Offer #2026-10562

Research Engineer F/M — Crowd data acquisition, processing and modelling

Contract type : Fixed-term contract

Renewable contract : Yes

Level of qualifications required : Graduate degree or equivalent

Fonction : Temporary scientific engineer

Level of experience : Recently graduated

About the research centre or Inria department

The Inria Centre at Rennes University is one of Inria's nine centres and has more than thirty research teams. The Inria Centre is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Context

The VirtUs team at the Inria Centre at Rennes University is internationally recognized for its work in crowd simulation and the study of collective human behaviour.

This position is part of the **FOUL-X project (Programme Inria Quadrant)**, which aims to develop a new generation of crowd simulators capable of capturing and reproducing the diversity of crowd dynamics observed in real-world public spaces.

The project combines two closely connected research directions. The first focuses on the acquisition and processing of real-world crowd data, from field video capture to individual trajectory extraction and the construction of a large-scale open dataset. The second focuses on learning crowd dynamics directly from these observations in order to develop adaptive, data-driven crowd simulation models.

Two postdoctoral researchers will lead these complementary scientific activities. The recruited research engineer will **work in close support of this postdoctoral team**, contributing to the technical implementation, operation and integration of the complete experimental and computational pipeline.

The position therefore offers a unique opportunity to work at the interface between **real-world experimentation, computer vision and data processing, scientific software development, data analysis and machine learning**.

Assignment

With the support of the VirtUs team and under the supervision of Julien Pettré, the recruited person will provide technical and experimental support to the two postdoctoral researchers involved in the FOUL-X project.

The main objective is to ensure that the different components of the project — field data acquisition, video processing, trajectory extraction, dataset construction, quantitative analysis and data-driven modelling — can be efficiently deployed, connected and maintained throughout the project.

The engineer will not be responsible for defining the scientific directions of the two postdoctoral projects, but will play a central role in **turning research ideas into robust operational pipelines**, supporting experiments, implementing tools, processing data, and facilitating interactions between the data acquisition and modelling activities.

Collaboration: The recruited person will work on a daily basis with:

- the postdoctoral researcher responsible for real-world crowd data acquisition, dataset construction and crowd dynamics characterisation;
- the postdoctoral researcher responsible for machine-learning-based crowd modelling;
- a PhD student developing video-based pedestrian tracking methods;
- other researchers, engineers and students of the VirtUs team involved in crowd simulation and analysis.

This position is therefore particularly suited to someone who enjoys working collaboratively and contributing to several interconnected research activities rather than focusing on a single isolated technical task.

Responsibilities: The recruited person will contribute to the implementation, testing and maintenance of the technical infrastructure required by the project. Depending on project needs and on the candidate's expertise, this will include field acquisition systems, video and trajectory processing pipelines, dataset management and visualisation tools, simulation software, and machine-learning pipelines.

The recruited person will also contribute to ensuring the reproducibility, robustness and documentation of the software and datasets developed within the project.

Main activities

Activity 1 — Support for field data acquisition

- Contribute to the preparation and deployment of video acquisition systems for crowd observation campaigns.
- Prepare, test and maintain cameras, computing equipment and associated acquisition tools.
- Participate in field acquisition campaigns at several sites in France.
- Develop or adapt tools for camera calibration, acquisition monitoring and data transfer.
- Contribute to checking data quality during and immediately after acquisition campaigns.
- Assist with the technical implementation of data anonymisation and GDPR-related requirements.

Activity 2 — Video processing and trajectory extraction

- Support the deployment and operation of the video-based pedestrian tracking pipeline developed within the team.
- Develop scripts and tools for preprocessing large volumes of video data.
- Contribute to camera calibration, geometric reconstruction, tracking validation and correction of extracted trajectories.
- Automate data-processing workflows where possible.
- Analyse pipeline failures and contribute to improving robustness across acquisition conditions.
- Develop tools for visual inspection and quality control of trajectory data.

Activity 3 — Dataset construction and quantitative analysis

- Contribute to structuring, cleaning, validating and documenting the FOUL-X crowd trajectory dataset.
- Implement tools for dataset exploration and visualisation.
- Compute standard crowd descriptors such as density, velocity, flow, interpersonal distances and other collective quantities.
- Support the implementation of new metrics developed by the postdoctoral researchers to compare crowd dynamics across sites.
- Contribute to preparing datasets for public dissemination and long-term reuse.

Activity 4 — Support for data-driven modelling

- Prepare and transform trajectory and environmental data for machine-learning pipelines.
- Implement data loaders, preprocessing tools and evaluation scripts.
- Support the deployment and testing of machine-learning models developed by the modelling postdoc.
- Run training and evaluation experiments on local or remote computing resources.
- Develop interfaces between learned models and the crowd simulation software used by the team.
- Contribute to benchmarking, visualisation and quantitative comparison of simulation results.

