

Thomas Guilmeau

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<https://tguilmeau.github.io/>

I am a PhD student working on the study and design of sampling-based schemes in variational inference, adaptive importance sampling, and global optimization. I do so using ideas from information geometry and non-Euclidean optimization. I also study the behavior and control of biological models.

EDUCATION

PhD in applied mathematics, *Université Paris-Saclay, INRIA, CentraleSupélec* October 2021 - present
Stochastic algorithms for global optimization. Part of the project ERC MAJORIS. Under the supervision of E. Chouzenoux and V. Elvira.

MSc in applied mathematics, *Université Paris-Saclay* 2018 - 2020
M2 Optimization: optimal control, continuous optimization (theoretical and numerical aspects), stochastic optimization, game theory, calculus of variations, and tropical algebra.

Engineering degree, *ENSTA Paris, Institut Polytechnique de Paris* 2017 - 2020
Major in applied mathematics: discrete and continuous optimization, control theory, statistics, probability, dynamical systems, and partial differential equations.

EXPERIENCES

Research stay, *School of Mathematics, UoE, Edinburgh, Scotland* February 2023 - May 2023
Exploration of the connections between variational inference and adaptive importance sampling and design of novel adaptive importance sampling algorithms. With V. Elvira and N. Branchini.

Research engineer, *OPIS team (INRIA), Palaiseau, France* December 2020 - September 2021
Stochastic algorithms for global optimization. Part of the project ERC MAJORIS. Under the supervision of E. Chouzenoux and V. Elvira.

Research engineer, *LBE (INRAE), Narbonne, France* October 2020 - November 2020
Development of a Matlab code to simulate metabolic transitions in microbial populations. Part of the projects HME 3BCAR and ANR JANUS.

Master thesis, *INRAE, Montpellier, France* April 2020 - September 2020
Optimal periodic control, with applications to the chemostat model and water bioremediation processes. Under the direction of A. Rapaport.

Research intern, *UTFSM, Valparaíso, Chile* May 2019 - August 2019
Continuity properties and sensitivity analysis of the set of sustainable thresholds for a discrete time controlled system. Under the direction of C. Hermosilla.

PUBLICATIONS

Journal papers

T. Guilmeau and A. Rapaport. "**Multiplicity of neutrally stable periodic orbits with coexistence in the chemostat subject to periodic removal rate**". *SIAM Journal on Applied Mathematics*, vol. 84(1), pp. 39-59, 2024.

T. Guilmeau and A. Rapaport. "**Singular arcs in optimal periodic control problems with scalar**

dynamics and integral input constraint". *Journal of Optimization Theory and Applications*, vol. 195, pp. 953-975, 2022.

Conference papers

T. Guilmeau, N. Branchini, E. Chouzenoux, and V. Elvira. **"Adaptive importance sampling for heavy-tailed distributions via α -divergence minimization"**. *Proceedings of the International Conference on Artificial Intelligence and Statistics (AISTATS)*, to appear, 2024.

T. Guilmeau, E. Chouzenoux, and V. Elvira. **"Adaptive simulated annealing through alternating Rényi divergence minimization"**. *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2023.

T. Guilmeau, E. Chouzenoux, and V. Elvira. **"Proximal-based adaptive simulated annealing for global optimization"**. *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2022.

F. Dupeuble, A. Rapaport, T. Guilmeau, J. Tchouanti, B. Enjalbert, C. Bideaux, J.-P. Steyer, A. Feddaoui-Papin, and J. Harmand. **"Deterministic models to decipher the lag phase duration during diauxie"**. *IFAC-PapersOnLine*, 2022.

T. Guilmeau, E. Chouzenoux, and V. Elvira. **"Simulated annealing: a review and a new scheme"**. *Proceedings of the IEEE Statistical Signal Processing Workshop (SSP)*, 2021.

TEACHING AND OUTREACH

Teaching assistant, AO101 - ENSTA Paris

Spring 2024

A 3rd year introductory course on optimization, with a special focus on the quadratic case and including algorithmic aspects.

Teaching assistant, OPT201 - ENSTA Paris

Fall 2023

A 4th year course on differentiable optimization, including optimality conditions, sub-differentiability, and duality theory.

Scientific diffusion mission, INRIA Saclay

2022

Talks in high schools about research. Université Paris-Saclay science fair. RJMI (a research-based outreach event directed towards high school girls). Coordination of the writing and the filming of interviews about AI.

Teaching assistant, Optimization - CentraleSupélec

Spring 2020 and Spring 2021

A 4th year course covering linear and convex optimization, integer programming, and introducing some iterative algorithms.

LANGUAGES

French: Native speaker

English: Fluent (TOEIC: 990/990)

Spanish: Intermediate level

CODING SKILLS

Advanced: Julia, Matlab, Python, \LaTeX

Basic level: C, C++, HTML, CSS