

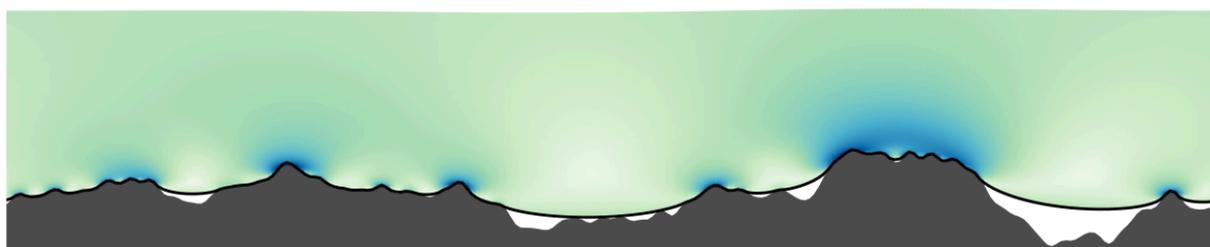
Postdoctoral research position: Developing a high-performance method for rough contact mechanics of solids undergoing finite strains

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Duration 12 - 18 months

Starting date January 2026

Place Institut Jean le Rond d'Alembert, Sorbonne Université, Paris, France

Keywords rough contact, Fourier-based methods, large deformation

Description

We are seeking a highly motivated postdoctoral researcher to join a collaboration between Institut Jean le Rond d'Alembert (Sorbonne University) and Centre des Matériaux (Mines Paris PSL) on the development of a next-generation simulation method tailored to contact of rough surfaces with solids undergoing large strains.

The project builds upon methods from rough-surface contact mechanics, from finite elements and from Fourier-based micromechanical homogenization methods to elaborate a new simulation method capable of modeling solids under finite strains in contact with random multi-scale self-affine rough surfaces with large spectra. Implementation of the method will be conducted in the state of the art open-source contact library [Tamaas](#).

Research objectives

- adapting existing Fourier-based Green's function methods to the computation of equilibrium of a half-space undergoing large strains;
- developing a highly-efficient contact detection and projection approach suited for rough surfaces;
- combining the above techniques into a robust scheme to solve the contact problem;
- applying the method to the friction force resulting from asperity interlocking.

Methods and tools

- Fourier-based Green's function methods,
- Node-to-segment contact methods,

- Unilaterally constrained optimization,
- modern C++ and Python.

Candidate profile

- PhD in mechanics, tribology, material science, applied mathematics, physics or related fields.
- Strong background in the development of numerical methods for partial differential equations and high-performance computing.
- Strong familiarity with C++ and Python, and motivation to contribute to the open-source ecosystem.
- Excellent communication skills and ability to work in a team.

Opportunities

The postdoctoral researcher will gain expertise in simulation techniques used in tribology and micro-mechanical heterogeneous modeling. International collaborations in Switzerland (Lausanne, Zürich) and Germany (Freiburg) are possible, as well as comparison to experimental data from Laboratoire de Tribologie et Dynamique des Systèmes in École Centrale de Lyon. This position will also provide opportunities to publish high-impact papers in both the computational mechanics and tribology communities.

Application process

Candidates are invited to contact:

- lucas.frerot@sorbonne-universite.fr,
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with the following documents:

- a resume (CV) with a list of publications,
- a statement of research interests,
- contact information of two references.

Relevant publications

1. L. Frérot, M. Bonnet, J.-F. Molinari, and G. Anciaux, "A Fourier-accelerated volume integral method for elastoplastic contact," *Computer Methods in Applied Mechanics and Engineering*, vol. 351, pp. 951–976, July 2019, <https://doi.org/10.1016/j.cma.2019.04.006>.
2. Schneider, Matti. 2021. "A Review of Nonlinear FFT-based Computational Homogenization Methods." *Acta Mechanica* 232 (6): 2051–2100. <https://doi.org/10.1007/s00707-021-02962-1>.
3. Yastrebov, V. A. 2013. *Numerical Methods in Contact Mechanics*. ISTE/Wiley