



Offer #2025-08785

PhD Position F/M PhD - Symmetry-driven computational framework for metamaterial design

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 Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Center is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Context

The recruited researcher will join a multi-disciplinary team involving established, **full-time research scientists** of all ages, MSc, PhD and postdocs (~30 ppl). The training programme intends to prepare candidates for scientific positions, either in academia or industry, by working in a research-intensive environment which fosters both scientific excellence (world-class researchers and over 65 prestigious ERC grants) and entrepreneurship (over 200 startups launched and a dedicated Inria Startup Studio). You will also have access to an extensive portfolio of training courses on digital science and technology, scientific programming or Artificial Intelligence. You will be recruited by Inria in the Beaulieu Scientific Campus of University of Rennes, Bretagne (France), a medium town (~220.000 inhabitants) close from Paris and from the sea, with an intense student life (25% of the

population). Rennes was ranked 1st city in France for quality of life and 8th most attractive city in Europe.

Assignment

This PhD project aims for an advance in the simulation and design of metamaterials - engineered structures with unique physical properties surpassing natural materials. It aims to develop automated finite element methods to enhance numerical modeling, focusing on precision and efficiency in simulations while enabling predictive design of adaptive systems. The research targets critical defense technologies, including stealth, cloaking, and wave manipulation, with applications spanning multispectral furtivity, dynamic resilience, and active wave modulation, relevant to both defense and civilian contexts.

Metamaterials leverage microstructural periodicity to control electromagnetic, acoustic, or mechanical waves, offering strategic capabilities like broadband signature reduction or shock absorption. Symmetry is central to this work and a key property of periodic structures that governs wave behavior. By exploiting symmetries, the project seeks to optimize computational performance and deepen insights into metamaterial functionality.

The supervising team is pioneering wave propagation methods for periodic structures and associated computational challenges, providing top-tier expertise. Integrating mathematics, computer science, finite element techniques, computer graphics and mechanics, the research addresses complex simulation demands. Potential impacts include stealth coatings for aircrafts, adaptive armors, predictive monitoring techniques, and wave-modulating systems for stealth.

Hosted in a leading research environment, this PhD offers a chance to drive metamaterial innovation with broad implications, collaborating with experts in wave-based computational methods.

Main activities

This PhD, focused on advancing metamaterial simulation through symmetry analysis, seeks motivated MSc (or soon-to-be) graduates with the following qualifications:

- **Graduation Topics:** Ideal candidates have backgrounds in computational mechanics, applied mathematics, and/or advanced scientific computing. Relevant MSc-level curricula include computational mechanics or physics, computer science, or finite element methods. Experience implementing numerical methods in high-level programming languages (e.g., Matlab, Python, Julia) is essential.
- **Academic Excellence:** A very good curriculum with top-class grades.

- **Computer Literacy:** Proficiency – and interest – in navigating advanced algorithms and theoretical concepts, with outstanding problem-solving capabilities.
- **Citizenship:** Candidates must have an EU citizenship, due to the defense-related scope of the project.
- Enthusiasm for computational modeling, metamaterials, symmetry-driven computational challenges in metamaterial design and innovative defense technologies.

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

2 200 per month

General Information

- **Theme/Domain :** Optimization and control of dynamic systems
Scientific computing (BAP E)
- **Town/city :** Rennes
- **Inria Center :** [Centre Inria de l'Université de Rennes](#)
- **Starting date :** 2025-10-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2025-06-01

Contacts

- **Inria Team :** [I4S](#)
- **PhD Supervisor :**
Droz Christophe / christophe.droz@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

Application & selection procedure:

- Submit your **initial application documents on this platform (see guidelines below)**.
- Applications will be screened on a rolling basis. Please submit your application as soon as possible: shortlisted candidates will be invited to an online interview.
- As soon as the best candidate has been identified, the offer will be removed from the application platform. The selected candidate will then be expected to provide some additional transcripts, diploma and references.
- The complete application documents will then be evaluated by the Defense Selection Committee. Final results will be communicated by **15/06/2025** and the PhD will begin in Oct. 2025.

Initial application documents:

- Field '**CV**': A detailed curriculum vitae (indicating your nationality and current country of residence).
- Field '**Motivation**': In one page or less, please outline your interest in this position and tell us about your most significant achievement.
- Field '**Recommendation**': A recent/MSc 2 academic transcript.
- Field '**Other documents**': Any additional document to support your application.

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.