Post-Doctoral Research Visit F/M [Post-docs DRI, Inria - Univ. Waterloo] Computational real algebraic geometry and applications in robotics

Contract type: Fixed-term contract
Level of qualifications required: PhD or equivalent
Fonction: Post-Doctoral Research Visit

Context

Every year Inria International Relations Department has a few postdoctoral positions in order to support Inria international collaborations. This is a position funded to support the collaboration between Inria and University of Waterloo (Canada).

The postdoctoral contract will have a duration of 12 to 24 months. The default start date is November 1st, 2024 and not later than January, 1st 2025. The postdoctoral fellow will be recruited by Inria Paris but it is recommended that the time is shared between France and the partner’s country (please note that the postdoctoral fellow has to start his/her contract being in France and that the visits have to respect Inria rules for missions).

The selected candidate will do her/his research at the OURAGAN team which is a joint team of Inria Paris and IMJ-PRG Sorbonne Université. She/he will be located at Sorbonne Université and will work with Elias Tsigaridas (Inria Paris) and Éric Schost (University of Waterloo).

The application deadline is June 2, 2024.

Assignment

Candidates for postdoctoral positions are recruited after the end of their Ph.D. or after a first postdoctoral period: for the candidates who obtained their PhD in the Northern hemisphere, the date of the Ph.D. defense shall be later than September 1, 2022; in the Southern hemisphere, later than April 1, 2022.

In order to encourage mobility, the postdoctoral position must take place in a scientific environment that is truly different from the one of the Ph.D. (and, if applicable, from the position held since the Ph.D.); particular attention is thus paid to French or international candidates who obtained their doctorate abroad.

Main activities

The research objective is to advance the foundations of algebraic algorithms, with a specific emphasis on deepening the connections between real algebraic geometry and practical applications. We are particularly interested in applying our findings to the realm of robotics, focusing on the intricacies of design. Our primary area of focus lies in the development of parallel manipulators. This involves delving into various aspects such as direct and inverse kinematics quandaries, path planning complexities, and the nuanced considerations of parameterized designs, including error analysis. Through this endeavor, we aim to contribute to the enhancement of robotic systems and their efficiency in real-world scenarios. At a second level, we opt for the use of such mechanisms for dedicated tasks emanating from problems in control theory.

Our main algebraic problem is real feasibility. That is to decide if a system of polynomial equalities and/or inequalities has a real solution. If this is the case, then we target to compute at least one point in each connected component of the real solution set. Even though algorithms exists for such problem, we aim at algorithms that make no assumptions on the input and that exploit the structure and the sparsity of the input polynomials. We also aim to provide precise bit complexity estimates that employ the sparsity structure and do not have any hidden constants in the exponents.

The feasibility problem is central in computational real algebraic geometry and it is of independent interest. But it is also one of the pillars in the efforts for obtaining efficient algorithms for polynomial optimization, both in the constrained and in the unconstrained case. Even more, along with the closely
related problem of computating discriminantal varieties it is of fundamental importance in robotics as it appears in motion planning and robot calibration.

Interested candidates should contact Elias Tsigaridas (elias.tsigaridas@inria.fr) for additional information.

Skills

Candidates should have PhD in mathematics, computer science or a related area; expertise in computational algebra and/or geometry is highly desirable.

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
- Flexible organization of working hours (after 12 month)
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training

Remuneration

According to civil service salary scales

General Information

- Theme/Domain: Algorithmics, Computer Algebra and Cryptology
- Scientific computing (BAP E)
- Town/city: Paris
- Inria Center: Centre Inria de Paris
- Starting date: 2024-10-01
- Duration of contract: 12 months
- Deadline to apply: 2024-06-03

Contacts

- Inria Team: OURAGAN
- Recruiter: Elias Tsigaridas / Elias.Tsigaridas@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

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.