Offer #2023-06148

PhD Position F/M Unsupervised Machine Learning for Wireless Communications

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

About the research centre or Inria department

The Inria research centre in Lyon is the 9th Inria research centre, formally created in January 2022. It brings together approximately 300 people in 16 research teams and research support services.

Its staff are distributed at this stage on 2 campuses: in Villeurbanne La Doua (Centre / INSA Lyon / UCBL) on the one hand, and Lyon Gerland (ENS de Lyon) on the other.

The Lyon centre is active in the fields of software, distributed and high-performance computing, embedded systems, quantum computing and privacy in the digital world, but also in digital health and computational biology.

Context

Wireless communication systems involve collecting large amounts of data related to electromagnetic propagation, which is normally used for the purpose of data transmission and demodulation, and then immediately discarded. While it is clear that leveraging the statistical aspects of propagation information (e.g. through learning the characteristics of its distribution and applying appropriate statistical techniques) has the potential to greatly enhance the performance and range of services offered by the network, this approach faces the practical challenges of real-time processing such as a limited computing and storage resources.

Assignment

The successful candidate will contribute to the development of advanced machine learning approaches for the processing of real-time signals in wireless communications systems, and in particular of the technique of channel charting [FGST23]. She or he will devise innovative theoretical approaches for distributed, real-time dimensionality reduction applied to multi-sensor systems; prototype these approaches trough simulations and/or lab experiments; write technical reports and articles for major conferences and journals in the field of wireless communications and machine learning; and regularly present the obtained results in scientific conferences and events.

The proposed topic lies at the crossroads of unsupervised machine learning, frugal AI, and signal processing for digital communications. It can lead to a number of directions ranging from theoretical machine learning to real-time implementation, depending on the skills and preferences of the candidate.

[FGST23] P. Ferrand, M. Guillaud, C. Studer, O. Tirkkonen, “Wireless Channel Charting: Theory, Practice, and Applications,” IEEE Communication Magazine, 2023. https://arxiv.org/abs/2304.08095

Main activities

The successful candidate will join the MARACAS research team of Inria (https://team.inria.fr/maracas/), hosted by CITI Lab (https://www.citi-lab.fr/) in Lyon, France. MARACAS is a research group consisting of approximately 15 people within Inria and INSA Lyon. The focus of MARACAS lies in the theoretical, algorithmic and experimental aspects of communication systems, developing and applying methods in information theory, statistical signal processing and machine learning.

The offered contract is for a fixed-term 3 year position funded by a collaborative research project, during which the candidate will work towards obtaining a Ph.D. degree. The candidate will have the opportunity to interact and collaborate with our high-profile partners from various European universities involved in the collaborative project funding the work. The candidate will be supervised by Dr. Maxime Guillaud.

Skills

The candidate must hold a Master's degree or equivalent in any of the following field: Computer Science, Informatics, Electronics, Mathematics, Statistics.

Required skills:

- fluent spoken and written technical english
- familiarity with machine learning concepts and tools (ScikitLearn, TensorFlow, Keras...)
- familiarity with Matlab and/or Python

Desired skills:

- a strong background in statistical signal processing
- familiarity with wireless digital communications
- familiarity with real time systems

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 (90 days / year) 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 under conditions

Remuneration

1st and 2nd year: 2 051 euros gross salary /month

3rd year: 2 158 euros gross salary / month

General Information

- **Theme/Domain :** Networks and Telecommunications
- **Town/city :** Villeurbanne
- **Inria Center :** Centre Inria de Lyon
- **Starting date :** 2023-09-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2023-09-30

Contacts

- **Inria Team :** MARACAS
- **PhD Supervisor :**
  Guillaud Maxime / maxime.guillaud@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.

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

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Processing of applications sent 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.