

MARTIN AVERSENG

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RESEARCH POSITIONS

Université d'Angers, Faculté des sciences, LAREMA *Since 1st Oct. 2023*
Chargé de Recherche.

POST-DOCTORAL POSITIONS

University of Bath, Department of Mathematical Sciences *Sept. 2022 - Sep. 2023*
Post-doc, under the supervision of E. A. Spence.

ETH Zurich, Seminar for Applied Mathematics *Sept. 2020 - Aug. 2022*
Post-doc, under the supervision of R. Hiptmair.

Laboratoire Jacques-Louis Lions, Inria Alpines team, Paris *Jan. 2020 - June 2020*
Post-doc, under the supervision of X. Claeys.

CMAP, Ecole Polytechnique *Nov. 2019 - Dec 2019*
Post-doc, under the supervision of F. Alouges

EDUCATION

CMAP, Ecole Polytechnique, Palaiseau *Sept. 2016 - Dec. 2019*
PhD thesis in applied mathematics:
Efficient methods in acoustic scattering in 2D and 3D
Preconditioning on singular domains and fast convolution. Direction: François Alouges.

Université Pierre et Marie Curie, Paris *Sept. 2015 - July 2016*
Master's degree, Numerical analysis of partial differential equations.
4-month research internship in Numerical Analysis, CMAP, Ecole Polytechnique
Under the supervision of F. Alouges (14/03/2016 - 31/07/2016)

IRCAM, Paris *Sept. 2014 - July 2015*
Master's degree, Acoustics, signal processing, computer science applied to music.
6-month research internship in behavioral neurosciences at ENS Ulm
Under the supervision of Shihab Shamma (28/03/2015 to 23/08/2015)

Ecole Polytechnique, Palaiseau *Sept. 2011 - July 2014*
Major in applied mathematics.
Minors in quantum and statistical physics, continuum mechanics
5-month Research internship in vibro-acoustics at ESI Group, San Diego
Under the supervision of Bryce Gardner, (March-July 2013)

Lycée Sainte-Geneviève *Sept. 2009 - July 2011*
Ecole Préparatoire, MPSI/MP
Preparation to the competitive exams for the French engineering schools.

PUBLICATIONS

- Averseng, M., Galkowski, J. and Spence, E. A.: Local errors and local meshing in the Helmholtz h-FEM for trapping problems *In Preparation*.
- Averseng, M., Claeys, X. and Hiptmair, R.: Boundary Element Methods for the Laplace Hypersingular Integral Equation on Multiscreens: a two-level Substructuring Preconditioner.
Preprint: <https://arxiv.org/abs/2310.09204>.

- Averseng, M., Galkowski, J. and Spence, E. A.: Helmholtz FEM solutions are locally quasi-optimal modulo low frequencies *Submitted to Math. Comp.*
Preprint: <https://arxiv.org/abs/2304.14737>.
- Averseng, M., Claeys, X. and Hiptmair, R.: Boundary Element Methods for the Hypersingular Integral Equation on Multiscreens: a two-level substructuring preconditioner. *In preparation*
- Averseng, M.: A stable and jump-aware projection onto a discrete multi-trace space. *Submitted to SINUM*. (2022).
Preprint: <https://arxiv.org/abs/2211.08223>.
- Averseng, M.: Stability of a weighted L^2 projection in a weighted Sobolev norm. Accepted for publication. *Comptes Rendus Mathématique* (2022).
Preprint: <https://math.ethz.ch/sam/research/reports.html?id=1021>.
- Averseng, M., Claeys, X. and Hiptmair, R.: Fractured Meshes. Accepted for publication in *FINEL* (2022).
Preprint: <https://arxiv.org/abs/2212.14222>.
- Alouges, F. and Averseng, M.: Quasi-local and frequency robust preconditioners for the Helmholtz first-kind integral equations on the disk. *Submitted to M2AN*. (2022).
Preprint: <https://math.ethz.ch/sam/research/reports.html?id=1020>.
- Alouges, F. and Averseng, M.: New preconditioners for the Laplace and Helmholtz integral equations on open curves. *Numerische Mathematik* 148, 225-292 (2021).
Link: <https://doi.org/10.1007/s00211-021-01189-5>
- Averseng, M.: Pseudo-differential analysis of the weighted layer potentials for the Laplace and Helmholtz integral equations on open curves. Submitted to *Integral Equations and Operator Theory*.
Preprint: <https://arxiv.org/abs/1905.13604>.
- Averseng, M.: Fast discrete convolution in R^2 with radial kernels using non-uniform fast Fourier transform with nonequispaced frequencies. *Numerical Algorithms* 83(1), 33-56 (2019).
Link: <https://doi.org/10.1007/s11075-019-00670-5>.
- Bagur, S., Averseng, M., Elgueda, D., David, S., Fritz, J., Yin, P., Shamma, S., Boubenec, Y. and Ostojic, S. (2018). Go/No-Go task engagement enhances population representation of target stimuli in primary auditory cortex. *Nature Communications*, 9(1), 1-16.
Link: <https://doi.org/10.1038/s41467-018-04839-9>.

