Offer #2025-08781

R&D Engineer - Improving Long-Term Multi-Object Tracking for Sports Analysis

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : Temporary scientific engineer

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 di?erent 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

Inria, the French National Institute for Computer Science and Applied Mathematics, promotes "scientific excellence for technology transfer and society". Graduates from the world's top universities, Inria's 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria can explore original approaches with its

partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of digital transformation. Inria is the source of many innovations that add value and create jobs.

Team

The STARS research team combines advanced theory with cutting-edge practice focusing on cognitive vision systems.

Team web site : https://team.inria.fr/stars/

The contract is part of a collaboration with FAIR VISION, located in Nice.

FAIR VISION collaborates with INRIA since 2020. The startup designs, develops and integrates software solutions and autonomous video capture and management equipment for the world of sport.

Company web site : https://www.fairvision.fr/

Project web site : https://argos.cam/

Scientific context

This project aims to develop advanced methods for long-term multi-object tracking (MOT), an essential task for sports analysis and video surveillance. Multi-object tracking involves locating targets while maintaining unique identities, enabling precise analysis of the movements and interactions of players or other subjects of interest in high-density environments.

The approach developed focuses on improving target association accuracy, by integrating a cost matrix into Hungarian-style association procedures. This matrix will take into account various attributes inherent to the targets, such as jersey color or player numbers, in order to optimize target matching on each image. In addition, the project focuses on reducing processing time, while adapting to the complexity introduced by a high density of people in the video sequences.

Detection-based tracking, currently divided into two independent stages (detection and association), will be enhanced by the following proposals:

  Local association: In this first stage, we will establish local associations between the current image and the objects in memory, to enhance tracking continuity.
  Long-term association: In the second stage, we'll apply a Hungarian approach to linking tracklets over an extended period. This method will reduce the calculation of re-identification functionalities and decrease the total number of tracklets created, thus ensuring better identification management.

Validation data: This project will be based on a large-scale multi-object tracking dataset, named SportsMOT, consisting of 240 video clips classified into three categories (basketball, soccer, volleyball). The characteristics of this dataset are

ideally suited to the needs of the project:

  Large scale
  Detailed annotations
  Consistent player identification
  No shot changes
  High, fixed resolution (1080P)
  Varied and complex movement patterns
  Re-identification challenges

Assignment

Expected result: At the end of the project, the aim is to reduce the number of "unaffected tracklets" during the 90-minute match. A key performance indicator (KPI) will be established to measure the number of tracklets generated at the end of the match, taking into account substitutes entering the field. This result will guarantee reliable and continuous player identification, which is essential for accurate sports analysis.

Main activities

The Inria STARS team is seeking an engineer with a strong background in computer vision, deep learning, and machine learning.

Skills

Candidates must hold a Master's or Engineering degree or equivalent in Computer Science or a closely related discipline by the start date.

The candidate must be grounded in computer vision basics and have solid mathematical and programming skills.

With theoretical knowledge in Computer Vision, OpenCV, Mathematics, Deep Learning (PyTorch, TensorFlow), and technical background in C++ and Python programming, and Linux.

The candidate must be committed to scientific research and substantial publications.

In order to protect its scientific and technological assets, Inria is a restricted-access establishment. Consequently, it follows special regulations for welcoming any person who wishes to work with the institute. The final acceptance of each candidate thus depends on applying this security and defense procedure.

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 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

From 2692 € gross monthly (according to degree and experience)

General Information

- **Theme/Domain :** Vision, perception and multimedia interpretation
- **Town/city :** Sophia Antipolis
- **Inria Center :** Centre Inria d'Université Côte d'Azur
- **Starting date :** 2025-07-01
- **Duration of contract :** 12 months
- **Deadline to apply :** 2025-05-01

Contacts

- **Inria Team :** STARS
- **Recruiter :**
  Brémond François / Francois.Bremond@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

- Essential qualities in order to fulfil this assignment are feeling at ease in an environment of scientific dynamics and wanting to learn and listen.
- Passionate about innovation, Computer Vision, and Machine Learning.

Languages: English

- Relational skills: teamwork
- Other values appreciated: leadership

> **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.