## URBAN TREES:





## **THE IMPACT OF MONITORING GREENNESS IN URBAN AREAS USING CITIZEN SCIENCE** J. Ravaglia<sup>1</sup>, F. Hétroy-Wheeler<sup>1</sup>, P.A. Herrault<sup>2</sup>, A. Puissant<sup>2</sup>, P. Wheeler<sup>3</sup> 1. Laboratoire ICube, UMR 7357, INS2I 2. Laboratoire LIVE, UMR 7362, INEE 3. The Open University, UK

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### **Overall objectives**

Better understand the **ecosystem services** provided by **urban trees**:

- Map urban trees in the Strasbourg urban area;
- Measure them in order to adapt forest allometric models to urban environments;
- Make **citizens aware** of their environment and involve them in a large-

### Methodology

**STAGE 1** Develop a mobile app allowing citizens to collect data.

**STAGE 2** Develop a **data processing pipeline** to derive tree key measurements.

**STAGE 3** Build **allometric models** adapted to urban environments and

#### scale scientific project.

## Results (2022)

#### 1. Mobile app (Android):

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Welcome to the forest!				ta.			RECORD VIDEO	снооз	E VIDEO		
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							Location: 45.580451, 7.740444				
				Record your video in vertical mode.							
SUBMIT A SCAN											
(	SEE YOUR CONTRIBUTIONS	ABOUT THIS APP						Your height	: 1.78m 🎤		

use to validate large-scale models (satellite imaging).

## Perspectives (2023)

#### 1. Mobile app:

- Improve design and UI (GPS coordinates, satisfaction form)
- Add user feedback (point cloud, badges, species)
- Release (Google Store)
- Advertise (Strasbourg Eurometropolis, Zone Atelier Environnementale Urbaine)
- 2. Data processing pipeline:
  - Select and collect ground truth measurements
    - Strasbourg tree databases
    - Manual tools (rangefinder, compass, ribbon)
  - Collect data with the app
    - Parameters: smartphone, environmental context, soil, species



Acquisition **protocol**: one **video**, vertical scanlines

2. Data processing pipeline:



Conversion to a **3D point cloud** + scaling + geometric model fitting **Measurements**: height, DBH, crown volume

Collaboration:

• Acquisition protocol design: ICube + OU

- (leaf size), growth form, natural or managed growth
- Provide data in open access
- Add other measurements (LAI)
- 3. Allometric models:
  - Conduct a **statistical analysis** of parameter effects
  - Calibrate a **first allometric model** for one selected species
    - Trees of various sizes
    - Pruned
  - Compare to forest models and models based on satellite imaging

Master project planned (LIVE)

#### Contact

https://urtrees.icube.unistra.fr/

PI: Franck Hétroy-Wheeler, ICube

- App and pipeline development: ICube
- Tests (alpha users): ICube + LIVE + OU
- Communication (workshop): ICube + LIVE + OU

#### Key points:

- Robustness w.r.t. user (smartphone, protocol understanding), tree (species, shape), environment, etc.
- Accuracy:  $\sim 12\%$  error so far
- Durability: database storage, server
- Communication, user engagement

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