



POSTDOC IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Dealing with Uncertainty in Crop Planning Optimization

A 2-year Postdoc position is available at Toulouse's ANITI Institute, starting ideally in Oct 2026 and no later than Dec 2026. The position is funded by the ANITI Chair HEROIC: « Hybridizing learning, search and combinatorial optimisation for industrial decision-making ». The Artificial and Natural Intelligence Toulouse Institute (ANITI) is one of the 9 AI clusters created as part of the French National AI Plan. ANITI brings together 300 researchers from 31 institutions around 19 research chairs. The HEROIC Chair aims to develop novel, scalable, robust, and transparent algorithmic solutions for planning and scheduling, capable of addressing challenging problems in the fields of manufacturing, health, mission planning, and space observation. This position will focus on a new application domain in agronomy, dealing with uncertainty in crop planning optimization.

- The crop planning problem consists of the spatial and temporal allocation of crops over a finite time horizon. Each year, the farmer's decisions can be revised depending on past events. Nevertheless taking into account the full proactive/reactive decision process can be too complex. We want to find a good compromise between decision quality and efficiency. For instance, a two-stage (bi-level) optimization approach will be developed at the beginning. Depending on the complexity of the adversarial problem, different algorithms will be proposed.
- Data acquisition for learning common farm constraints and preferences.
The postdoc will collect data from:
 - Satellite images: information on crop acreage (spatial repartition of crops) and crop rotations (temporal sequence of crops) will be collected and incorporated in the model.
 - State/area regulation documents, identifying water regulation policy and collecting historical data.
 - Long-term climate forecasting models to predict the impact on crop yields and associated revenues.
- Possibility theory, belief functions, and probabilities: different frameworks to model uncertainty on crop yields and resource constraints will be considered. Depending on

available data and user knowledge, a specific framework or a combination of them will be tested and evaluated, starting from the simplest framework to more complex ones.

Depending on the methodological progress made during the first year, a proof of concept will be implemented and validated in the second year.

Applications open until: 15/09/2026

Location: INRAE, Castanet Tolosan (near Toulouse), France

Contract duration: 2 years (postdoc)

Position is expected to begin: ideally in October 2026 and no later than December 2026

Supervisors: Simon de Givry, Gauthier Quesnel (INRAE) and Romain Guillaume (Université de Toulouse-IRIT)

Selection criteria

- A PhD in a relevant discipline
- Experience in constraints programming, mixed integer programming, knowledge representation, machine learning
- Excellent publication track record
- Excellent programming skills in a variety of languages
- Excellent formalisation skills
- Excellent spoken and written English

Applications should be emailed to simon.de-givry@inrae.fr gauthier.quesnel@inrae.fr and Romain.Guillaume@irit.fr, and include detailed cv, motivation letter, links to publications, and referees details.

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