Thomas Saigre, PhD

Post-doctoral researcher at INRIA
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Employment History

2025 – present **Postdoctoral researcher,** INRIA in the project-team Mimesis based in Strasbourg. Working on the Premyom project (Management and Slowdown of the Myopia Epidemic through Medical Optics).

2024 – 2025 **Research Engineer,** Cemosis, Institut de Recherche Mathématique Avancée, Université de Strasbourg. Part of the Exa-MA project of the PEPR NumPEx, working on discretization methods for Exascale simulations.

2021 – 2024 **PhD. student,** Institut de Recherche Mathématique Avancée, Université de Strasbourg.

Education

2021 – 2024 **Ph.D., Université de Strasbourg,** Institut de Recherche Mathématique Avancée.
Thesis title: *Mathematical modeling, simulation and reduced order modeling of ocular blood flows and their interactions: Building the Eye's Digital Twin.*

2019 – 2021 **Master Calcul Scientifique et Mathématiques de l'Information,** Université de Strasbourg. (Mention Très Bien)
Data processing, learning algorithms, Signal processing, Modeling / Simulation / Optimization, High performance computing

2017 – 2021 **Magistère de Mathématique,** Université de Strasbourg. (Mention Bien)

2015 – 2017 **Classe Préparatoire aux Grandes Écoles,** Lycée Camille Guérin, Poitiers.
MPSI/MP* (Mathématiques, Physique et Sciences de l'Ingénieur)

Teaching

2021 – 2024 **Scientific Computing,** Université de Strasbourg, L2
Tutorial, practical work in Python.

Cercle Mathématique de Strasbourg.
Structure for high-school students taking place in the laboratory once a week.

2021 – 2022 **Applied numerical analysis,** Université de Strasbourg, L2
Tutorial, practical work in Scilab.

2021, 2024, 2025 **Khôlles of Mathematics,** Université de Strasbourg and Lycée Kléber, L1 / L2 / MPSI

Research Publications

Journal Articles

1 T. Saigre, V. Chabannes, C. Prud'homme, and M. Szopos, "Mathematical modeling and simulation of coupled aqueous humor flow and temperature distribution in a realistic 3d human eye geometry," *International Journal for Numerical Methods in Biomedical Engineering*, vol. 42, no. 1, e70132, 2026. DOI: https://doi.org/10.1002/cnm.70132.

2. P. J. Hossie, B. Laroche, T. Malou, L. Perrin, T. Saigre, and L. Sala, "Surrogate modeling of interactions in microbial communities through Physics-Informed Neural Networks," *ESAIM: Proceedings and Surveys*, vol. 81, D. Auroux, M. Campos Pinto, B. Després, V. Dolean, S. Lanteri, and V. Michel-Dansac, Eds., pp. 104–122, 2025, ISSN: 2267-3059. DOI: 10.1051/proc/202581104.

3. T. Saigre, C. Prud'homme, and M. Szopos, "Model order reduction and sensitivity analysis for complex heat transfer simulations inside the human eyeball," *International Journal for Numerical Methods in Biomedical Engineering*, vol. 40, no. 11, e3864, 2024. DOI: https://doi.org/10.1002/cnm.3864.

PhD Theses

1. T. Saigre, "Mathematical modeling, simulation and reduced order modeling of ocular flows and their interactions: Building the Eye's Digital Twin," Theses, Université de Strabourg, Dec. 2024. URL: https://theses.hal.science/tel-04813671.

Pre-prints

1. S. Bertoluzza, C. Prud'homme, T. Saigre, and M. Szopos, "Low to high order finite element resolution for elliptic problems in the presence of a Dirac source term," In preparation, Jun. 2024.

Peer reviewed conference proceedings

1. T. Saigre, V. Chabannes, G. Guidoboni, C. Prud'homme, M. Szopos, and S. P. Srinivas, "Effect of Cooling of the Ocular Surface on Endothelial Cell Sedimentation in Cell Injection Therapy: Insights from Computational Fluid Dynamics," in *Investigative Ophthalmology & Visual Science*, vol. 66, Jun. 2025, pp. 2921–2921. URL: https://iovs.arvojournals.org/article.aspx?articleid=2804368.

2. T. Saigre, C. Prud'Homme, M. Szopos, and V. Chabannes, "A coupled fluid-dynamics-heat transfer model for 3D simulations of the aqueous humor flow in the human eye," in *8th International Conference on Computational and Mathematical Biomedical Engineering – CMBE2024 Proceedings*, P. Nithiarasu and R. Löhner, Eds., Arlington (Virginia), United States, Jun. 2024. URL: https://www.compbiomed.net/2024/cmbe-proceedings.htm.

Skills

Applied Mathematics

- Modelling: Partial differential equations, ordinary differential equations, optimization, control theory …
- Simulation: Finite element method, reduced order modelling, sensitivity analysis …

Coding

- Python: NumPy, Plotly, PyTorch, TensorFlow, Keras …
- C/C++: Standard library, MPI, …
- Other: LaTeX, Julia, OCaml …

Miscellaneous Experience

- 2024-present: Member of the representative committee of young researchers in NumPEx.
- 2022-2023: Co-organizer of the **PhD seminar** at IRMA.
- Member of the **Young Researcher Committee** of the ITI IRMIA++.

Miscellaneous Experience (continued)

TFJM²

2026 – 2018 — Member of the Local Organization Committee of the **Tournoi Français des Jeunes Mathématiciennes et Mathématiciens** 2026, 2025, 2023, 2021 and 2018.

2024, 2023 — Supervision of the team Cercle Mathématiques de Strasbourg.

Scientific animation and mediation

2024, 2023 — Supervision of a research workshop at **Rendez-vous des Jeunes Mathématiciennes et Informaticiennes** in Strasbourg.

2023, 2022 — **Fête de la science :** Animation of the Enig'maths course and the IRMA stand on the cube and its bosses.