

**Date limite d'enregistrement des candidatures et du dépôt
des documents dématérialisés sur Galaxie :**

March 31, 2022 at 4 pm

JOB DESCRIPTION

Emploi : Maître de conférences (Associate Professor)

Section du CNU : 61/63

Département : Electronics et Telecommunications (E&T)

Laboratoire : Institut d'Electronique et des Technologies du numéRique (IETR, UMR 6164) – Equipe SIGNAL (SIGNal et ALgorithmS)

Profil : Machine learning for signal processing : neural approaches for smart communications

Employment environment:

INSA Rennes, a founding member of the INSA Group, is the largest public engineering school in Brittany. It welcomes 2,200 students and apprentices and graduates more than 340 engineers, 60 masters and 40 PhDs per year. Composed of 10 teaching departments, including 7 specialties and an apprenticeship program, and supervised by 6 research laboratories, INSA employs approximately 500 public employees (research professors, teachers, permanent and contractual employees) and more than 400 temporary employees, particularly from companies.

By positioning itself as an impact institute, INSA Rennes intends to be part of a positive metamorphosis aimed at building a more just and sustainable world for future generations. Being an engineering school today, producing skills and knowledge, requires more than ever to assert its responsibility; to anticipate the impact of inventions on individuals, society and the environment; to place itself at the service of a reasoned economy and social progress that is a source of well-being.

More aware than ever of its social impact, the school also intends to go further in diversifying profiles and providing each student with the keys to fulfill his or her potential and succeed in his or her studies, regardless of the educational investment he or she made before entering a prestigious school.

The Impact Institute is first and foremost a lever for transformation in the service of society and for meeting the challenges of the 17 sustainable development goals defined by the United Nations.

This affirmed trajectory has been materialized by the adoption of its 2021-2026 strategic plan, which can be consulted on the school's website: www.insa-rennes.fr

Specific context: Creation of a Chair in Machine Learning for smart everything and physical layer security.

INSA Rennes and IETR support the creation of this chair, which is naturally positioned on the evolution of scientific and societal issues in the field of communicating objects (5G+, 6G, IoT, ...) and which feed the calls for funding at local, national and international levels, as well as industrial collaborations. The ambition is to position itself at the highest international level in the years to come in this field. Through this chair, the person recruited will have to play a driving role in the setting up of regional, national and European collaborative projects.

Hosting Laboratory: IETR, Rennes

The IETR is a public research laboratory dedicated to electronics and digital technologies. It is composed of 13 research teams addressing specific scientific topics. Activities deal with multiple challenges mostly related to the digital transformation of our society, including its transitions in terms of the environment, ecology, energy and health.

The main fields of expertise of the IETR range from materials to systems. They gather the main following disciplines: (1) antennas and microwave devices over a very broad frequency spectrum from a few MHz to sub-THz, (2) electromagnetic compatibility and electromagnetism for biomedical applications, (3) multifunction materials for miniature and reconfigurable devices, communications and also energy harvesting and storage, (4) microtechnologies and microsensors according to two branches (low-temperature silicon and organic electronics) for the analysis of circuits or microsensors, (5) digital communications systems and related signal processing, as well as connected electronics and embedded systems, (6) remote sensing, multimodal imaging and propagation properties (indoor,

outdoor, complex media), and last (7) image analysis and processing (compression, prototyping, cryptography and security of contents, multimodal analysis, emotion analysis).

Hosting team description : SIGNAL (Signal & Algorithms)

The SIGNAL team leads research in the domain of the signal processing for digital communications. The strength of the team comes from his wide scientific skills going from theoretical models to global system studies, with the central goal of optimizing communicating systems and related algorithms. The The team benefits from a recognized and advanced expertise on innovative waveform design, radio architectures, multi-antenna techniques, performance bound derivation, as well as modelling of heterogeneous or hybrid systems and networks.

Department of teaching of the position: Electronics and Telecommunications

Department head: Matthieu CRUSSIÈRE (matthieu.crussiere@insa-rennes.fr)

Specific skills required :

Research :

General theme: Optimization of the physical layer of communication systems by machine learning and application to next generation radio interfaces. Models, algorithms and performance calculations.

The person recruited will play a central role in developing the skills of the IETR SIGNAL team in its research activities in the field of machine learning and signal processing for the physical layer of digital communications systems.

His work will focus on new generation digital communication interfaces in connection with the strong evolutionary trends of infrastructures and so-called "intelligent" systems: massively multi-antenna systems, frequency rise, mass connectivity systems, cybersecurity, energy constraints. The person recruited will be interested in the theoretical limits of these systems. The targeted fields of application are the evolution of cellular networks (beyond 5G/6G), the factory of the future (Smart Factory), the connected and autonomous car (SmartCar), the smart city (SmartCity).

A strong point of the activities will be the research of system and algorithmic solutions as well as performance computation linking the so-called traditional approaches of signal processing (model-based optimization) and neural strategies (data-driven learning), where a methodological competence beyond the simple use of the tool is expected. The candidate will be interested in finding new solutions for waveform design and communication strategies, resource allocation and coding in relation to the evolution of multi-antenna and radio frequency architectures, low latency and short packet communication formats, and energy and reliability/security constraints. The results should allow experimentations and the elaboration of proofs of concept within the "Connected Objects" platform of the IETR.

Teaching:

The recruited person will mainly intervene in the Electronics and Telecommunications (E&T) department of INSA Rennes, but also in the INSA Euro-Méditerranée course and the Electronics (Design and Development of Innovative Technologies) apprenticeship course. The main part of the teaching will be in the field of digital communication systems in the broad sense of the term and associated signal processing techniques, with a strong emphasis on machine learning techniques.

The general orientation of the expected teaching will be methods and algorithms for the physical layer of communication systems, in particular

-Signal processing in the broad sense, from the basics to advanced techniques including machine learning techniques.

-Digital communications, from the basics to advanced techniques of modulation, coding and reception processing, systems and networks.

-Information and communication theory, decision theory and parametric and statistical estimation, deep and reinforcement learning.

This person will be in charge of courses, tutorials, practical work and project follow-up on this theme from the 3rd to the 5th year of engineering (L3, M1, M2).

Pedagogical investment :

The recruited person will also contribute to the construction of teaching modules articulated around fields of application such as the evolution of cellular networks (beyond 5G/6G), the factory of the future (Smart Factory), the connected and autonomous car (SmartCar) or the smart city (SmartCity).

Finally, a particular expectation will be placed on the investment in the implementation of new teaching methods.

Responsibilities:

The person recruited will be expected to be involved in the medium and long term in responsibilities related to teaching activities: module responsibilities (short term), pedagogical responsibilities, follow-up of student projects and administrative responsibilities (medium term).

For more information, please contact :

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