Activity 5 — Software integration and reproducibility

- Maintain and document the software components developed throughout the project.
- Contribute to version control, testing and reproducible experiment workflows.

- Facilitate integration between tracking, dataset analysis, machine learning and crowd simulation software.
- Produce technical documentation enabling the tools to be reused by future team members and by the scientific community.
- Participate in the preparation of open-source software and open datasets resulting from the project.

Skills

Technical skills — required

- Strong programming skills, particularly in **Python**.
- Experience in scientific computing, data processing, computer vision, machine learning, simulation, or a closely related field.
- Ability to manipulate and process large datasets.
- Experience developing robust research or scientific software.
- Familiarity with standard collaborative software development tools such as Git.
- Ability to rapidly understand and integrate existing software components.

Technical skills — highly appreciated

Candidates are not expected to already master all of the following. Experience in several of these areas would be particularly valuable:

- Image and video processing.
- Object or pedestrian tracking.
- Camera calibration and multi-camera systems.

- Computer vision libraries such as OpenCV.
- Machine learning and deep learning frameworks such as PyTorch.
- Data analysis using NumPy, SciPy, Pandas or equivalent tools.
- C++ development.
- Simulation or computer graphics.
- Processing and analysis of human trajectories.
- GPU computing and management of machine-learning experiments.
- Scientific visualisation.
- Linux environments and scripting.
- Experience with field experimentation and acquisition hardware.
- Experience preparing research datasets for public release.

Languages

- English: sufficient level to work in an international research environment and read technical documentation.
- French: appreciated, particularly for field acquisition activities in France, but not mandatory.

Relational skills

- Strong ability to work in a collaborative research environment.
- Taste for teamwork and for supporting the work of other researchers.
- Ability to interact with researchers with different backgrounds, from experimentation and computer vision to machine learning and simulation.

- Autonomy in solving technical problems.
- Organisational skills and ability to manage several technical tasks in parallel.
- Adaptability and willingness to work on different parts of a research pipeline according to project needs.
- Curiosity and interest in understanding the scientific objectives behind technical developments.

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
- Social security coverage

Remuneration

Starting from €2,695 gross per month, based on your experience

General Information

- **Theme/Domain :** Interaction and visualization
  Software engineering (BAP E)
- **Town/city :** Rennes
- **Inria Center :** Centre Inria de l'Université de Rennes
- **Starting date :** 2027-01-01
- **Duration of contract :** 2 years
- **Deadline to apply :** 2026-12-31

Contacts

- **Inria Team :** VIRTUS
- **Recruiter :**
  Pettre Julien / julien.pettre@inria.fr

About Inria

Inria, the French national institute for research in digital science and technology, supports the French government in national research and innovation strategies in the digital field, acting as Digital Programs Agency. Inria leads over 300 research and innovation projects with its 3,500 scientists, engineers, and support staff, in partnership with universities and the digital ecosystem (businesses, entrepreneurs, and public stakeholders). Together, we explore strategic fields such as artificial intelligence, cybersecurity, quantum computing, cloud technologies, digital transformation in healthcare, digital twins, and digital technologies for defence. We develop practical solutions such as software, tech startups, partnerships with national companies, and cutting-edge training programmes. Our goal is to drive scientific, technological, and industrial excellence to ensure France's digital sovereignty.

The keys to success

The ideal candidate is a **versatile research engineer who enjoys making complex experimental and computational systems work in practice**.

Rather than being a specialist restricted to a single technology, we are looking for someone comfortable moving between different components of a research project: preparing an acquisition campaign one week, improving a video-processing pipeline the next, analysing trajectory data, and then helping connect these data to a machine-learning or simulation pipeline.

A strong background in computer science or engineering is expected, together with solid programming skills. Candidates may come from computer vision, machine learning, robotics, computer graphics, data science, scientific computing, or related domains.

It is **not necessary to already have expertise in crowd simulation**. More important is the ability to understand existing methods, implement and adapt technical solutions, analyse problems rigorously, and work closely with researchers.

The position requires a genuine taste for teamwork. The engineer will work in direct support of two postdoctoral researchers whose activities are strongly interconnected. A key part of the role will be to help make these interactions effective by ensuring that data, software and experimental tools can move smoothly from one stage of the project to another.

We particularly value candidates who are pragmatic, curious and autonomous, who enjoy solving unexpected technical problems, and who care about producing clean, documented and reusable research software.

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

Please submit online : your resume, cover letter and letters of recommendation eventually

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.