Offer #2023-06945

PhD Position F/M Adoption dynamics in social networks for green mobility

Contract type: Fixed-term contract

Level of qualifications required: Graduate degree or equivalent

Function: PhD Position

About the research centre or Inria department

The Centre Inria de l'Université de Grenoble groups together almost 600 people in 22 research teams and 7 research support departments.

Staff is present on three campuses in Grenoble, in close collaboration with other research and higher education institutions (Université Grenoble Alpes, CNRS, CEA, INRAE, ...), but also with key economic players in the area.

The Centre Inria de l'Université Grenoble Alpe is active in the fields of high-performance computing, verification and embedded systems, modeling of the environment at multiple levels, and data science and artificial intelligence. The center is a top-level scientific institute with an extensive network of international collaborations in Europe and the rest of the world.

Context

This work will be carried out in the DANCE team (Dynamics and Control of Networks), a research team of GIPSA-Lab research center in Grenoble, France. The team's research concerns modeling, estimation and control of network systems, with a broad spectrum of theoretical and applied topics including traffic networks, intelligent vehicles, social dynamics, and analysis of large-scale complex networks.

The thesis is part of the FORBAC project funded by the French government within the PEPR “DATA TECHNOLOGY for MOBILITY IN THE TERRITORIES”. The activities of the PhD thesis will be hosted at the Grenoble INRIA Center.

Assignment

Scientific scope and objectives: Tomorrow's mobility is being reinvented by the increased usage of less polluting modes of transport, the diffusion of shared means of transportation, and the provision of information to users who must be actors of their mobility. The various mobility or communication technologies require time to be adopted and the full spectrum of their consequences must be understood. In order to analyze the long-term effects of a technology on overall mobility, models with different time scales must be integrated: on the one hand, the daily mobility that can be captured by macroscopic models such as, and on the other hand, the gradual adoption of the technology, whose dynamics can be accelerated by the incentives from policy makers.

Adoption dynamics for green or shared means of transportation are also challenging because they involve, together with human choice, physical dynamics and constraints. A new technology, such as hydrogen vehicles, requires a significant investment in terms of infrastructure. How to achieve an optimal deployment in time and space of the infrastructure in view of the uncertainty of the adoption of the technology? In the face of the recurrent discussion about free public transport, how can the overall system be impacted in a sustainable way?

Coupling technology adoption models (such as the Bass model) with traffic models is a crucial research issue for understanding the complex systems of multi-modal transport. Taking into account the specificities of suburban areas is also a fundamental issue. The adoption of a technology is also strongly dependent on space and on various socio-economic factors. We will study adoption dynamics that involve various components: an adoption model, possibly game-theoretic in nature in order to readily account for incentives; a social network, where dynamics of social influence takes place; and the dynamics of infrastructural changes and investments. These dynamics involve time-scales in the order of months (or longer) and spatial scales from the neighborhood to the whole country.

Our contribution will have strong focus on the network aspects (transportation networks and, where relevant, social networks), with due consideration to their structure: we will for instance investigate when and where incentives are most effective to deploy (Bini 2022). Considering the PEPR focus on large scales, suitable averaging techniques need to be used for the model to be tailored to the right
geographical scale: candidate techniques developed by the team include continuation (Nikitin 2022) and graphon-based models (Vizuete 2020).

Literature


Main activities

Main activities: Perform research under the supervision of the advisors.

Additional activities:

- In collaboration with project partners, contribute to define the mathematical models and, as needed, develop and use simulation setups.
- Write internal and external reports, as well as scientific articles for peer review
- Present the works' progress to team partners, project partners, and general scientific audiences.

Skills

The candidate will have a MS degree in Automatic Control, Applied Mathematics, or related disciplines.

Languages: English and French

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 (after 6 months of employment) 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

- Gross salary: 2082 euros monthly (1st & 2nd year); 2190 euros 3rd year

General Information

- Theme/Domain: Optimization and control of dynamic systems
- Town/city: Montbonnot
- Inria Center: Centre Inria de l'Université Grenoble Alpes
- Starting date: 2024-01-01
- Duration of contract: 3 years
- Deadline to apply: 2024-02-29
Contacts

- **Inria Team**: DANCE
- **PhD Supervisor**: Frasca Paolo / paolo.frasca@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.

The keys to success

The candidate will have a MS degree in Automatic Control, Applied Mathematics, or related disciplines.

The candidate should be open to engage in some interdisciplinary work, including professional and scientific interactions with civil engineers, economists and behavioral scientists.

**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

**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.