



Offre n°2025-09170

PhD Position F/M Signal and attack detection infrastructure based on heterogeneous antennas in wireless networks

Type de contrat : Fixed-term contract

Niveau de diplôme exigé : Graduate degree or equivalent

Fonction : PhD Position

A propos du centre ou de la direction fonctionnelle

The Inria University of Lille centre, created in 2008, employs 360 people including 305 scientists in 15 research teams. Recognised for its strong involvement in the socio-economic development of the Hauts-De-France region, the Inria University of Lille centre pursues a close relationship with large companies and SMEs. By promoting synergies between researchers and industrialists, Inria participates in the transfer of skills and expertise in digital technologies and provides access to the best European and international research for the benefit of innovation and companies, particularly in the region. For more than 10 years, the Inria University of Lille centre has been located at the heart of Lille's university and scientific ecosystem, as well as at the heart of Frenchtech, with a technology showroom based on Avenue de Bretagne in Lille, on the EuraTechnologies site of economic excellence dedicated to information and communication technologies (ICT)

Contexte et atouts du poste

The PhD student will be co-supervised by Valeria Loscri (FUN Team) and Nicolas Battaglini (Université Paris Cité)

The Inria FUN research group investigates solutions to enhance programmability, adaptability and reachability of FUN (Future Ubiquitous Networks) composed of RFID, wireless sensor and robot networks. Limited resources, and high mobility evolving in distrusted environments characterize the objects that compose FUN. They communicate in a wireless way. To be operational and efficient, such networks have to follow some self-organizing rules. Indeed, components of FUN have to be able in a distributed and energy-efficient way to discover the network, self-deploy, communicate, self-structure in spite of their hardware constraints while adapting the environment in which they are operating.

evolve. For additional information on the FUN research group, please see <http://team.inria.fr/fun/>

Mission confiée

The main objectives of the thesis can be summarized as follows:

- 1) Design and development of a surveillance infrastructure based on heterogeneous nodes, including thin and flexible planar antennas made of conductive nanomaterials.
- 2) Characterization of an environment based on infrastructure nodes, in both passive and active scenarios.
- 3) Collection and processing of data/signals and development of machine learning approaches for device and communication technology identification, real-time demodulation, and tracking [alla-acsac24][bou21].
- 4) Ability to jam target devices while minimizing the impact on neighboring devices.

[alla-acsac24] Ildi Alla, Selma Yahia, Valeria Loscri, Hossien Eldeeb. Robust Device Authentication in Multi-Node Networks: ML-Assisted Hybrid PLA Exploiting Hardware Impairments. Annual Computer Security Applications Conference (ACSAC), Dec 2024, Waikiki, Hawaii, USA, United States. hal-0472749

[bou21] Emilie Bout, Valeria Loscri, Antoine Gallais. How Machine Learning changes the nature of cyber-attacks on IoT networks: A survey. Communications Surveys and Tutorials, IEEE Communications Society, Institute of Electrical and Electronics Engineers, 2021. hal-03390359

Principales activités

To achieve the objectives of this thesis, we plan to select a candidate with a background in signal processing. The following tasks are planned:

[M0-M6] Review of the literature on approaches for device detection, localization, and identification;

[M3-M10] Design of flexible antennas and selection of reprogrammable cards for indoor and outdoor applications. Initial tests for initial data collection in controlled environments.

[M9-M24] Design of algorithms for environmental characterization in the "passive" and "active" cases, and indoor/outdoor. Development of detection, geolocation, and environmental characterization algorithms based on machine learning approaches. Analysis of key characteristics and parameters for the construction phase of the monitoring infrastructure.

Design of algorithms for the detection and identification of devices and their occupancy in the transmission spectrum. Development of anti-jamming solutions.

[M24-M30] Experimentation and validation of detection approaches in real-world scenarios based on reprogrammable cards and flexible antennas.

Testing and validation of identification of anti-jamming devices and solutions.

[M30-36] Finalization of activities, thesis writing, and defense.

Compétences

Skills

Technical skills and level required :Programming skills on C++, Python and Matlab

Languages : English or French

Relational skills :Capacity to work in team

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 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

Rémunération

2 200 € gross monthly salary

Informations générales

- **Thème/Domaine** : Networks and Telecommunications
System & Networks (BAP E)
- **Ville** : Villeneuve d'Ascq

- **Centre Inria :** [Centre Inria de l'Université de Lille](#)
- **Date de prise de fonction souhaitée :** 2025-10-01
- **Durée de contrat :** 3 years
- **Date limite pour postuler :** 2025-08-21

Contacts

- **Équipe Inria :** [FUN](#)
- **Directeur de thèse :**
Loscri Valeria / Valeria.Loscri@inria.fr

A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

Consignes pour postuler

Please send your CV and cover letter

Sécurité défense :

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.