Offre n°2022-04404

Development and application of high order finite element solvers for nanoscale light-matter interactions

Type de contrat : CDD

Contrat renouvelable : Oui

Niveau de diplôme exigé : Bac + 5 ou équivalent

Autre diplôme apprécié : Thèse

Fonction : Ingénieur scientifique contractuel

Niveau d'expérience souhaité : Jeune diplômé

A propos du centre ou de la direction fonctionnelle

The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center's staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) "Université Côte d'Azur (UCA)".

Contexte et atouts du poste

Atlantis is a joint project-team between Inria and the Jean-Alexandre Dieudonné Mathematics Laboratory at Université Côte d'Azur. The team gathers applied mathematicians and computational scientists who are collaboratively undertaking research activities aiming at the design, analysis, development and application of innovative numerical methods for systems of partial differential equations (PDEs) modelling nanoscale light-matter interaction problems. In this context, the team is developing the DIOGENeS [https://diogenes.inria.fr/] software suite, which implements several Discontinuous Galerkin (DG) type methods tailored to the systems of time- and frequency-domain Maxwell equations possibly coupled to differential equations modeling the behaviour of propagation media at optical frequencies. DIOGENeS is a unique numerical framework leveraging the capabilities of DG techniques for the simulation of multiscale problems relevant tonanophotonics and nanoplasmonics.

Mission confiée

The main objective of this assignement is to further enhance the capabilities of the DG-type high order finite element solvers developed in the framework of the DIOGENeS software suite, and to demonstrate the benefits of these solvers through the study of realistic uses cases pertaning to various applications of nanoscale light-matter interactions. In particular, the team is now actively collaborating with potential end-users of the DIOGENeS software suite who are raising various modeling issues that need to be addressed prior to simulating such realistic uses cases.

Principales activités

More precisely, the successful candidate will be assigned two main tasks. On one hand, he/she will develop new methodological functionalities in the various components of the DIOGENeS software suite. These new features are concerned with generic core properties of DG-type high order finite element methods for the system of time-domain and frequency-domain Maxwell equations coupled to appropriate differential models of the behaviour of nanostructured materials under optical illumination, and with the geometrical modeling of nanoscale devices involved in concrete applications. This part of the work will be conducted in close collaboration with Ph.D and postdoctoral fellows of the team who are currently investigating innovative finite element solvers for the solution of the PDE models relevant to nanophotonics and nanoplasmonics. On the other hand, he/she will be in charge of several numerical studies dealing with the concept of metasurfaces, which are at the heart of planar photonics also referred as flat optics or metaoptics. During the last decade, metasurfaces have been extensively studied due to their ability to precisely control the phase, amplitude, and wavefront of light. These light-matter interactions are mediated by ensembles of subwavelength meta-atoms, made of plasmonic or high dielectric refractive index materials, which have thicknesses within the range of the operating wavelength. Our team is currently engaged in several collaborations with researchers from academic laboratories and private companies, to exploit the DG-type high order finite element solvers of the DIOGENeS software suite for the design of metasurfaces. In particular, this position could lead to a permanent job with one of the team's industrial partners.

Compétences

Candidates will hold a Master degree or a PhD degree in applied mathematics/scientific computing or computational wave physics or computational photonics.

Required skills:
- Sound knowledge of numerical analysis and development of finite element type methods for computational physics;
- A concrete experience in numerical modeling for computational electromagnetics   will be an asset;

- Strong programming skills and exposure to object-oriented model;

- Knowledge and experience of Fortran 95/2000x and Python programming languages;

- Fluent spoken and written English.

Avantages

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Rémunération

Gross salary : between 2632€ and 2936€ (depends on the experience)

Informations générales

- **Thème/Domaine :** Schémas et simulations numériques
  Calcul Scientifique (BAP E)
- **Ville :** Sophia Antipolis
- **Centre Inria :** Centre Inria d'Université Côte d'Azur
- **Date de prise de fonction souhaitée :** 2022-04-01
- **Durée de contrat :** 12 mois
- **Date limite pour postuler :** 2022-08-31

Contacts

- **Équipe Inria :** ATLANTIS
- **Recruteur :**
  Lanteri Stéphane / Stephane.Lanteri@inria.fr

A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

Consignes pour postuler

Sécurité défense :
Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

Politique de recrutement :
Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.