# Offre n°2024-07770

## Post-Doctoral Research Visit F/M Large Physics Models

*Le descriptif de l'offre ci-dessous est en Anglais*

**Type de contrat :** CDD

**Niveau de diplôme exigé :** Thèse ou équivalent

**Fonction :** Post-Doctorant

**Niveau d'expérience souhaité :** Jusqu'à 3 ans

## A propos du centre ou de la direction fonctionnelle

*The Inria Saclay-Île-de-France Research Centre was established in 2008. It has developed as part of the Saclay site in partnership with Paris-Saclay University and with the Institut Polytechnique de Paris since 2021.*

*The centre has 39 project teams , 27 of which operate jointly with Paris-Saclay University and the Institut Polytechnique de Paris. Its activities occupy over 600 scientists and research and innovation support staff, including 54 different nationalities.*

## Contexte et atouts du poste

The TAU/A&O team is an Inria joint team with LISN (Laboratoire Interdisciplinaire des Sciences du Numérique), working on Machine Learning and data-based modeling. ML for Numerical Simulation is one of the pillars of TAU research program. In the frame of this project, the team will collaborate with Lionel Mathelin (Dataflot team at LISN) and Alexandre Allauzen (ESPCI). The former will provide his expertise on CFD numerical simulations, while the latter will share his expertise in developing large-scale transformers in the context of natural language applications. Collaboration with the DataMove Inria team is also envisioned, to help tackling the HPC challenges related to data generation and model training.

## Mission confiée

Data-driven ML methods have shown potential in reducing the computational costs of numerical simulations, but they often struggle with scalability and versatility. This project aims to develop a Foundational Large Physics Model for fluid simulations. This large model, based on the Transformer architecture, will be pre-trained to solve 3D simulations across various geometries and flow conditions, requiring only light fine-tuning to optimally adapt it to specific problems. Former members of the TAU team have conducted promising proof-of-concept experiments on challenging CFD datasets, but many challenges remain. We are seeking a highly motivated post-doctoral researcher to manage the operational aspects of the project, which includes:

- Familiarizing with existing solutions developed by the TAU team and studying state-of-the-art approaches that leverage large models for science.

- Managing the data generation process, including creating comprehensive training datasets from diverse CFD sources and augmenting these datasets with high-fidelity numerical simulations.

- Designing an efficient training strategy, potentially leveraging pre-training approaches from other large models.

- Evaluating the model's generalization capabilities when fine-tuned for several specific tasks, and its performance compared to other existing Machine Learning methods for solving partial differential equations.

## Principales activités

- Maintaining an up-to-date bibliography on the topic of ML for Numerical Simulations

- Conducting state-of-the-art research, including programming and model development.

- Participating to the team activities (seminars,

- Writing scientific papers.

- Presenting work at scientific conferences.

- Developing potential collaborations with academic and industrial partners.

## Compétences

The ideal candidate should:

- Hold a PhD in a related field such as Machine Learning, Computational Fluid Dynamics, Applied Mathematics, or Physics.

- Have experience with developing and training large-scale ML models.

- Possess strong programming skills (e.g., Python, PyTorch).

- Have the ability to conduct independent research as well as to collaborate within an interdisciplinary team

- Have experience in publishing scientific papers.

## 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 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

2788 € gross / month

## Informations générales

- **Thème/Domaine** : Optimisation, apprentissage et méthodes statistiques
Calcul Scientifique (BAP E)
- **Ville** : Orsay
- **Centre Inria** : Centre Inria de Saclay
- **Date de prise de fonction souhaitée** : 2024-08-01
- **Durée de contrat** : 2 ans
- **Date limite pour postuler** : 2024-07-31

## Contacts

- **Équipe Inria** : TAU (DGD-S)
- **Recruteur** :
Schoenauer Marc / Marc.Schoenauer@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.

## L'essentiel pour réussir

A deep interest in bridging the gap between the most recent generative AI / ML methods and large-scale numerical simulations.

**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.