SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Cartography & GIS

has the honor to invite you to the public defence of the PhD thesis of

Robbe Neyns

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Beyond the Canopy:
Deep Learning for Urban Tree Species Classification
Applications in Pollinator Ecology and Tree Phenological Responses to Urban Stressors

Supervisor:
Prof. dr. Frank Canters (VUB)
Co-supervisor:
Prof. dr. Pieter Libin (VUB)

The defence will take place on
Wednesday, September 9, 2026 at 4 p.m.

VUB Etterbeek campus, Pleinlaan 2, Elsene,
In auditorium I.0.02

The defence can be followed through a live stream on teams through this link

Members of the jury

Prof. dr. Matthieu Kervyn (VUB, chair)
Prof. dr. Lynn Houthuys (VUB)
Prof. dr. Marijke Huysmans (VUB)
Prof. dr. Benoît Smets (VUB)
Prof. dr. Stefanos Georganos (Karlstad University, SE)
Prof. dr. Ben Somers (KU Leuven)

Curriculum vitae

After studying Geography (VUB) and Artificial Intelligence (KU Leuven), Robbe started his PhD at the VUB in 2020. His research develops deep learning methods for remote sensing to map urban trees at the species level, and applies these in ecological research: from mapping the habitat and food trees of wild bees to the impact of urban heat and air pollution on tree health. His work resulted in publications in peer-reviewed journals and was presented at international conferences, including EARSeL 2024, where he won the Young Scientist Award.

Abstract of the PhD research

Urban trees provide critical ecosystem services and represent a key adaptive strategy against climate change, yet fine-scale characterization of urban tree populations remains constrained by the incompleteness of in-situ inventories. Remote sensing offers a scalable alternative, but its application to detailed, species-level analysis in complex urban environments remains underexplored. This dissertation investigates the potential of advanced deep learning-based remote sensing frameworks for urban tree species mapping, and their integration in applied ecological research.

A multi-modal deep learning framework is first developed to classify street trees at the species level across the Brussels-Capital Region, fusing multi-temporal satellite imagery with high-resolution ortho-imagery. Components of this framework are subsequently deployed in two ecological use cases.

The first maps Salix species in Braunschweig, Germany, in support of research on the nesting ecology of Andrena vaga, a ground-nesting bee with a pollen dependency on Salix. These findings are extended through a Bayesian habitat suitability model integrating remote sensing-derived variables with existing ecological knowledge, well suited to data-sparse urban environments.

The second use case uses the species classification model to underpin a city-scale assessment of how urban heat, air pollution, and impervious surface relate to phenological tree health indicators across five common tree species.

Taken together, these contributions demonstrate that multi-modal deep learning frameworks can meaningfully advance fine-scale urban tree analysis, with direct relevance to urban biodiversity monitoring and urban biostress-related research.