

# Call for applications for a Research & Teaching position in "Computational Mechanics augmented by scientific AI".

**MINES Paris - PSL**

**Affectation**

**CEMEF**

UMR CNRS/Ecole des Mines 7635

Sophia Antipolis, 06

## **1. RESEARCH AT MINES PARIS - PSL**

In line with its teaching/training activities, Mines Paris - PSL is developing a research activity that covers a very wide range of scientific disciplines. The eighteen research centers are organized into five departments: Earth and Environmental Sciences, Energetics and Processes, Mechanics and Materials, Mathematics and Systems, and Economics, Management and Society.

Research at Mines Paris - PSL aims for both academic excellence and socio-economic impact. This research-oriented model is developed in close interaction with the socio-economic world: private and public sector companies, as well as public institutions and administrations. Mines Paris - PSL is the number one school in France in terms of the volume of contract research carried out by Armines, the Mines Paris Foundation or Mines Paris - PSL. This original positioning has enabled the School to build up its teams and maintain unique experimental and digital platforms over the long term, the quality of which is recognized by its partners.

This ability of Mines Paris - PSL and companies to work together on ambitious scientific and industrial projects is recognized at both national and international levels: for 2020, let's mention the CNRS silver medal awarded to Tatiana Budtova, two ANR industrial chairs, the renewal of the Carnot label in 2016 (MESR), a 23rd-place ranking worldwide in the QS World University Rankings by Subject, and placements within the top 100, 150, and 300 of the Shanghai Ranking's Global Ranking of Academic Subjects in engineering.

## **2. THE CENTER FOR MATERIALS FORMING – CEMEF**

The position to be filled is at the Center for Materials Forming (CEMEF) (<https://www.cemef.minesparis.psl.eu/>), based at the Sophia Antipolis site of Mines Paris – PSL. CEMEF is a research center of Mines Paris – PSL, affiliated with the CNRS (Joint Research Unit CNRS, UMR7635). Research at CEMEF focuses on materials and their manufacturing processes in a broad sense, extending to other fields such as fluid

mechanics, solid mechanics, and biomechanics. The research combines experimental approaches with the development of multi-scale numerical simulation tools.

In the field of numerical methods, CEMEF has been developing advanced numerical techniques and their implementation in massively parallel finite element libraries for high-fidelity simulations for several years.

CEMEF (Mines Paris – PSL) aims to **strengthen its expertise in developing AI-augmented numerical methods in the field of solid mechanics and material forming**. These methods are expected to enhance both the formulation of finite element methods and the integration of recent AI approaches for processing data sequences.

To expand its Computational Solid Mechanics (CSM) research team, which currently includes five research professors and one research engineer, Mines Paris – PSL is opening a research position in AI-augmented computational mechanics.

### 3. CONTEXT

Computational modeling in solid mechanics, particularly tailored to material forming issues, is a historical and core focus of the laboratory. This work is characterized by the use of finite element methods and the development of numerical techniques designed to address large deformation problems in materials with nonlinear behaviors and evolving contacts.

Several finite element software have been developed in the laboratory, including Forge®. These software packages are not only industrial products distributed internationally, enabling collaborative research with numerous industry partners, but they also serve as tools for the sustainability and consolidation of innovative numerical methods developed by the CSM team.

### CSM TEAM

The CSM team's historical activities are part of this context, and have gradually expanded to include related and complementary topics: forming - in-service properties relationships, multiphysics couplings, multi-scale approaches to materials damage, fracture modeling, biomechanics applications, use of AI for solid mechanics, etc.

### 4. JOB DESCRIPTION

#### Research

The position focuses on the development of innovative numerical strategies dedicated to solid mechanics modeling in large deformations (plastic or hyperelastic). The

candidate must therefore be proficient in solving partial differential equations to model these problems using appropriate numerical methods for finite element applications.

The objective of this research is twofold:

- First, the aim is to develop new, more efficient numerical methods to address the complexity of the problems tackled by the group (complex loading paths in forming, multiphysics couplings, variety of mechanical behaviors, etc.) in a more effective and accurate way (reduction of computation time, new element types, improving accuracy for complex contact problems, etc.).
- Secondly, the goal is to explore forming processes modeling using numerical methods based on deep learning for structured data on graphs or point clouds.

A solid understanding of mechanical problems, especially the ability to comprehend and integrate complex nonlinear behaviors into models, is also an important skill for this position.

In addition to activities related to the CSM group, the candidate will also collaborate with other teams at CEMEF, where interactions between teams are a key strength of the laboratory.

### **Teaching**

The researcher will deliver theoretical and practical courses in finite element modeling, numerical methods, and scientific deep learning as part of the curriculum for Engineering students at Mines Paris, Post-master programs, and doctoral courses.

## **5. JOB PROFILE**

The candidate must hold a PhD in computational mechanics or applied mathematics and demonstrate some or all of the following skills:

- Proficiency in linear algebra, applied mathematics, and high-performance computing (HPC) for solid mechanics problems
- Skills in the development of finite element methods in an HPC context
- Expertise in nonlinear mechanics and material behavior under thermomechanical loads
- Knowledge in deep statistical learning on structured data such as graphs (particularly meshes), tensors, or high-dimensional data sequences
- Experience with convolutional neural networks or Transformers is a plus

The position is open to both experienced researchers and early-career candidates with strong potential and the ability to develop high-level academic research in a dynamic and demanding industrial context.

## 6. APPLICATION PROCEDURE

The application file should include:

- A detailed Curriculum Vitae
- A list of works and publications
- A cover letter
- A proposal outlining the candidate's plan for integrating into the position's responsibilities
- Two or three letters of recommendation to be sent directly to us by the referees chosen by the candidate.

If the letters are not yet available, please provide at least the names and contact information of three scientists who can be contacted for an evaluation of the candidate's work and skills.

***The application must be submitted by 15/07/2025 at the following address :***

MINES Paris – CEMEF  
Rue Claude Daunesse  
BP 207  
06904 Sophia Antipolis cedex, France  
à l'attention du directeur du CEMEF  
Prof. Elie Hachem  
e-mail : [elie.hachem@minesparis.psl.eu](mailto:elie.hachem@minesparis.psl.eu)

For any administrative inquiries:

Madame Coralie Fischer

e-mail : [coralie.fischer@minesparis.psl.eu](mailto:coralie.fischer@minesparis.psl.eu)

For questions regarding courses in finite element modeling and scientific deep learning

Prof. David Ryckelynck

Email : [david.ryckelynck@minesparis.psl.eu](mailto:david.ryckelynck@minesparis.psl.eu)

For any questions regarding the research team:

Prof. Katia Mocellin

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