Postdoctoral position "Generation of training data for the evaluation of low-power AI-based channel estimation and spectrum detection algorithms in a realistic railway context".
12 months fixed term contract - Start date: 01/09/2024 at the latest

1. Job environment

Université Gustave Eiffel, is a unique, experimental and pioneering university, the first national institution, created in 2020, bringing together: a Research Institute, a University, a School of Architecture and three Engineering schools. It is a multidisciplinary university and multi-campus with world-class research facilities. The LEOST laboratory is located on the Lille campus in the north of France. It covers several research areas such as radio channel modelling for telecommunication systems. LEOST is one of the 7 laboratories of the Component and system Department. The position is open in the framework of the Regional project IMITECH and it will be in collaboration with IMT-Atlantique in Brest in the framework of the ANR project mmW4Rail.

Geographic location : Université Gustave Eiffel, Campus of Lille, 20 Rue Elisée Reclus, 59650 Villeneuve d'Ascq. https://leost.univ-gustave-eiffel.fr/

2. Scientific context

The use of wireless sensors in the rail sector is exploding to meet a variety of needs relating to train and infrastructure maintenance. Optimizing sensor networks and their positioning in railway environments is therefore a crucial challenge. The data collection/forward can be done by reconfigurable mobile nodes based on cognitive radio concept. The proposed research aims to evaluate different innovative algorithms for energy-efficient channel estimation and spectrum sensing based on artificial intelligence (AI). In order to minimize the energy consumption of the various nodes in the wireless sensor network, the issues of radio coverage optimization and knowledge of channel state information (CSI) are crucial. To do this, we will consider information from radio channels measured in various typical railway environments and also from Ray tracing simulator.

3. Objectives

AI-based algorithms require a large amount of data to train deep learning (DL) models. In addition, the data used for training can be derived from models and must be matched with data from real scenarios. The term data refers here to the radio channel data, in millimeter wave. The aim of this work is twofold. Firstly, to generate sufficient data at the output of the channel in order to train the DL models. We therefore need to generate new data from the database of measured channels (from ANR projects). Two strategies will be considered. The first will be based on the classic statistical generation of channels used in telecommunications, while the second will consider a very new approach using GAN (generative adversial network), which is well known in the field of image processing. The generated channel data will then be used first for training and then for evaluating the various AI-based channel estimation and spectrum detection algorithms in a more realistic context, corresponding to the measured channel data.

4. Professional skills

- PhD in wireless communications and particularly in the areas of signal processing
- Experience and taste for mathematics developments, statistical modelling and Deep learning methods
- Knowledge of ray-tracing based simulation tools will be highly appreciated
- Strong ability in computer programming (Matlab, C, C++, Python, etc.)
- Ability to communicate and disseminate scientific results
- English written and spoken
- Rigour and autonomy

Application documents to be send to marion.berbineau@univ-eiffel.fr

- Resume, Covering letter, references, Copy of your degree, National identity card or passport