Research Internship at LSCE - Spring 2024

Measuring canopy height and assessing Ciaran storm damage on forest using satellite imagery and LiDAR from various sources

Context:

The development of satellite imagery and LiDAR, combined with the high performance of deep learning computer vision models, are improving the way forests are being monitored. It is now possible to produce canopy height maps with both granularity (10m resolution) and global scale. In a recent <u>publication</u>, Schwartz & al. produced canopy height <u>maps</u>, using a deep learning model trained on S2/S1 satellite imagery (input) and GEDI height measurements (labels).

Goal:

IGN has started releasing very precise "<u>LiDAR HD</u>" measurements on France, that could improve the precision of canopy height models. The goal of the internship will be to use a combination of LiDAR HD, <u>GEDI</u>, optical and radar images (<u>Sentinel 1&2</u>) to train a new canopy height model. This model will be used to assess damages of the recent storm Ciaran, among other applications.

The intern will work closely with members of the research group and IGN, and will be able to use existing tools and infrastructure.

Working environment:

A group of fifteen researchers (ENS, LSCE, IGN), collaborations with institutions such as ONF, German and Danish research groups.

Roadmap:

- Review of literature
- Data preparation
- Model training
- Production of maps
- Assessment of disturbance impact (Ciaran storm)
- Writing a report/paper.

Profile:

- You are currently doing a masters in AI/Machine learning/Datascience/Computer vision, and looking for a research internship in an academic lab.
- You enjoy coding, especially in python, and already have a bit of experience from previous internships and/or university projects.
- You know how to train and test a deep learning model for computer vision tasks.
- You like problem solving, you are autonomous, but want to work in a collaborative environment.
- Working with big data is not a problem for you.
- You are curious, enjoy learning, and want to develop skills in remote sensing.
- You are motivated to work on a problem that can have an impact on forests.

Location: LSCE lab (Saclay).

Start: Spring 2024

Duration: 4-6 months

Supervision: Fajwel Fogel, post-doc researcher Team of Philippe Ciais.

Contact: fajwel.fogel@ens.fr

References:

Schwartz, Martin, et al. "FORMS: Forest Multiple Source height, wood volume, and biomass maps in France at 10 to 30 m resolution based on Sentinel-1, Sentinel-2, and Global Ecosystem Dynamics Investigation (GEDI) data with a deep learning approach." *Earth System Science Data* 15.11 (2023): 4927-4945.

GEDI: https://gedi.umd.edu/

S1/S2 satellite imagery: <u>https://sentinels.copernicus.eu/web/sentinel/home</u> LiDAR HD: <u>https://geoservices.ign.fr/lidarhd</u>

Example of height maps before/after fires at Teste-de-Buch

