Thomas Saigre, PhD

Research Engineer at Université de Strasbourg

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Employment History

2024 – present   🔖 **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   🔖 **Khôlles of Mathematics,** Université de Strasbourg and Lycée Kléber, L1 / MPSI

Research Publications

Journal Articles

1 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," Jan. 2025, To appear in *ESAIM: Proceedings and Surveys*. 🔗 URL: https://hal.inrae.fr/hal-04440736.

2 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 Strasbourg, Dec. 2024. 🔗 URL: `https://theses.hal.science/tel-04813671`.

Pre-prints

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," 2025.

2   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," working paper or preprint, Feb. 2025. 🔗 URL: `https://hal.science/hal-04918559`.

3   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, 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++.

TFJM²

2023, 2021, 2018	🔖	Member of the Local Organization Committee of the **Tournoi Français des Jeunes Mathématiciennes et Mathématiciens**.
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.

Miscellaneous Experience (continued)

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