



Offer #2025-08817

PhD Position F/M Artificial intelligence and non-smooth mechanics for bridging scales in natural gravitational hazards

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

About the research centre or Inria department

The Inria Grenoble research center groups together almost 600 people in 24 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 (University Grenoble Alpes, CNRS, CEA, INRAE, ...), but also with key economic players in the area.

Inria Grenoble 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

The successful candidate will conduct interdisciplinary research bridging applied mathematics, mechanics, and granular physics at INRIA-TRIPOP and INRAE-ECRINS. The project addresses challenging problems in Granular Physics and Artificial Intelligence to better understand, model, and predict the dynamics of natural gravitational hazards, providing extensive opportunities for academic and

industrial career development. The appointment is part of a pending research grant.

TRIPOP (Inria Grenoble Rhône-Alpes, Laboratoire Jean Kuntzmann) team specialises in modelling, simulation, control of non-smooth dynamical systems, and data-driven modelling of complex materials.

ECRINS (INRAE, IGE) team specialises in gravity-driven natural hazards, aiming to improve understanding, prediction, and management of landslides, rockfalls, snow avalanches, and debris flows through integrated research approaches.

Supervisory team:

- Vincent Acary (INRIA-TRIPOP) vincent.acary@inria.fr
- Thierry Faug (INRAE-ECRINS) thierry.faug@inrae.fr
- Filippo Masi (INRIA-TRIPOP) filippo.masi@inria.fr
- Franck Bourrier (INRAE-ECRINS, INRIA-TRIPOP) franck.bourrier@inrae.fr

Assignment

Climate change intensifies gravitational hazards with increasing threats to safety and infrastructures. Traditional modelling approaches, relying on phenomenological parameterisations of the state space determined through human trial-and-error adjustments, fail to fully capture the complex, non-smooth, and multiscale rheology of granular systems. The project seeks to develop advanced physics- and data-driven models that accurately represent granular flows and their non-smooth dynamics, aided by high-fidelity simulations and available experimental datasets.

For more details, contact: filippo.masi@inria.fr

Main activities

As a PhD researcher, you will explore and develop Artificial Intelligence methods aimed at robust and high-fidelity modelling of granular systems and flows. You will focus on developing first-principled, data-driven models and advanced numerical simulations to enhance predictive accuracy.

The interdisciplinary research will integrate AI with physics and mechanics to advance scientific understanding of gravitational natural hazards and rheology. Outcomes will contribute to advancements with impact in the scientific community and the industry.

The appointment is for a duration of three years. The successful candidate will join the TRIPOP and ECRINS research groups within Inria and INRAE-IGE. Both groups provide an engaging, collaborative research environment with access to state-of-the-art computing resources, field and laboratory facilities, and numerous opportunities for professional development.

The position also includes opportunities to engage in academic activities, such as supervising Master's and undergraduate students.

Skills

Successful candidates should demonstrate strong scientific capabilities and high motivation. Fluency in spoken and written English is mandatory. The candidates will carry out research, develop tools, and write scientific articles in close collaboration with the supervisory team and the members of TRIPOP and ECRINS.

The candidate is expected to have:

- Background in Applied Mathematics or completed related coursework.
- Proficiency in programming (e.g., Python, C++).
- Knowledge of Machine Learning.

Highly appreciated qualifications include:

- Background in dynamics, mechanics, geomechanics, or geophysics.
- Passion for software development in computational mechanics.
- Teamwork and collaboration skills.

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 (90 days / year) 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
- Complementary health insurance under conditions

Remuneration

2 200 euros gross salary /month

General Information

- **Theme/Domain** : Optimization, machine learning and statistical methods
- **Town/city** : Montbonnot
- **Inria Center** : [Centre Inria de l'Université Grenoble Alpes](#)
- **Starting date** : 2025-09-01
- **Duration of contract** : 3 years
- **Deadline to apply** : 2025-05-18

Contacts

- **Inria Team** : [TRIPOP](#)
- **PhD Supervisor** :
Masi Filippo / filippo.masi@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

Highly motivated and suitable candidates should submit their application, containing a CV, a cover letter detailing interests and qualifications related to the position, an academic track record, and contact details of two reference professors. Selection will be based on the quality of the CV and motivation letter.

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

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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.