Frédérique LECOURTIER

PhD student
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Research interests

Scientific computing · Physics-informed machine learning · Numerical analysis · Finite element methods · Hybrid solvers · Partial differential equations · Error estimation

Education

2023 - ... **PhD** in Applied Mathematics, *University of Strasbourg*, France
Team: Mimesis, Inria Center at the University of Lorraine.
Supervised by: Emmanuel Franck, Michel Duprez and Vanessa Lleras.

2021 - 2023 **Master** in Scientific Computing and Mathematics of Information (CSMI), *University of Strasbourg*, France - Honors

2018 - 2021 **Bachelor** in Applied Mathematics, *University of Strasbourg*, France - Honors

2018 **Scientific Baccalaureate**, *Lycée LeCorbusier*, Illkirch, France

Experience

2023 - ... **PhD** in Applied Mathematics, *Mimesis*, Strasbourg, France

Python | PyTorch | Jax | FEniCSx | ScimBa

Subject: Finite element methods and neural networks for augmented surgery.
Objectives:

- Develop hybrid methods combining finite element methods and neural networks to solve parametric PDEs.

- Develop scientific machine learning methods in ScimBa (a Python library under development in the Macaron Inria team) for solving parametric PDEs.

🔗 GitHub repository.

2023
(6 months) **Internship**, *Mimesis*, Strasbourg, France

Python | Tensorflow | PyTorch | FEniCS | GitHub | VSCode

Subject: Finite element methods and neural networks for augmented surgery.
Supervised by: Emmanuel Franck, Michel Duprez and Vanessa Lleras.
🔗 GitHub repository.   🔗 Report.

2022
(2 months) **Internship**, *Cemosis*, Strasbourg, France

C++ | Python | MPI | Feel++ | Antora | Sphinx | Doxygen | VSCode | CMake

Subject: Parareal method for solving the heat equation in Feel++.
Supervised by: Christophe Prudhomme and Luca Berti.
Objectives:

- Understand and implement the Parareal method in Python and C++, a parallel-in-time integration method.

- Implement the heat equation solver in Feel++ (a C++ library developed by the Cemosis team, IRMA).

🔗 GitHub repository.   🔗 Report.

Publications

2026   H. Barucq, M. Duprez, F. Faucher, E. Franck, <u>F. Lecourtier</u>, V. Lleras, V. Michel-Dansac, N. Victorion. **Enriching continuous Lagrange finite element approximation spaces using neural networks**. Mathematical Modelling and Numerical Analysis (M2AN). (pdf), (preprint [arXiv, HAL])

Conferences, presentations and posters

2026
29 June-3 July
SciCADE 2026, *George Square campus*, Edinburgh, United Kingdom
🔗 Website.

2025
17 December
PhD seminar, *IMAG Institute*, Montpellier, France
🔗 Website.   🔗 Presentation.

2025
13-18 July
ICOSAHOM 2025, *McGill University*, Montreal, Canada
🔗 Website.   🔗 Presentation.

2025
24-26 March
EMS-TAG-SciML-25, *Polytechnic University of Milan*, Milan, Italy
🔗 Website.   🔗 Poster.

2025
17-21 February
DTE & AICOMAS 2025, *Arts et Metiers - ENSAM*, Paris, France
🔗 Website.   🔗 Presentation.

2024
28-30 October
CJC-MA 2024, *Ecole Normale Superieure de Lyon*, Lyon, France
🔗 Website.   🔗 Poster.

2024
8-12 July
SciML 2024, *UFR de mathématique et d'informatique*, Strasbourg, France
🔗 Website.   🔗 Poster.

Teaching experience

2025 - 2026   **Teaching assignment**, *UFR de mathématique et d'informatique*, Strasbourg, France
50 h of computer science labs - L1 (Python) / L2 (Python).
14 h of integrated lectures in computer science - L2 (Python).

2025   **Rendez-vous des Jeunes Mathématiciennes et Informaticiennes (RJMI)**, *UFR de mathématique et d'informatique*, Strasbourg, France
Supervision of research workshops for a group of high school students as part of the RJMI event (3-day event).

2024 - 2025   **Teaching assignment**, *UFR de mathématique et d'informatique*, Strasbourg, France
64 h of computer science labs - L1 (Python) / L2 (Python) / L3 (C++).

2023 - 2024   **Teaching assignment**, *UFR de mathématique et d'informatique*, Strasbourg, France
50 h of computer science labs - L2 (Python) / L3 (C++).

Skills

GitHub · Python · C++ · C · Rust · LaTeX · PyTorch · JAX · ParaView · Gmsh · FEniCS

References

PhD advisor:
Emmanuel Franck : emmanuel.franck@inria.fr

PhD co-supervisors:
Michel Duprez : michel.duprez@inria.fr
Vanessa Lleras : vanessa.lleras@umontpellier.fr

Collaborator:
Victor Michel-Dansac: victor.michel-dansac@inria.fr