogeneous landscapes

Open Access

Mapping tree cover expansion in Montana, U.S.A. rangelands using high-resolution historical aerial imagery

Open Access

Automated detection of Hainan gibbon calls for passive acoustic monitoring

Remote Sensing in Ecology and Conservation

ZSL

Original Research | Open Access

Canopy palm cover across the Brazilian Amazon forests mapped with airborne LiDAR data and deep learning

Ricardo Dalagnol, Fabien H. Wagner, Thaise Emílio, Annia S. Streher, Lênio S. Galvão, Jean P. H. B. Ometto, Luiz E. O. C. Aragão

Remote Sensing in Ecology and Conservation

ZSL

Original Research | Open Access

Tracking canopy gaps in mangroves remotely using deep learning

Guillaume Lassalle, Carlos Roberto de Souza Filho

First published: 12 July 2022 | <https://doi.org/10.1002/rse2.289>

Funding Information

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Remote Sensing in Ecology and Conservation

ZSL
LET'S WORK FOR WILDLIFE

RESEARCH ARTICLE

Beyond tree cover: Characterizing southern China's forests using deep learning

Qian Li^{1,2,3}, Yuemin Yue^{1,2}, Siyu Liu⁴, Martin Brandt⁴, Zhengchao Chen⁵, Xiaowei Tong^{1,2}, Kelin Wang^{1,2}, Jingyi Chang^{1,2,3} & Rasmus Fensholt⁴

¹Key Laboratory of Agro-ecological Processes in Subtropical Region, Institute of Subtropical Agriculture, Chinese Academy of Sciences, Changsha 410125, China

²Huanjiang Observation and Research Station for Karst Eco-systems, Huanjiang 547100, China

³University of Chinese Academy of Sciences, Beijing 100049, China

⁴Department of Geosciences and Natural Resource Management, University of Copenhagen, Copenhagen, Denmark

⁵Airborne Remote Sensing Center, Aerospace Information Research Institute, Chinese Academy of Sciences, Beijing 100094, China

Bronnen: zslpublications.onlinelibrary.wiley.com 2023

KATAM FOREST MINI

KATAM

https://www.youtube.com/watch?time_continue=31&v=ivPw7nV2qxo&feature=emb_logo



KATAM FOREST MINI

Class 1 – Supported (recommended for beginners)



Class 2 – Supported (after some training)



Class 3 – Supported (requires very good recording skills)



Class 4 – Not supported



ARBOREAL APP

Products

Arboreal Forest - a real digital caliper

Now you can measure Diameter, Basal Area, Height, Tree species, Trees per hectare and calculate volumes.

- Great accuracy
- Easy to use
- Get the result immediately
- Measure in a circle plot or along a transect
- Sync the result to the cloud
- See the results on a map
- Show results from many plots

[Read more!](#)



Verskil in complexiteit

Remote sensing ondersteunend op diverse niveau's:

- Vegetatie aanwezig ja/nee
- Type vegetatie
- (Boom)soortherkenning
- Data individuele boom: o.a. volume
- ...

Complexiteit en schaalniveau bepaalt type data: veldmeting en/of remote

Uitdagingen



Uitdagingen



Uitdagingen



Foto: Fons Voncken (NBI-8)

Uitdagingen



Blik vooruit

Hybride-inventarisatie:

- Veldwerk blijft basis en onmisbaar
- Remote sensing gaat nieuwe en verdiepende inzichten toevoegen: inzet LiDAR, RGB, NDVI



Blik vooruit

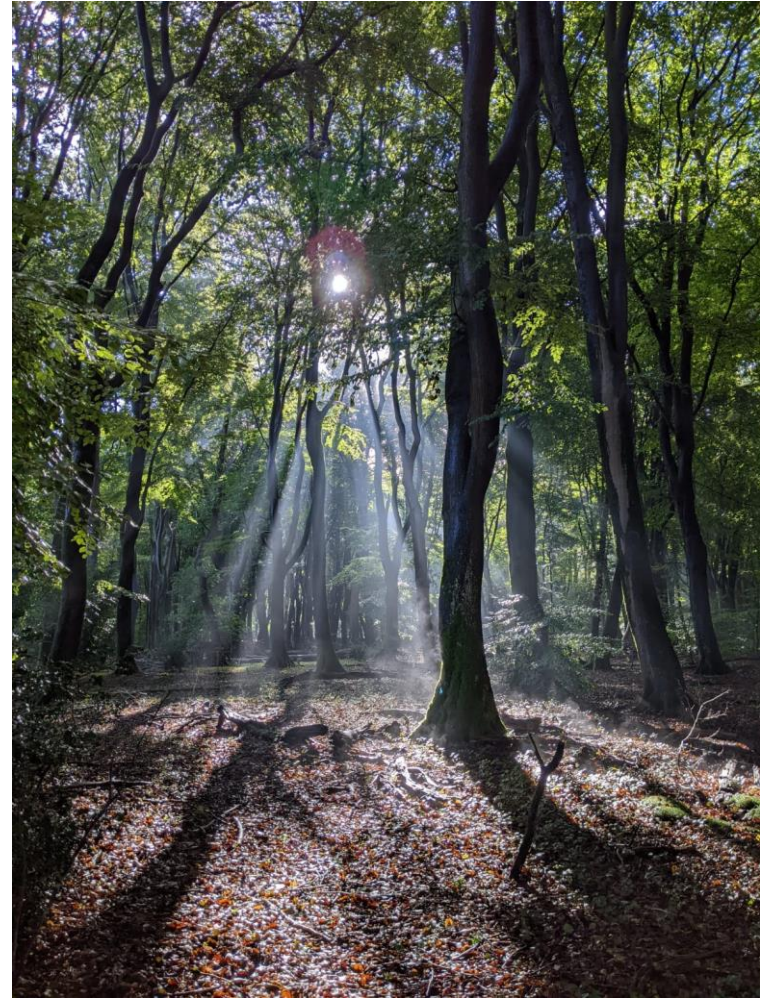
Combineren van datasets – toepassen deep learning:

- Bosinventarisatie-data
- Remote sensing: LiDAR en Lichtspectrum
- Flora- en Fauna
- Bodemdata
- Hydrologie / vocht
- Recreatie: bezoekersaantallen en bewegingen
-
- ???



Blik vooruit

- Veldwerk: 'way-of-life'
- Karakter veldwerk veranderd dankzij nieuwe techniek
- Zelf observeren en meten blijft cruciaal



Vragen?

Dank voor uw aandacht!



Ing. Nico Spliethof
Ir. David Borgman
info@borgmanbeheer.nl



Toegewijd partner voor bos, natuur en landschapsbeheer

