

Post-Doctoral Fellowship on “Multiscale problems and Homogenization: Theoretical and Computational issues”

Ecole des Ponts & Team-project Matherials at Inria
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Applications are invited for a postdoctoral fellowship to work on the development of theoretical tools and efficient computational approaches in the context of multiscale materials.

Computing the homogenized properties of heterogeneous materials is a challenging issue. Our research team has a solid experience in contributing to the theoretical foundations of such problems and the improvement of such computations. A specific context of interest is that of periodic media that have embedded defects. Taking those into account into the homogenization theory has lead to several non-trivial mathematical developments (see e.g. [1]).

From a more numerical viewpoint, several computational approaches have been introduced to handle the case of multiscale materials. Our research team has a long-term experience in the development of those approaches (see e.g. [2, 3]), which are often based on finite elements that are adapted to the precise microstructure of the media, in order to appropriately encode the fine-scale features.

The post-doc position will address some of the many relevant aspects, at the intersection between recent theoretical developments on non periodic homogenization problems and (multi-scale) finite element approaches. The focus of the work will be made precise considering the profile of the candidate and the various research efforts ongoing in the team at the time of application.

The candidate will be expected to have a PhD in applied mathematics with a focus either on homogenization theory or on computational techniques for engineering problems, a good publication record and/or a solid expertise in programming.

Keywords: Homogenization, multi-scale problems, Model reduction, Finite element methods.

Supervision: Claude Le Bris and Frédéric Legoll (Ecole Nationale des Ponts et Chaussées and Inria Matherials project-team). A scientific collaboration with Alexei Lozinski, University of Besançon and partly on leave at Inria Paris, could be part of the project.

Location: The successful candidate will take up the position as soon as possible and will be based at Ecole des Ponts, 77455 Marne La Vallée (RER A, station Noisy-Champs) and/or Inria Paris, rue Simone Iff, 75012 Paris (RER A, station Gare de Lyon, and Métro 6, station Dugommier).

See <https://team.inria.fr/matherials/> for more details on the location and activities of our research team. The work is partly supported by EOARD under Grant FA8655-20-1-7043 and ONR under Grant N00014-20-1-2691.

References

- [1] X. Blanc, C. Le Bris and P.-L. Lions, *On correctors for linear elliptic homogenization in the presence of local defects*, Communications in P. D. E., vol. 43, No. 6, pp. 965-997, 2018.
- [2] C. Le Bris, F. Legoll and F. Madiot, *A numerical comparison of some MsFEM-type approaches for advection dominated problems in heterogeneous media*, M2AN, vol. 51, No. 3, pp. 851-888, 2017.
- [3] C. Le Bris and F. Legoll, *Examples of computational approaches for elliptic, possibly multiscale PDEs with random inputs*, J. Comp. Phys., vol. 328, pp. 455-473, 2017.