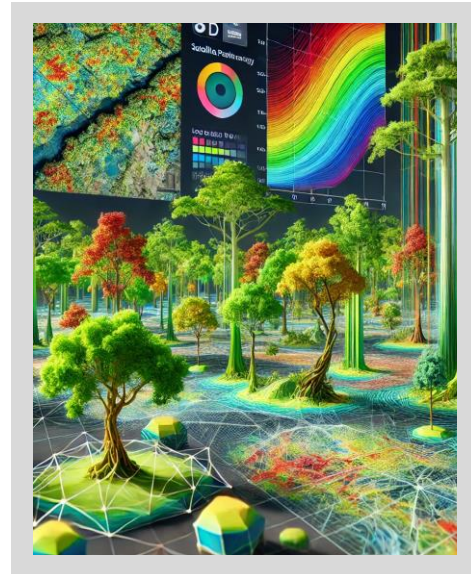


### Combining Remote sensing techniques to build a Digital Mirror of the Veluwe

Digital twins have tremendous potential for environmental applications.. Forests play a essential role in global ecosystems, but accurately incorporating tree within an environmental digital twin poses significant challenges. With remote sensing technologies advancing, a new opportunity arises to create comprehensive digital replicas of forest structures by integrating various data sources. This project explores two topics revolving around 1) estimating tree structure and species and 2) retrieving species functional traits



By integrating multi-modal remote sensing products, such as LiDAR and optical imagery, through on data assimilation techniques, radiative transfer models and AI classification tools, this research, estimate three essential biodiversity variables (i.e., vertical distribution of biomass, species distribution and species functional traits) to create a digital mirror of the Veluwe Nature-Conservation Area that will be used to contribute to the ongoing nitrogen crisis in the Netherlands.

#### Proposed activities:

Estimate Vertical distribution of biomass and tree species distribution

- Develop and implement a flexible framework for tree structure estimation by integrating remote sensing data (LiDAR, optical imagery, etc).
- Compare the most commonly used methods for modelling tree structures in terms of accuracy, scalability, and computational efficiency.
- Explore the potential of the framework for broader application in ecosystem digital twins and its relevance to biodiversity and climate studies.

Species functional traits

- Investigate data assimilation techniques to integrate Sentinel-2 and Neo-Pleiades data for vegetation trait estimation.
- Apply radiative transfer modeling to by combine Neo-Pleiades and Sentinel 2 data and retrieve key biophysical parameters, such as leaf area index and chlorophyll content. Assess the framework's potential for improving vegetation trait estimation in diverse ecosystems.

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