

## **Phd Fellow in Deep Learning and Drone-based Lidar Systems for Assessing Carbon Stocks in Cropland and Forest Areas (MapCland).**

The Department of Geosciences and Natural Resource Management in Faculty of Science at the University of Copenhagen is inviting applications for a PhD position in monitoring the terrestrial carbon storage in natural and conventionally managed ecosystems using the capabilities of Lidar (Light Detection and Ranging) and deep learning technologies.

In line with the efforts of United Nations' Sustainable Goals to conserve, restore and manage forests, water-related ecosystems and their services, accurate quantification of carbon (C) sequestration is indispensable to formulate mitigation strategies against climate change. Recent developments in drone-Lidar systems and the forthcoming satellite laser observations from NASA's and ESA's missions pave the way for introducing a new scientific area that lies at the intersection of geoscience and computer science to constrain the uncertainty inherent to quantify and project ecosystems' C stocks. Compared to passive optical remote sensing, Lidar technology has the potential to radically improve the quantification of C storage of vegetation and forests by providing fine-grained 3-D information of ecosystem structures. In parallel, there is a necessity for research of automatic methods in extracting accurate terrain or semantic information from Lidar-derived point cloud data.

### **Project Description**

Despite the strong power of deep learning techniques on extracting patterns from large datasets, and the concurrent realization of the high uncertainty in C stock estimations there is a lack of well-established methods in acquiring and processing Lidar point cloud data of high density with deep learning for accurately monitoring ecosystems' carbon dynamics. The MapCland project targets exactly this line of research and applies an interdisciplinary approach building upon the combined competences of team partners from the Department of Geosciences and Natural Resource Management (IGN) and the Department of Computer Science (DIKU) at the University of Copenhagen. The aim is to initiate new groundbreaking research by applying and extending deep learning methods to explore relevant information from large datasets from Lidar.

The objectives of the PhD project will require the elaboration of aerial campaigns to collect point cloud datasets and ground truth data in agricultural and forest experimental sites in Denmark, which will necessitate the application and development of deep learning architectures that are capable of detecting individual plants and trees and associated geometrical properties. If successful, we can provide very accurate information of the spatial distribution of biomass and its non-linear relationship with vegetation dynamics and environmental variables to foster the sustainable resource management and functions of croplands and forest ecosystems.

## **Qualifications**

The candidates should hold a Master of Science degree in geo- , environmental science or computer science (or similar) with a dedicated interest in field based research and machine learning applications in environmental science. The applicants should have good communication skills in both spoken and written English and experience in analyzing ecosystem's variables or knowledge of scientific programming (Matlab, Python or similar). Experience with machine learning or point cloud data processing is advantageous, but not a requirement.

## **Description of the scientific environment**

The Ph.D. fellow will be hosted by the Geography section in the Dept. of Geosciences and Natural Resource Management and collaborating with the machine learning section in Dept. of computer Science of the University of Copenhagen. The section of geography has currently about 40 PhD and postdocs.

## **Deadline for applications is 13th of February 2020.**

The University wishes our staff to reflect the diversity of society and thus welcomes applications from all qualified candidates regardless of personal background.

Inquiries about the position or formalities regarding the application can be made to Postdoc Katerina Trepekli ([atr@ign.ku.dk](mailto:atr@ign.ku.dk) ; phone: +45 81 93 01 72) or Assoc.Prof. Thomas Friborg ([tfj@ign.ku.dk](mailto:tfj@ign.ku.dk))