FACULTEIT INGENIEURSWETENSCHAPPEN
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Phd position : Does environmental noise exposure lead to biodiversity loss ?

Background

Global society is strongly dependent on **ecosystem services**, underpinned by **biodiversity**. Although biodiversity loss is on top of research agendas worldwide, unrecognized and potentially strong drivers such as light and **noise pollution** need further study. In this Phd work, the focus is on environmental noise exposure, known to disturb animal acoustics, impacting essential functions such as mate finding, prey-predator interactions and communication.

Goal

Although environmental noise exposure **mapping** has become mature since the issuing of the European Environmental Noise directive, current models and knowledge are strongly human oriented, and cannot be easily transferred to terrestrial ecosystems. In this work, a main goal is assessing the **exposure due to anthropogenic noise on wildlife**. Despite that the physics of sound propagation (including ground surface interactions, terrain undulations, propagation through vegetation and meteorological influences) are reasonably well understood and prediction models exist, there are two main issues. First, detailed models need detailed **input data**. Secondly, the **computational burden** is high. Both will hinder the production of anthropogenic noise maps at the European scale.

Methodology

In order to enable such predictions, not only environmental input data (such as ground surface type and terrain height) but also noise sources should become available in a semi-automated way. Given the easy access to e.g. orthophotos and other data resources such as Open Street Map, essential information could be retrieved. To avoid time consuming propagation simulations, **surrogate models** will be used. Recent advances in **machine learning** and in particular **deep learning**, have allowed us to construct such efficient models for human exposure and will be constructed also in this project for wildlife exposure. For the latter, physically based models form a starting point for their training. Further note that the frequency ranges of interest and temporal patterns might strongly differ from human noise exposure. Different activity patterns in animals might lead to different diurnal modelling demands. Avifauna is a specific interest, needing sound propagation simulations not only at ground level. Simplifications in the overall modelling process might be needed to achieve the final product, namely a **European atlas of bio-noise disturbance**.

Candidate

We are looking for a Phd candidate with a keen interest in the overarching themes of **biodiversity** and **animal acoustics**, a general interest and preferably some experience in **machine learning**, and the willingness to engage in the world of numerical **simulations** of sound propagation. The ideal candidate has a Master in (bio-)engineering with good programming skills (e.g. in Python). Experience with geographical information systems (GIS) and the processing of other relevant open data sources is an asset.

Interested candidates should send their curriculum vitae and motivation letter to Prof. Dr. ir. Timothy Van Renterghem (Department of Information Technology, WAVES research group, via timothy.vanrenterghem@ugent.be), at latest on October 15th 2023. Earlier applications are encouraged. The project will start in January 2024.

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