



Offer #2024-08231

Post-Doctoral Research Visit F/M Multigraded elimination, resultants and discriminants

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 center at Université Côte d'Azur includes 42 research teams and 9 support services. The center's staff (about 500 people) is made up of scientists of different nationalities, engineers, technicians and administrative staff. The teams are mainly located on the university campuses of Sophia Antipolis and Nice as well as Montpellier, in close collaboration with research and higher education laboratories and establishments (Université Côte d'Azur, CNRS, INRAE, INSERM ...), but also with the regional economic players.

With a presence in the fields of computational neuroscience and biology, data science and modeling, software engineering and certification, as well as collaborative robotics, the Inria Centre at Université Côte d'Azur is a major player in terms of scientific excellence through its results and collaborations at both European and international levels.

Context

We are seeking applications for a Postdoctoral Researcher position in the areas of applied algebraic geometry, elimination theory, and symbolic-numeric computation. This position offers an exciting opportunity to engage in cutting-edge research at the intersection of pure and applied mathematics, with potential applications in geometric modeling [BC21], in polynomial system solving [BFMT21,BCN22], or in arithmetic [BMT20, BN17].

References

[BC21] Laurent Busé and Marc Chardin. Fibers of rational maps and elimination matrices: an application oriented approach. *Commutative Algebra - Expository papers dedicated to David Eisenbud on the occasion of his 75th birthday*, Springer, p. 189–217, 2021.

[BCN22] Laurent Busé, Marc Chardin and Navid Nemat. Multigraded Sylvester forms, duality and elimination matrices. *Journal of Algebra*, 609(1):514-546, 2022

[BFMT21] Matías R Bender, Jean-Charles Faugère, Angelos Mantzaflaris, Elias Tsigaridas. Koszul-type determinantal formulas for families of mixed multilinear systems. *SIAM Journal on Applied Algebra and Geometry*, 5(4):589-619, 2021

[BMT20] Laurent Busé, Angelos Mantzaflaris and Elias Tsigaridas. Matrix formulae for resultants and discriminants of bivariate tensor-product polynomials. *Journal of Symbolic Computation*, 98:65-83, 2020

[BN17] Laurent Busé and Ibrahim Nonkané. Discriminants of complete intersection space curves. *ACM proceedings of ISSAC*, p. 69-76, 2017.

Position: One-year post-doctoral position in the research team Aromath.

Location: Inria Centre at Université Côte d'Azur.

Starting date: flexible, but before end of May 2025.

Contact: Laurent Busé and Angelos Mantzaflaris.

Application: Interested candidates should submit the following two documents:

- A curriculum vitae (CV) including a list of publications.
- A cover letter explaining their research background and interest in the position.

Review of applications will begin immediately and continue until the position is filled. Inria Centre at Université Côte d'Azur offers a dynamic research environment with opportunities for collaboration and growth, and we encourage applications from candidates in the full spectrum of algebraic geometry and symbolic computation.

Assignment

Polynomial systems, equivalently algebraic subvarieties, in a projective space have been extensively studied and there exist many tools to capture their geometry such as minimal free resolutions, syzygies or elimination ideals and matrices. When the ambient space is a product of projective spaces the study of polynomial systems is more delicate. Nevertheless, multi-projective polynomial systems appear in many situations and are of interest for both applied and theoretical purposes. Their study is a very active research area and this research program falls in this context.

The successful candidate, depending on his/her background and interests, will work on topics related to the study of algebro-geometric properties of elimination ideals (e.g. equations of Rees algebra, estimation of Castenuovo-Mumford regularity, etc), to the extension of the theory of multi-projective resultants and discriminants, with an eye on algorithmic aspects that bridge symbolic and numerical approaches as well as their software implementation.

Main activities

Responsibilities

- Conduct high-quality research in applied algebraic geometry, elimination theory, and symbolic-numeric computation.
- Develop and analyze new algorithms for solving algebraic systems using a mix of symbolic and numerical methods.
- Collaborate with other members of Inria and participate in interdisciplinary projects.
- Prepare research papers and present results at conferences and workshops.

Skills

Qualifications

- A Ph.D. in Mathematics, Computer Science, or a closely related field, with a strong focus on Algebraic Geometry, Computational Algebra, or Symbolic-Numeric Computation.
- Solid knowledge of elimination theory and experience with symbolic and numerical methods for solving algebraic systems.
- Proficiency in programming and familiarity with some computational algebra software (e.g., Macaulay2, Singular, Maple, or MATLAB), experience with C++ is a plus.
- Strong analytical skills and a track record of high-quality research publications. Excellent communication and teamwork skills.

Desirable Skills

- Experience in applying algebraic geometry and its computational aspects, with a view in numerical computations.
- Knowledge of modern algorithms in algebraic elimination, such as Gröbner bases or resultants.
- Experience working with hybrid symbolic-numeric methods, numerical algebraic geometry and software development in C++.

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
- Contribution to mutual insurance (subject to conditions)

Remuneration

Gross Salary : 2788 € per month

General Information

- **Theme/Domain** : Algorithmics, Computer Algebra and Cryptology
Scientific computing (BAP E)
- **Town/city** : Sophia Antipolis
- **Inria Center** : [Centre Inria d'Université Côte d'Azur](#)
- **Starting date** : 2025-01-01

- **Duration of contract** :12 months
- **Deadline to apply** :2024-12-15

Contacts

- **Inria Team** : [AROMATH](#)
- **Recruiter** :
Busé Laurent / Laurent.Buse@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 on the Inria website. Collecting applications by 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.