Master's Internship position

Modelisation-optimisation for a fleet of autonomous agricultural robots

5 months - starting from March 1st, 2026

Context

Facing lower numbers of agricultural workers and the needs for an agroecological transition requiring specialized approaches and multicropping, the use of robots on farms open promising perspectives.

However, agricultural robots are costly to acquire and maintain. A solution is to share their use between several farms. This leads to the problem of planning for the fleet of autonomous robots. The proposed model is the following: several sites will be deserved by the robotic fleet. Each site has specific needs that we can anticipate, and other that can happen in an unforeseen manner. The central planner will have to deploy the robots on sites in an optimal way (under different criteria), while taking unplanned events (new needs, breakdowns, delays, etc) into account. Managing each robot within each site will be left to a local supervisor, but the local progress of each task will be followed at the central level to adjust solutions.

Optimisation problems in planning are generally hard to solve in an optimal manner. Some solvers exist, but tend to be costly and inefficient in contexts where real-time decision-making is essential. Fast optimal algorithms or, if those prove to be impossible to obtain in our setting, heuristic approaches, will be the favoured approaches. One such model which will be studied is the optimisation-simulation coupling.

Follow-up

The internship aims to allow the recruited intern to start working on the topic of an MSCA (Marie Skłodowska-Curie Action) PhD thesis, in order to apply to it. The PhD is funded in the project Green-Field Data, and will take place one year and a half at the University of Aarhus (Denmark) followed by one year and a half at INRAE Clermont-Ferrand (France). The supervisor will be Claus Sørensen (Univ. Aarhus), and the student will work several months at companies (Conpleks Inc, SabiAgri) during their PhD. The full description and conditions can be provided.

It is important to be aware that **getting the internship does not necessarily implies getting the PhD**, since the recruitment for the PhD will be done through an open process. However, the internship will allow the student to apprehend the topic, complete some work, and thus to strengthen their application.

Expected results

The scientific and technical results of the internship involve starting to apprehend the scientific literature and accomplish some initial work. The expected tasks are the following ones:

- A literature review on route planning, coverage path planning, and scheduling with dynamic constraints. It is not expected to be a full review, but should be enough to grasp the topic.

- Conception of a formal model describing the environment and the robotic fleet.

- Definition of the static constraints and of the objectives to optimize (makespan, fairness of use, costs, yield...). The multi-objective aspect will be taken into account, but not the dynamic constraints (breakdowns, delays...) yet.

- First resolution methods (heuristics or efficient exact ones): conception, implementation, analysis, experimentation, evaluation.

Environment

The internship will take place at the research unit TSCF of INRAE, which is specialized in agricultural robotics and data science. Located on the Cézeaux campus at Clermont-Ferrand (France), the unit employs around sixty researchers, engineers and students in computer science, robotics and electronics for agricultural and environmental applications. Part of the unit is located on the experimental site of Montoldre.

The recruited intern will have a working station on a shared office. Participating to the events of the unit (meetings, seminars) will be encouraged.

Profile

Masters' student in computer science and applied mathematics. A good level in operations research, optimisation and algorithms is required. The candidates will be rated on their academic achievements and their motivation to pursue with a PhD.

An excellent level in English is required, and a good of French will be a plus. Good communication skills are expected.

It is important to note that, due to the MSCA mobility rule, the candidates to the PhD cannot have spent more than 12 months in France out of the last 36 before their hiring.

Internship location

INRAE - UR TSCF
9 avenue Blaise Pascal - CS20085
63178 Aubière - France

Conditions

- The intern will be paid a *gratification*, fixed at 15% of the hourly rate of the Social Security ceiling, which amounts to 4.50€ in 2026.

- Working on-site only.

- 2.5 days of vacation for each full month.

- Subject to approval of a security officer.

How to apply

Send your CV and cover letter (both in English) by e-mail.

Contact

Antoine Dailly - antoine.dailly@inrae.fr