JOB OFFER

Post-doctoral researcher in computer science / deep learning / remote sensing applied to mixed crop phenotyping

The French National Research Institute for Agriculture, Food, and the Environment (INRAE) is a public research establishment. It is a community of 12,000 people with more than 200 research units and 42 experimental units located throughout France. The institute is among the world leaders in agricultural and food sciences, in plant and animal sciences, and is 11th in the world in ecology and environment. INRAE's main goal is to be a key player in the transitions necessary to address major global challenges. In the face of the increase in population, climate change, scarcity of resources and decline in biodiversity, the institute develops solutions for multiperformance agriculture, high quality food and sustainable management of resources and ecosystems.

MISSION AND ACTIVITIES

■ The agroecological transition requires the development and the assessment of new multiperformant, resilient and sustainable agroecosystems. For this purpose, high-throughput observation tools based on close range imagery and LiDAR appear as essential for rapidly characterizing the state and the dynamics of such cropping systems, which are often mixed crops. In this context, the Deep4Mix project aims to evaluate the potential of deep learning algorithms and various sensors (RGB cameras and LiDAR) for field monitoring of the dynamics of the proportion and structure of species in a crop mixture.

You will be working at the joint research units CAPTE (CAPTeurs et TElédetection) and EMMAH (Environnement Méditerranéen et Modélisation des AgroHydrosystèmes) in the INRAE center of Avignon. CAPTE develops observation systems (vectors and sensors) and data processing methods for high-throughput crop phenotyping. You will be working closely with CAPTE researchers and engineers, as well as with other partners of the Deep4Mix project : the research units LIRMM (Laboratoire d'Informatique, de Robotique et de Microélectronique de Montpellier) and AMAP (botAnique et Modélisation de l'Architecture des Plantes et des végétations), specialized in deep learning and funders of the API Pl@ntNet, and the research unit AGIR (Agoécologie – Innovations - Territoires), specialized in agroecology.

Your mission will be to develop deep learning / machine learning methods that will make it possible, first, to identify the different plant species in the RGB images, and, second, to characterize their structures.

■ More specifically, you will have to :

- Build a dataset of annotated RGB images to train deep learning algorithms. You will gather datasets already annotated by the different partners in previous studies, and datasets published in the literature. You will also be in charge of the annotation of additional images, together with INRAE technicians.
- Develop deep learning models to identify plant species in the images. You will compare various segmentation model architectures (semantic segmentation and instance segmentation), as well as various training strategies and data augmentation methods. The contribution of plant height information derived from LiDAR will also be investigated.
- Develop deep learning or machine learning based algorithms to estimate the proportion and the leaf area of every species, based on the segmentation results obtained at the previous step and the LiDAR data. The estimation results will be assessed using the available destructive measurements.

■ Special conditions of activity: short trips to Montpellier and/or Toulouse will be possible to interact with the other partners of the Deep4Mix project.

TRAINING AND SKILLS

- Since this postdoc is funded by the #DigitAg program (www.hdigitag.fr), the candidate (1) must not have conducted her/his PhD within the EMMAH research unit, and (2) may have conducted her/his PhD in another research unit that is member of the #DigitAg program, provided that the PhD was not funded by #DigitAg.
- Background: PhD in computer science, with knowledge in signal and image processing, deep learning, machine learning and/or remote sensing.
- Skills : good knowledge in scientific programming (Python, Matlab, C++), image analysis using deep learning and statistical analysis. Knowledge in LiDAR data processing is a plus. Interested in plant observation and life sciences. Dynamic and collaborative team player, autonomous, proactive and rigorous. Good English oral and written communication.

INRAE LIFE QUALITY

By joining our teams, you benefit from (depending on the type of contract and its duration):

- up to 30 days of annual leave + 15 days "Reduction of Working Time" (for a full time);
- skills development systems: training, career advise;
- social support: advice and listening, social assistance and loans;
- holiday and leisure services: holiday vouchers, accommodation at preferential rates;
- parenting support: CESU childcare, leisure services;
- sports and cultural activities;
- collective catering.

↘ Reception arrangements

- Unit: UMR EMMAH 1114
- City : Avignon, France
- Type of contract : temporary position
- Duration of the contract : 18 months
- Starting date : ASAP
- Salary : INRAE salary grid, depending on experience

↘ How to apply

Please, send a cover letter (outlining motivation, experience and qualifications) and a resume to : Marie Weiss and Sylvain Jay

- E-mail : marie.weiss@inrae.fr
  sylvain.jay@inrae.fr
- Par courrier : x