2023-06148 - PhD Position F/M Unsupervised Machine Learning for Wireless Communications

**Type de contrat :** CDD  
**Niveau de diplôme exigé :** BAC + 5 ou équivalent  
**Fonction :** Doctorant

**A propos du centre ou de la direction fonctionnelle**

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.

**Contexte et atouts du poste**

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.

**Mission confiée**

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 through 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.


**Principales activités**

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.

**Compétences**

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

- Statistical signal processing and machine learning.
- Theoretical, algorithmic and experimental aspects of communication systems, developing and applying methods in information theory, statistical signal processing and machine learning.
- Wireless communication systems, and in particular of the technique of channel charting [FGST23].
- 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

**Avantages**

- 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

**Rémunération**

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

3rd year: 2 158 euros gross salary / month