Offer #2023-06883

Experimental Validation of Low-Cost Air Pollution Sensor Networks

**Contract type:** Internship agreement

**Level of qualifications required:** Graduate degree or equivalent

**Fonction:** Internship Research

**Level of experience:** From 3 to 5 years

**About the research centre or Inria department**

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.

**Context**

This work will take place in the Inria Agora research team in Lyon. The intern will be supervised by Dr. Ahmed Boubrima (Inria Agora) and will collaborate with local air pollution monitoring collectivities.

**Assignment**

**Context:**

Air pollution monitoring is a major global issue due to its impact on both human health (cancer, etc.) and the environment (climate change, etc.). Traditionally, air pollution is monitored using reference stations that are accurate (provide near-ground truth accuracy) but costly and therefore limited in number in most cities (10 to 20 per major city on average). Thanks to the recent progress in electronics, new cheaper, and more affordable air pollution sensing devices have been made available in the market. These low-cost sensors are however much less accurate than reference stations due to their limited underlying technology.

Although low-cost sensors are still in the early development stages, multiple deployments of these sensing devices have already taken place in the last few years (mostly part of research projects). However, governments and local collectivities don't take into account the data provided by current sensor deployments as the available pollution sensor data cannot be used without proper validation. Such a validation process is indeed challenging due to two main reasons. First, pollution sensors drift from their expected output over time due to their limited sensing technology. Secondly, most pollution sensors are highly impacted by weather conditions (temperature, humidity, wind speed, sun exposure, etc.), which results in a variable sensing accuracy. As a result, a pre-deployment sensor validation against reference data is not an adequate option.

**Assignment:**

In this internship, the objective is to tackle the issue of air pollution sensor validation in active deployments. The intern will design a validation approach that allows decision-making entities to characterize the sensing quality of a given low-cost pollution sensor. To that end, we can leverage the correlations of low-cost pollution sensor outputs with (1) the data of non-co-located reference stations, (2) the outputs of physical models' simulations, (3) the data provided by neighboring low-cost sensors, (4) weather data, and (4) land-use parameters (traffic proximity, elevation, etc.).

**Bibliography:**


Main activities

Main activities:
1- Modeling the aging (degradation of performance) of pollution sensors as a function of measurements and weather conditions.
2- Development of a pollution sensor confidence indicator that will be calculated and updated throughout the deployment period.
3- Evaluation of the proposed confidence indicator based on the level of discretization of air pollution measurements using data from real deployments.

Skills

Required skills:

Applicants studying for a Computer Science or Telecommunication Engineering degree are encouraged to apply. Background in mathematics as well as practical skills with programming languages are highly appreciated. Basic English level is mandatory.

Benefits package

- 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.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Remuneration

Gratification = 4,05€ gross / hour

General Information

- Theme/Domain: Networks and Telecommunications
- System & Networks (BAP E)
- Town/city: Villeurbanne
- Inria Center: Centre Inria de Lyon
- Starting date: 2023-02-01
- Duration of contract: 6 months
- Deadline to apply: 2024-01-11

Contacts

- Inria Team: AGORA
- Recruiter: Boubrima Ahmed / ahmed.boubrima@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

Warning: you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Applications must be submitted online via the Inria website. Processing of applications submitted via other channels is not guaranteed.
Defence Security:
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy:
As part of its diversity policy, all Inria positions are accessible to people with disabilities.