



Offre n°2024-07134

Post-Doctorant F/H Modèles équivalents et méthode d'ordre réduit

Type de contrat : Fixed-term contract

Niveau de diplôme exigé : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Niveau d'expérience souhaité : Recently graduated

A propos du centre ou de la direction fonctionnelle

The Inria center at the University of Bordeaux is one of the nine Inria centers in France and has about twenty research teams. The Inria centre 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 SMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute...

Contexte et atouts du poste

The post-doc will be based in the Concace team, a joint venture between Cerfacs, Inria and Airbus, working on the use of modern programming techniques in HPC to produce composable software bricks. The team is at the crossroads of academic research, industrial research and end-user applications, aiming to transfer the developments made to end-users, whether Airbus or Cerfacs shareholders (Météo France, Total Energies, CNES, etc.).

Mission confiée

In industry in general, and at Airbus in particular, numerical simulation is widely used to model the sometimes complex behavior of certain physical phenomena. To speed up calculation, we try to use the coarsest possible mesh. In some cases, however, we are obliged to mesh locally very finely to obtain a correct result (e.g. in electromagnetism around slots, wires, small structural details, etc.).

The aim of this work is to replace these meshed areas with a few "equivalent" elements, so as to find a solution to the system that is close to the reference solution. This idea, which is quite old, is known as equivalent models; these models were obtained by simplifying the initial equation under particular conditions. For example, in electromagnetic cable modeling, if the radius of the cable is very small compared to the wavelength, Maxwell's equations can be simplified to an equation that can be solved numerically with far fewer unknowns.

The idea of this work is to find these equivalent models, not by simplifying the equation but by learning the equivalent behavior from reference simulation results. Initial results in 2D suggest that this technique can be extended to 3D and for more complex models. We propose to look at models in electromagnetism (the case of closely spaced cable assemblies for which no equivalent asymptotic models are available) and acoustics (the case of acoustic radiation through a complex fluid). In both cases, simulation codes exist, and research is carried out at the algebraic level. Knowledge of solved equations or underlying physics is not a prerequisite.

This work can be approached in successive increments, starting from a particular situation and extending the generalization step by step. For example, in electromagnetism, we'll probably go through the following stages:

1. the case of an insulated cable, where we focus on the interaction of one cable segment with another. This can be compared with an existing equivalent model.
2. the case of 2 distant cables, where the focus will be on the interaction of one cable on another.
3. the case of a set of closely spaced cables; the question here is whether to learn a model grouping all the cables together, or whether to make the individual models interact.
4. and finally, the case protected by a raceway.

Principales activités

Main activities:

- Bibliography and understanding of existing algorithms;
- Programming, testing and validating new methods;
- Carrying out industrial tests;
- Writing documentation, scientific reports and research articles;
- Presentations as part of the CONCACE project and at scientific conferences.

Additional activities if desired: teaching, internship supervision.

Compétences

Technical skills and level required: 5 years or more of higher education or equivalent, master's degree or engineering diploma + doctorate in applied mathematics or scientific computing.

Languages: the working language will be French or English, but English will be used frequently (with non-French-speaking team members/collaborators and written communication).

Interpersonal skills: enjoy working and interacting in a collaborative research environment, demonstrate curiosity and creativity.

Additional skills: writing scientific articles and public presentation of results.

Avantages

- 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 partial 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
- Social security coverage

Rémunération

gross monthly salary : 2788€ (before social security charges and income tax deduction)

Informations générales

- **Thème/Domaine** : Numerical schemes and simulations
Scientific computing (BAP E)
- **Ville** : Talence
- **Centre Inria** : [Centre Inria de l'université de Bordeaux](#)
- **Date de prise de fonction souhaitée** : 2024-04-01
- **Durée de contrat** : 2 years
- **Date limite pour postuler** : 2024-06-30

Contacts

- **Équipe Inria** : [CONCACE](#)
- **Recruteur** :
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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.

L'essentiel pour réussir

Candidates should be interested in digital sciences, numerical analysis, linear algebra and machine learning techniques. Working in a team, both locally and remotely, will be part of the daily routine of this job.

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

Please send the following documents :

- CV
- Cover letter
- Support letters

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.