Job description

Chaire de Professeur Junior
(Tenure-Track Professor position)
Innovative numerical methods and machine learning in the geosciences
École des Ponts, CEREA
Campaign 2023

École des Ponts ParisTech is opening a Chaire de Professeur Junior in the domain of machine learning in computational fluid dynamics for an appointment before the end of 2023. This recruitment is aimed at researchers with a strong potential, willing to participate in national, European, or international projects, and, in the longer term, to lead a research team.

Terms of recruitment

The terms of this recruitment are taken in application of the décret n° 2021-1710 of December 17, 2021 relating to the status of the Chaire de Professeur Junior. This position is offered as a 6-year tenure-track junior professorship, leading to a tenure as Full Professor (Research Director, DR2). The selection will be carried out by an international jury with a first selection based on the candidate's application file, followed by an audition of the candidates of the short list

This chair ensures a very favourable research environment. It includes a teaching assignment within the École des Ponts ParisTech (28 hours of lectures or 42 hours of practical or directed work per year) as well as an ANR funding (starting grant, 200 k€ over 6 years).

Conditions of enrolment

- There are no age nor nationality requirements to apply;
- The applicants should have PhD or equivalent degree, or with equivalent scientific qualifications and research work;
- The position is accessible to people with disabilities.

How to apply?

- Send your application as a single pdf file by email to cpj-2023-cerea@liste.enpc.fr no later than August 14, 2023 at 23:59 CEST.
- Additional documents (see detailed list in the application form) can be submitted at the following link as a single file named Firstname_Lastname.pdf: https://cloud.enpc.fr/s/baFMJiQoq9LMdrE
- Do not hesitate to contact Patrick Massin (Director of CEREA, patrick.massin@enpc.fr) to discuss the possible insertion in the scientific environment at CEREA.

Research Profile

Classical 3D-CFD atmospheric fluid modelling approaches allow a fine and much needed description of complex areas. But even by exploiting intensive computing tools, the resulting simulation times hamper their use at mesoscale, especially if one wishes response times close to real/emergency time, or to generate large simulation ensembles for uncertainty quantification. This scaling up can be addressed in several ways, using model reduction via physical analyses, traditional statistical techniques or machine learning, or the combination of these different approaches. Another objective of CEREA is to be able to integrate the physico-chemical processes that characterise reactive pollutants. Their modelling can indeed also require significant, and often prohibitive, computational times, which one may want to try to abate with the techniques mentioned before. The young Professor will therefore have the specific objective of tackling these two scientific issues. In particular, he/she will be able to rely on a set of open-source software for atmospheric modelling, through the Polyphemus (http://cerea.enpc.fr/polyphemus) and code_saturne (www.code-saturne.org) platforms to which CEREA contributes (in design and development), and on CEREA's recent developments in deep learning for surrogate modelling.

The young researcher will be keen to develop academic recognition at the highest international level and scientific independence to enable him or her to be appointed as Research Director by the end the 6-year period.

Teaching Profile

As part of her or his teaching assignment at École des Ponts, the junior Professor could be especially involved in the courses on fluid mechanics and energetics, atmospheric environment and air quality as well as numerical simulation, data assimilation and machine learning, with the objective of participating in the creation and being in charge of a course. The junior professor is expected to engage in the M2 Water, Air Pollution and Energies of which École des Ponts is a leading member in Île-de-France.

The junior professor will also be involved in teaching through the supervision of projects at École des Ponts as well as the supervision of master and doctoral students, and postdoctoral researchers.

Teaching in English will be possible. However, it is expected that the candidate will be able to teach in French after a few years.

Corresponding CNU sections: 60 (mechanics, civil engineering), 26 (applied mathematics), and 37 (meteorology, physical oceanography and physics of environment).

Presentation of École des Ponts

École des Ponts ParisTech is one of the most prestigious French engineering schools, with an excellent international scientific reputation. It trains high-level students with a solid background in mathematics, computer science and engineering sciences. A specific training is also dedicated to environment for its engineers. The school is co-lead of the prestigious Master Water, Air Pollution and Energies, the Master in energy transition and territories, the Master Soil Mechanics, Rocks and Constructions, the Master Sustainable Materials and Structures, the Master Multi-Scaling for Materials and Structures. In Applied Mathematics it is also the co-lead of several renowned mathematics masters in Paris such as the Master Mathematics, Vision, Learning (Master Vision Apprentissage), the Parisian Master in Operations Research and the Probability and Random Models Master. École des Ponts is placed under the responsibility of the Ministry in charge of sustainable

development and therefore actively investigates topics related to the Ministry's missions, including the environmental impact of transportations. These topics are at the heart of many academic and industrial projects at École des Ponts.

Presentation of the CEREA laboratory

CEREA is a research and training centre in atmospheric environment. Itis a joined lab between ENPC and EDF R&D. CEREA is a member of Pierre-Simon Laplace Institute for climate sciences in Île-de-France. It is structured with three poles: physics of atmospheric flow; physico-chemistry of atmospheric pollution; data assimilation, machine learning and inverse modelling. The laboratory has 10 faculty members, half of which having the Habilitation, 10 research engineers and around 20 PhDs or postdoctoral students.

Its research activities focus on air pollution and microclimate of the lower part of the atmosphere. They range from academic research in numerical modelling (CFD developments, dynamics of the atmospheric boundary-layer, aerosol modeling, data assimilation, machine learning, inverse modelling) to impact studies in relation with activities in the energy and transport sectors, and predictive models for the transport of reactive pollutants at regional or urban scales. This positioning allows the CEREA to maintain a strong research partnership with both academic and industrial partners, in France and abroad.

Indicators taken into account during the Chair period (during tenure-track)

- Quality and quantity of publications (scientific journals and conferences).
- Invitations or participation in recognised international conferences.
- Involvement in teaching (participation in courses, organisation of modules and courses, follow-up of projects and student internships).
- Academic and industrial partnership activities: participation in national or international projects, collaborations with renowned universities and academic partners, contracts with R&D departments of companies or public actors.
- Animation of research and supervision of young researchers.

Finally, the candidate is expected to be able to defend a Habilitation (Habilitation à Diriger des Recherches) in mechanics, mathematics, environmental sciences/geosciences and to apply for a grant from the European Research Council and/or the Agence Nationale de la Recherche within 5 years.