Joint PhD position
Data-Driven Methods for Modeling the 3D Structure of Plants

PhD Project short description

The aim of this PhD thesis is to develop data-driven techniques for modelling the 3D structure of plants and analyze how plant structure is affected by various intrinsic and extrinsic factors such as soil conditions and environmental factors. This is an important problem that has a wide range of applications in plant biology and agriculture. One of the main scientific challenges is to develop efficient algorithms for the extraction of features and patterns from 3D point clouds representing plant shape. Another challenge is to develop models that can simulate the growth and development of plant structures over time, taking into account various environmental factors. Another scientific question addressed in this project is how to analyze the complex relationships between plant structure and function at different scales. This involves the development of methods to measure and quantify plant traits such as biomass, leaf area, and stomatal density, and to relate these traits to plant function and performance. Overall, the project aims to advance our understanding of the structure-function relationships in plants and to provide new tools for plant breeders, ecologists, and agronomists to improve crop productivity and resilience in the face of environmental challenges.

Keywords: *Deep Learning, 3D computer vision, shape analysis, geometric modelling.*

Working Environment

The thesis will carry out under joint co-supervision between INRAE in France (Professor Maguelonne Teisseire from TETIS lab, INRAE and Marc Jaeger AMAP lab, CIRAD), and Murdoch University (Professor Hamid Laga from the School of Information Technology, Murdoch University). The PhD thesis will be hosted for 18 months in the TETIS lab (Montpellier, France) and 18 months in Murdoch University (Perth, Australia). The PhD will be funded for 3 years (~19300€ net per year for 18 months in France and approximately AU$33000 net per year for the 18 months spent in Australia). During the thesis, there will be opportunities to undertake some teaching duties, with extra payment on top of the PhD scholarship, but this will be subject to satisfactory progress. The student will also benefit from mentoring from experienced research leaders in the field and will have the opportunity to interact with various experts.

Team supervision

- Professor Hamid Laga, Murdoch University, Australia
- Professor Maguelonne Teisseire, INRAE, France
- Marc Jaeger, CIRAD, France

Candidate profile

Qualification: The successful candidate is expected to have a MSc degree (or equivalent), with a significant research component, completed by September 2023, with background in either image processing, computer vision, computer graphics, machine learning applied for vision, or 3D geometry processing. Students with background in mathematics, especially 3D geometry, are highly encouraged to apply.

Experience: The ideal candidate should have some knowledge and experience in at least one of the fields listed above. The successful candidate should have strong programming skills.

As for generic competences, we seek a qualified self-motivated professional, open to multidisciplinary, with capacity to undertake independent research, ability to work in a teamwork, and self-motivated.

The candidate should also be willing to spend 18 months in Australia and 18 months in France.

Language Skills: Fluent written and verbal communication skills in English are required.

How to apply

Please send by July 17 2023:

- CV which should include the list of publications as well as the name of one referee who could comment on your ability to undertake research
- A copy of the undergraduate and postgraduate (master or honours) grades,
- A motivation letter

These should be sent by email to Maguelonne Teisseire: maguelonne.teisseire@inrae.fr