



Offer #2024-08291

STAGE (Internship) - Hybrid neural PIC methods for Vlasov equations

Contract type : Internship agreement

Level of qualifications required : Graduate degree or equivalent

Fonction : Internship Research

Assignment

The Vlasov equation used to simulate the dynamics of weakly or strongly collisional plasma is a very expensive PDE to solve, as it is posed in 6 dimensions. One of the standard methods for solving it is the PIC method, which uses a large number of particles deposited on a grid to calculate their interaction with the field. Neural methods have shown good ability to deal with high-dimensional problems at low cost, but are not very accurate and have difficulty in dealing with the fine structures generated by the Vlasov equation. We therefore propose to couple a new neural method with a PIC method in order to maintain accuracy at low impact.

The method will be tested on more or less simple transport problems before being tested on linear and nonlinear Vlasov.

Main activities

Read the papers Neural methods (PINNs, Neural Galerkin)

- Read papers on PIC methods
- Valide the neural methods on some test cases
- Add the correction part based on PIC
- Validate the scheme on classical tests cases

Skills

- Python
- ML
- Numerical methods
- if possible basics on kinetic equations

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

4.35 €/hour

General Information

- **Theme/Domain** : Earth, Environmental and Energy Sciences
Scientific computing (BAP E)
- **Town/city** : STRASBOURG
- **Inria Center** : [Centre Inria de l'Université de Lorraine](#)
- **Starting date** : 2025-02-17
- **Duration of contract** : 6 months
- **Deadline to apply** : 2025-01-04

Contacts

- Inria Team : [MACARON](#)
- Recruiter :
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About Inria

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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.