Offer #2024-07545

Post-Doctoral Research Visit F/M A method for approximately synchronizing heterogeneous agents

**Contract type:** Fixed-term contract

**Level of qualifications required:** PhD or equivalent

**Fonction:** Post-Doctoral Research Visit

About the research centre or Inria department

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 EurA Technologies site of economic excellence dedicated to information and communication technologies (ICT).

Assignment

The information revolution through embedded sensors and actuators brings new possibilities but also new challenges related to the Internet of Things (IoT) and Cyber-Physical Systems (CPSs) in agriculture, robotics, health monitoring, and elderly assistance. The design of CPS involves interdisciplinary approaches. Notable scenarios include renewable energies in power networks and connected autonomous vehicles.

Motivated by this, our aim is to develop a practical design methodology for distributed control and estimation algorithms for interconnected CPSs. Here, by practical design, we mean crucial characteristics such as safety, rapid adaptivity, and satisfying information constraints in the distributed algorithms for CPSs. In other words, to rapidly cope with unexpected contingencies while efficiently protecting the information about the environment, people, and society, in a world where everything becomes a sensor and data.

Main activities

There are three possible proposals, each spanned over 1.5 years.

1) Generalizing the design methodology for networked control systems by synchronization enforcement and non-identical individuals, eg, to work in the setting of discrete time.

2)

- Stage 1: Understanding how to enforce synchronization using homogeneity and sliding mode control approaches, what class of non-identicalness can be considered, and what will be the obtained emergent collective behavior.
- Stage 2: Based on this general understanding, designing synchronization enforcement based tools (using homogeneity and sliding mode control approaches) for distributed estimation of uncertain large-scale systems (taking into account possible synchronization enforcement of local estimators on global parameters and states).
- Stage 3: Developing a practical design methodology for distributed control algorithms for interconnected CPSs using synchronization enforcement (and using homogeneity and averaging methods).

3) Getting motivated by neural central pattern generators on the observed properties of robust and rapid convergence with limited resources, to develop finite-time estimation and control tools that satisfy information constraints.

Skills
The candidate should have experience in the analysis of nonlinear dynamic systems and/or in control and estimation theory. The main mission will be the development of new theories and their practical verification.

**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.)
- 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

**Remuneration**

2788€ gross per month

**General Information**

- **Theme/Domain**: Optimization and control of dynamic systems
  Biologie et santé, Sciences de la vie et de la terre (BAP A)
- **Town/city**: Villeneuve d'Ascq
- **Inria Center**: Centre Inria de l'Université de Lille
- **Starting date**: 2024-10-01
- **Duration of contract**: 1 year, 6 months
- **Deadline to apply**: 2024-05-31

**Contacts**

- **Inria Team**: VALSE
- **Recruiter**: Lee Jin Gyu / jin-gyu.lee@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**

**CV + Cover Letter**

**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.