



Offer #2024-08442

Internship Research Activity (Master/Engineering Level) - Agricultural field boundary extraction from satellite image time series data via geometric aware deep learning approaches

Contract type : Internship agreement

Level of qualifications required : Master's or equivalent

Fonction : Internship Research

About the research centre or Inria department

The Inria center at Université Côte d'Azur includes 42 research teams and 9 support services. The center's staff (about 500 people) is made up of scientists of different nationalities, engineers, technicians and administrative staff. The teams are mainly located on the university campuses of Sophia Antipolis and Nice as well as Montpellier, in close collaboration with research and higher education laboratories and establishments (Université Côte d'Azur, CNRS, INRAE, INSERM ...), but also with the regional economic players.

With a presence in the fields of computational neuroscience and biology, data science and modeling, software engineering and certification, as well as collaborative robotics, the Inria Centre at Université Côte d'Azur is a major player in terms of scientific excellence through its results and collaborations at both European and international levels.

Context

The internship position is opened in the context of the EVERGREEN team project - <https://team.inria.fr/evergreen/>.

Our team is actively working on the design and implementation of cutting-edge machine learning techniques to effectively exploit heterogeneous and multi-temporal Earth observation data for agricultural and environmental applications.

The team, located in a multidisciplinary laboratory, has an active and stimulating environment with master, PhD and Post-doc students coming from different countries.

Assignment

Assignments :

With the help of the members of the EVERGREEN team (Raffaele Gaetano and Dino Ienco), the recruited person will explore, design and implement deep learning approaches, based on recent transformer neural network architecture, to automatically detect agricultural field boundary from satellite image time series data acquired via the Sentinel-2 mission.

For a better knowledge of the proposed research subject :

The research activity carried out by the intern will be based on the recent TSViT model [1] and the aim will be to adapt and extend such a model to extract agricultural field boundaries [2] by injecting a priori geometric information related to curvilinear structures [3] into the model learning process.

[1] Tarasiou, Michail, Erik Chavez, and Stefanos Zafeiriou. "Vits for sits: Vision transformers for satellite image time series." *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2023.

[2] Kerner, Hannah, et al. "Fields of The World: A Machine Learning Benchmark Dataset For Global Agricultural Field Boundary Segmentation." *arXiv preprint arXiv:2409.16252* (2024).

[3] Cheng, Mingfei, et al. "Joint topology-preserving and feature-refinement network for curvilinear structure segmentation." *Proceedings of the IEEE/CVF International Conference on Computer Vision* 2021.

Collaboration :

The recruited person will be in tight connection with an industrial PhD student (Quentin Yeche - ATOS/INRAE) working on the same topic.

Main activities

Main activities (5 maximum) :

The people recruited will be responsible for:

- Explore the scientific literature related to the research topic
- Design a solution to integrate geometric a priori information into the transformer model.
- Implement the proposed solution using the Pytorch library
- Carry out experiments and evaluation using state of the art approaches for agricultural field boundary detection on real world data.
- Report and summarise the results obtained.

Additional activities (3 maximum) :

- If the results allow, prepare a scientific paper for submission to an international journal or conference.

Skills

Technical skills and level required :

- Advanced Python programming skills
- Proficiency in data manipulation libraries
- Expertise in deep learning frameworks - Pytorch or Tensorflow
- Experience with image segmentation, object detection, and classification techniques
- Experience with satellite data analysis is a plus

Languages :

- English - good proficiency
- French - is a plus but not necessary

Relational skills :

- Communication skills (Ability to explain complex technical concepts, Presentation skills for research findings and project outcomes, Collaborative communication in interdisciplinary teams)
- Problem solving (Analytical thinking and creative problem-solving, Ability to break down complex problems into manageable components, Critical evaluation of research methodologies)
- Project Management (Self-motivated and goal-oriented, Ability to work independently and as part of a team, Adaptability to changing project requirements)
- Research & Learning (Ability to read and comprehend scientific research papers, Continuous learning mindset)
- Interpersonal Skills (Teamwork and collaboration, Active listening, Cultural sensitivity in international research environments)

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Contribution to mutual insurance (subject to conditions)

Remuneration

Traineeship grant depending on attendance hours.

General Information

- **Theme/Domain** : Earth, Environmental and Energy Sciences
Scientific computing (BAP E)
- **Town/city** : Montpellier

- Inria Center : [Centre Inria d'Université Côte d'Azur](#)
- Starting date : 2025-04-01
- Duration of contract : 6 months
- Deadline to apply : 2025-03-30

Contacts

- Inria Team : [EVERGREEN](#)
- Recruiter :
Ienco Dino / dino.ienco@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

Technical skills and level required :

- Advanced Python programming skills
- Proficiency in data manipulation libraries
- Expertise in deep learning frameworks - Pytorch or Tensorflow
- Experience with image segmentation, object detection, and classification techniques
- Experience with satellite data analysis is a plus

Languages :

- English - good proficiency
- French - is a plus but not necessary

Relational skills :

- Communication skills (Ability to explain complex technical concepts, Presentation skills for research findings and project outcomes, Collaborative communication in interdisciplinary teams)
- Problem solving (Analytical thinking and creative problem-solving, Ability to break down complex problems into manageable components, Critical evaluation of research methodologies)
- Project Management (Self-motivated and goal-oriented, Ability to work independently and as part of a team, Adaptability to changing project requirements)
- Research & Learning (Ability to read and comprehend scientific research papers, Continuous learning mindset)
- Interpersonal Skills (Teamwork and collaboration, Active listening, Cultural sensitivity in international research environments)

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Applications must be submitted online on the Inria website. Collecting applications by other channels is not guaranteed.

Defence Security :

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :

As part of its diversity policy, all Inria positions are accessible to people with disabilities.