SOFTWARE DEVELOPMENT

- Matlab/C++ prototype for 3D BEM simulations on multi-screens, and domain decomposition preconditioning.
<https://github.com/MartinAverseng/multi-screen-bem3D-ddm>
- Matlab toolbox for square-root preconditioners on screens in 2D and 3D.
<https://github.com/MartinAverseng/sqPrecondOpenCurves> (2D)
<https://github.com/MartinAverseng/SqPrecondDiskScreen> (3D).
- Matlab implementation for generalized meshes, including fractured meshes and polygonal multi-screens in FEM simulations.
<https://github.com/MartinAverseng/frackMeshLib>.
- Domain decomposition and parallel computation of local errors for large-scale high-frequency scattering problems (FreeFem++).
https://github.com/MartinAverseng/local_go_experiments
- Matlab toolbox for fast convolution by (gradients of) radial kernels in R^2 .

TALKS IN CONFERENCES AND SEMINARS

- *Hypersingular integral equations in non-manifold geometries: a preconditioning method by iterative substructuring*. Invited talk at the 28th International Domain Decomposition Conference in January 2024. In Mini-symposium "Novel Solution Techniques: Theory and Applications" organized by Blanca Ayuso De Dios and Suzanne Brenner.
- *Méthode des éléments finis appliquée à la propagation d'ondes haute-fréquence : des maillages non-uniformes définis par la dynamique des rayons*. . Invited talk in November 2023 at the team seminar of the IDEFIX team of INRIA, ENSTA Paris-Saclay.
- *Local error analysis in the Finite Element Method for high-frequency wave-propagation problems*. Prize talk at the UKAN+ Mathematical Acoustics Workshop at UCL 18-19 September 2023 (5 finalists).
- *Is the FEM error smaller away from the scatterer than near it for high-frequency Helmholtz problems with trapping?*. Talk at the conference PoWER2023, Torino, July 2023.
- *Fractured Meshes*. Poster at the Journées Singulières, Nice, 2022.
- *Singular geometries, DtN map and preconditioning*. Numerical analysis seminar, University of Bath, Oct. 2022.
- *An algorithm for fast convolution by radial kernels*. Swiss Numerics Day 2022.
- *Singularités et preconditionnement en BEM*. Rencontres JCJC ondes 2020.
- *Preconditioners for integral equations on screens*. Oberwolfach workshop, "Boundary Element Methods", 2020.
- *Preconditioning Helmholtz integral equations on singular geometries*. Fast Boundary Element Methods in Industrial Applications, Sollerhaus, October 2020.
- *Éléments finis de frontière sur des domaines singuliers*. 9ème Biennale des Mathématiques Appliquées et Industrielles, May 2019.
- *New preconditioners for the Helmholtz integral equation on screens*. Fast Boundary Element Methods in Industrial Applications, Sollerhaus, April 2019.
- *Numerical resolution of boundary integral equations on some domains with singularities*. 14th International Conference on Mathematical and Numerical Aspects of Wave Propagation. Vienna, 2019.
- *Task-driven A1 plasticity in the temporal domain during performance of a click-rate discrimination task*. Poster at ARO 39th MidWinter Meeting. San Diego, February 2016.

OTHER ATTENDED CONFERENCES

- At the Interface between Semiclassical Analysis and Numerical Analysis of Wave Scattering Problems, Oberwolfach workshop, Sept. 2022
- Wave propagation in complex domains, UCL, March 2017.
- New trends in Integral Equations. Ecole Polytechnique, Feb. 2016.

COURSE ORGANIZER

- Computational Methods for Quantitative Finance: PDE Methods (Spring 2021). Master's course, ETH Zurich.

TEACHING ASSISTANT

- High-Performance Computing Lab for CSE (Spring 2022). Bachelor course, ETH Zurich. Organized by Olaf Schenk and Roger Käpelli.
- At the Interface Between Semiclassical Analysis and Numerical Analysis of Wave-Scattering Problems (Winter 2021, [course link](#)). Post-doctoral lecture at ETH Zurich. Lectures by visitor professor E. A. Spence (University of Bath).
- Optimisation linéaire et convexité. Third year of License, Jussieu (Spring 2020). Organized by Pauline Tan
- Computational mathematics. First year Bachelor at Ecole Polytechnique (Spring 2019). Organized by Aline Lefebvre-Lepot.
- Tutoring for students in second year for applied mathematics courses, Ecole Polytechnique (2018).

SCIENTIFIC DIFFUSION

- Co-organizer of *La tournée de Pi* in 2017, a musical show about mathematics, interlaced with mathematical recreatory talks, which toured in Paris, Lyon and Marseille, totaling almost 2000 spectators.