

## FACULTY RECRUITMENT PROFILE

Assistant Professor

Laboratory of Signals and Systems, CentraleSupélec

Gif-sur-Yvette, France

**Title:** Assistant Professor

**Position:** Assistant Professor in *Wireless Communications*, Telecommunications Department, CentraleSupélec Paris-Saclay campus, Laboratoire des Signaux et Systèmes (L2S, UMR 8506, pôle Télécoms & Réseaux), « CDI de droit public », level Assistant Professor.

**CNU Section:** 61

### **Domain / Job profile:**

The Assistant Professor will perform research and teaching at the interface of applied mathematics, communication theory, wireless communications, and communication networks. The Assistant Professor, in particular, will focus his/her research on ***communication-theoretical models and algorithmic solutions to design flexible, adaptive, and reconfigurable communication networks that integrate communication, sensing, and computing.***

### **Keywords:**

Wireless communications, communication theory, optimization theory, stochastic geometry, Markov chains, fractional programming, resource allocation, modeling and performance evaluation, machine learning, deep neural networks, reinforcement learning, distributed caching, storage, and processing, energy efficiency, spectral efficiency, delay efficiency, distributed optimization.

### **CentraleSupélec:**

CentraleSupélec is a public scientific, cultural and professional institution (EPSCP in French) under the authority of the Ministry of Higher Education and Scientific Research and the Ministry of the Economy, Industry and Digital Technology. Its main missions are: training high-level scientific general engineers, research in engineering and systems sciences, and executive education.

According to the **Shanghai Ranking's Global Ranking of Academic Subjects 2018 - Telecommunication Engineering**, CentraleSupélec is ranked 1st in France, 2nd in Europe, and 18th in the world in the field of Telecommunications Engineering.

The Department of Telecommunications is an academic department of CentraleSupélec whose educational scope covers the fields of communications for the 3-year of CentraleSupélec's Engineering Program. The department also manages Masters for Université Paris Saclay / and Specialized Masters for CentraleSupélec.

The Laboratory of Signals and Systems is a joint CNRS-CentraleSupélec-Université Paris-Sud academic and research unit. The main areas of research include communications, signals processing, and control. These activities are organized around three research Poles.

#### **Academic profile:**

The candidate will be part of the Telecommunications Pole and will contribute to the training of CentraleSupélec's students and of the International Research Master SAR (Advanced Wireless Systems). The candidate will teach in French and/or English on several topics at the interface between applied mathematics, communications and networks. She or he will participate and contribute to the training program SCOC (Communicating Systems and Connected Objects) and will be involved in more specialized courses related to her or his research activities under the teaching module "Systems and Intelligent Networks". The candidate will contribute to the development of new academic courses in CentraleSupélec, which encompass emerging technologies such as intelligent and reconfigurable surfaces and their applications to communication and sensor networks, high frequency communications (millimeter-wave band, terahertz, visible light, etc.), molecular communications, communication networks using energy harvesting technologies, intelligent and reconfigurable networks and their many applications to smart cities, Internet of Things (IoT) and other networked systems (energy, transport, autonomous vehicles, logistics health, environment, agriculture, security, etc.).

#### **Research profile:**

Future wireless networks will be more than allowing people, mobile devices, and objects to communicate with each other. Future wireless networks will be turned into a distributed intelligent wireless communications, sensing, and computing platform, which, besides

communications, will be capable of sensing the environment to realize the vision of smart living in smart cities by providing them with context-awareness capabilities, of locally storing and processing information in order to accommodate the time critical, ultra-reliable, and energy efficient delivery of data, of accurately localizing people and objects in environments and scenarios where the global positioning system is not an option. Future wireless networks will have to fulfill the challenging requirement of interconnecting the physical and digital worlds in a seamless and sustainable manner.

To fulfill these challenging requirements, it is apparent that it is not sufficient anymore to rely solely on wireless networks whose logical operation is software-controlled and optimized (software networks). The wireless environment itself needs to be turned into a software-reconfigurable entity, whose operation is optimized to enable uninterrupted connectivity. Future wireless networks need a smart radio environment, i.e., a wireless environment that is turned into a reconfigurable space that plays an active role in transferring and processing information. This emerging concept is referred to as “smart radio environment”.

The concept of smart radio environment is a fundamental paradigm shift with respect to the design of current wireless networks. In current wireless networks, broadly speaking, the environment, i.e., the set of physical objects that alter the propagation of the radio waves, is not controllable. The environment ignores the underlying process of transferring and processing information, and is perceived, in addition, as an adversary to the communication process, i.e., it has usually a negative effect that needs to be counteracted by the transmitters and receivers. The advent of emerging electromagnetic materials and devices, such as the reconfigurable metasurfaces, reconfigurable reflect arrays, reconfigurable large-intelligent surfaces, etc. challenges this status quo, but asks for new methodologies for modeling, analyzing, and optimizing wireless networks, and, in addition, equips them with a distributed sensing platform for enabling their smart and adaptive optimization by capitalizing on reinforcement, transfer, and federated learning methods.

The candidate will be researching on the communication-theoretic and algorithmic foundation of wireless networks in reconfigurable smart radio environments. To this end, the mathematical tools of stochastic geometry, (distributed) optimization, and machine learning seem to be fundamental enabling methods for system modeling, performance evaluation, and optimization.

The Telecoms and Networks division of the Signals and Systems Laboratory has already many activities in some of these subjects, and intends to reinforce this research activity, which will

enable the laboratory to complement its research topics, and to find new applications motivated by new theoretical know-how. This approach is perfectly in line with many starting or on-going works by members of the group, such as the analysis and optimization of intelligent and reconfigurable surfaces and their applications to communication networks.

**Candidate profile:**

The candidate must hold a Ph.D. degree in electrical engineering, communications and/or applied mathematics (stochastic geometry, communication theory, optimization theory, learning). The candidate is expected to be outstanding in terms of research publications, research potential, and creativity. The candidate will work in a team and will have the ambition to establish long-term international research collaborations. She or he will teach in French and/or English. Knowledge of French is not necessary at the time of application.

**Application:**

One single file in .pdf format, including a cover letter, a detailed CV (teaching experience, research experience, publications, etc.), a research project, a copy of an identity document, a copy of the doctoral degree, and any other relevant documents. Applications need to be sent, no later than **September 30<sup>th</sup>, 2019**, by email to:

Élodie Ledoux, ressources humaines : [elodie.ledoux@centralesupelec.fr](mailto:elodie.ledoux@centralesupelec.fr)

Lorraine Maret, ressources humaines : [lorraine.maret@centralesupelec.fr](mailto:lorraine.maret@centralesupelec.fr)

Interviews with the shortlisted candidates are expected to take place in October-November 2019, and the selected candidate is expected to join CentraleSupélec in January 2020.

**Scientific contacts:**

Candidates interested in further information about this position are invited to contact:

Marco Di Renzo, CR CNRS, pôle Télécoms & Réseaux:  
[marco.direnzo@l2s.centralesupelec.fr](mailto:marco.direnzo@l2s.centralesupelec.fr)

Armelle Wautier, Directrice du Département : [armelle.wautier@centralesupelec.fr](mailto:armelle.wautier@centralesupelec.fr)