Offer #2025-08777

PhD Position F/M Compact mesh generation for geological models

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 centre at Université Côte d'Azur includes 42 research teams and 9 support services. The centre's staff (about 500 people) is made up of scientists of di?erent 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 regiona 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

This PhD proposal is part of a larger ”Defi” project between BRGM and INRIA. The candidate will
be integrated into a multidisciplinary team that includes members of both institutes. The candidate will work in the Titane research team of Inria, located at Sophia Antipolis, France.

Assignment

One of the fundamental challenges of geology is to understand the soil, the subsoil and its history, which makes it of great importance to society. Mapping the different types of underground rocks is the key to optimal access to water and natural resources. Knowledge of soils and their chemical composition is necessary to ensure the viability of certain plant species, and thus protect biodiversity. Finally, the study of the physics and history of landscapes improves our understanding of risks, which is key to anticipate and prevent landslides, floods, coastal erosion, etc.

One of the key challenges in the field for interactive visualization and physical simulation is to digitalize the soil and subsoil in 3D with explicit mesh-based representations. Acquired on site, geological knowledge is traditionally interpolated with implicit functions that predict the shape in the 3D space of various geological objects such as subsoil layers or faults. Mesh generation techniques are then used to create a mesh data structure that conforms to the zero value of implicit functions. These mesh generation techniques however suffer from several issues. They typically produce dense meshes, conform poorly to implicit surface intersections or discontinuities, and scale poorly to large scenes.

The main objective of this PhD is to design and implement solutions to the mesh generation problems mentioned above. In particular, the PhD candidate will investigate efficient and scalable algorithms that can produce lightweight 3D meshes whose cells conform to the implicit functions and their intersections. One of the main challenges will be to minimize the number of implicit function evaluations, as they often are computationally expensive.

More info about this job offer can be found at
https://team.inria.fr/titane/files/2025/03/PhD_offer_geological_models.pdf

Main activities

see assignments.

Skills

Technical skills and level required : good knowledge in computational geometry and/or geometry processing and/or applied mathematics, be able to program in C/C++, be fluent in English, and be creative and rigorous.

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:

1st year : 2200 € per month

2nd and 3rd year : 2300 €per month

General Information

- **Theme/Domain :** Interaction and visualization
  Scientific computing (BAP E)
- **Town/city :** Sophia Antipolis
- **Inria Center :** Centre Inria d'Université Côte d'Azur
- **Starting date :** 2025-10-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2025-04-27

Contacts

- **Inria Team :** TITANE
- **PhD Supervisor :**
  Lafarge Florent / Florent.Lafarge@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.