



Offer #2024-08185

Tools for collection, context inference, trajectory reconstruction and contact inference

Level of qualifications required : Graduate degree or equivalent

Other valued qualifications : Master or PhD

Fonction : Temporary scientific engineer

Level of experience : From 3 to 5 years

About the research centre or Inria department

The Inria Saclay-Île-de-France Research Centre was established in 2008. It has developed as part of the Saclay site in partnership with Paris-Saclay University and with the Institut Polytechnique de Paris since 2021.

The centre has 39 project teams, 27 of which operate jointly with Paris-Saclay University and the Institut Polytechnique de Paris. Its activities occupy over 600 scientists and research and innovation support staff, including 54 different nationalities.

Context

A research-engineer position is available in the Inria TRiBE team in the Saclay Center in collaboration with the FUN team of Inria Lille. This position is funded by the project Mob Sci-Data FAcotry of the National French PEPR project MOBIDEC.

The research-engineer fellow will collaborate with Dr. Nathalie Mitton (<http://researchers.lille.inria.fr/~mitton/>) from INRIA FUN team, Dr. Aline C. Viana (<https://pages.saclay.inria.fr/aline.viana/>) and Dr. Nadjib Achir (<https://nadach.github.io>) from INRIA TRiBE team.

If needed, travels to Lille are foreseen for this post.

Assignment

The research community faces a crucial lack of meaningful user mobility data today. Available data are generally very focused on a single kind of mobility (e.g., road traffic) or are sparse. Most of the existing datasets, such as Call Detail Records (CDR) logged by cellular operators [3, 4], Access Point measurements logged by the Internet provider [5], or check-ins collected by popular Location-Based Online Social Networks (LBOSN) [6] providing information of a large population, have limited accuracy in both spatial and temporal dimensions, which induces incomplete trajectories and consequently, missing interactions among end-users (i.e., wireless contacts among users). Besides their sparse spacial and coarse temporal features, such datasets either do not bring collection-related contextual information (e.g., LBOSN) or lack fine-grained information, allowing the comprehension of the involved environment conditions and contact inference.

The alternative is to extract data directly from smartphones, thanks to their high penetration among the population, or from wearable devices capturing sent-in-the-air public frames emitted by wireless devices. Although small-scale, such data captures fine-grained contextual information and environmental conditions, providing opportunities for users to contact inference.

This position aims to provide the community with tools to collect or generate new kinds of heterogeneous data and the means to publish and populate the datasets to be made available for the research community. The FUN and TRiBE teams have already designed and proposed different tools, such as network traffic dataset generators and tools to collect network traffic intrusively and privacy-compliantly. These tools are necessary for inferring user mobility.

The person to be recruited will make these existing tools more open and usable while enriching them.

References:

[1] Automated and Reproducible Application Traces Generation for IoT Applications, Nina Santi, Rémy

- Grünblatt, Brandon Foubert, Aroosa Hameed, John Violos, Aris Leivadeas, Nathalie Mitton Q2SWinet 2021 - 17th ACM Symposium on QoS and Security for Wireless and Mobile Networks, Nov 2021, Alicante, Spain. pp.1-8,
- [2] Dataset Collection of Multi-Communication Technologies Monitored in Different Mobility Contexts Jana Koteich, Nathalie Mitton Under Submission
- [3] G. Chen. Human Habits Investigation: from Mobility Reconstruction to Mobile Traffic Prediction. Ph.d. thesis, University Paris-Saclay, April 2018.
- [4] G. Chen, S. Hoteit, A. C. Viana, M. Fiore, and C. Sarraute. Enriching sparse mobility information in Call Detail Records. *Computer Communications*, 122:44–58, 2018.
- [5] T. Henderson, D. Kotz, and I. Abyzov. The Changing Usage of a Mature Campus-wide Wireless Network. In *ACM Mobicom*, pages 187–201, September 2004.
- [6] T. H. Silva, A. C. Viana, F. Benevenuto, L. Villas, J. Salles, A. Loureiro, and D. Quercia. Urban computing leveraging location-based social network data: a survey. *ACM Computing Surveys*, 2019.
- [7] F. D. de Mello Silva, A. K. Mishra, A. C. Viana, N. Achir, A. Fladenmuller and L. H. M. K. Costa, "Performance Analysis of a Privacy-Preserving Frame Sniffer on a Raspberry Pi," 2022 6th Cyber Security in Networking Conference (CSNet), Rio de Janeiro, Brazil, 2022, pp. 1-7, doi: 10.1109/CSNet56116.2022.9955615.
- [8] L. Jouans, A. C. Viana, N. Achir and A. Fladenmuller, "Associating the Randomized Bluetooth MAC Addresses of a Device," 2021 IEEE 18th Annual Consumer Communications & Networking Conference (CCNC), Las Vegas, NV, USA, 2021, pp. 1-6, doi: 10.1109/CCNC49032.2021.9369628.
- [9] ANR Mitik <https://project.inria.fr/mitik/>

Main activities

- Inventory all the tools for collecting and analyzing traces offered by the two teams, FUN and TRiBE.
- Organize the tools to make them accessible for partners and open source for the community.
- Improve (when necessary), validate, and use these tools through measurement campaigns to capture device mobility, collect related wireless environment conditions, and ensure privacy compliance.
- Present work progress to partners of the project and related community.
- Tools documentation, publishing, and reporting.

Skills

- A PhD or Master's in wireless networks, mobile networks, or data-related topics.
- A solid understanding of networking principles, protocols, and architectures is essential.
- The ability to write and debug (student) code in Python is an essential requirement.
- Proficiency in programming languages commonly used in AI and networking research.
- Experience with relevant libraries and frameworks is also valuable.
- Ability to design and implement algorithms for solving complex problems.
- Familiarity with optimization techniques.
- Excellent written and verbal communication skills for presenting research findings, writing academic papers, and collaborating with peers.
- ability to work effectively as part of a research team, collaborate with colleagues from diverse backgrounds, and contribute positively to group dynamics
- This multi-disciplinary, multi-team project requires good personal and project management skills.
- Language: French/English

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
- Social security coverage

Remuneration

According to profile

General Information

- **Theme/Domain** : Networks and Telecommunications System & Networks (BAP E)
- **Town/city** : Palaiseau
- **Inria Center** : [Centre Inria de Saclay](https://www.inria.fr/centre)
- **Starting date** : 2024-12-02

- **Duration of contract** : 2 years
- **Deadline to apply** : 2024-12-31

Contacts

- **Inria Team** : [TRIBE](#)
- **Recruiter** :
Carneiro Viana Aline / Aline.Viana@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

There you can provide a "broad outline" of the collaborator you are looking for what you consider to be necessary and sufficient, and which may combine :

- tastes and appetencies,
- area of excellence,
- personality or character traits,
- cross-disciplinary knowledge and expertise...

This section enables the more formal list of skills to be completed and 'lightened' (reduced) :

- "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, with expertise in Ruby on Rails development and strong influencing skills. A thesis in the field of **** is a real asset."

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

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.