

Daniel Mimouni



PhD in Applied Mathematics & Machine Learning

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Applied ML Researcher — Optimal Transport • Optimization • Reinforcement Learning

Experience

2022–2025 **PhD Researcher** – IFP Énergies Nouvelles (**IFPEN**), *Applied Math & Computer Science Dept.*

- 4 **first-author publications** in top journals (e.g., *SIAM*)
- Developed 5 **open-source libraries** actively used — high-performance ML algorithms
- Presented at 5 **international conferences**
- A **patent** in preparation (IFPEN): OT-based RL/DRO optimization pipeline for industrial energy management
- Teaching Assistant: *Data Science* (Mines Paris, 2023–2024-2025)

May 2021–Oct. 2022 **Data Scientist** – Île-de-France Mobilités (**IDFM**) *Public authority managing transport for 12M inhabitants in Paris region (€11B budget)*

2021–2022 **Freelance Developer** –

- ML prototypes and automation tools

Oct. 2020–Apr. 2021 **Engineering Intern** – **Vinci** Construction Grands Projets, *Research & Development Dept.*

- Performed numerical integration optimizations of Finite Element Equations (FEA).

May 2020–Oct. 2020 **Research Intern** – **Imperial College London**, *Dept. of Nonlinear Structures*

Master's thesis under the supervision of Prof. Ahmer Wadee

- Studied cost-effective bridge implementation using nonlinear constrained optimization (FEA).

Education

2022–2025 **PhD Candidate in Applied Mathematics** – Mines Paris PSL, *Centre de Mathématiques Appliquées (CMA) Multistage Stochastic Optimization: From Optimal Transport-Based Scenario Tree Reduction to Robust Optimization for Energy Management*

Funded by IFPEN.

- Advanced coursework at MVA ENS Paris (Ulm): *Optimal Transport* (Gabriel Peyré), *Reinforcement Learning*

2019–2020 **MSc – Imperial College London**

- Graduated with **Distinction** (highest honor in the cohort)

2017–2021 **Diplôme d'Ingénieur (MSc Equivalent)** – Centrale Lyon

Applied Mathematics

2015–2017 **Preparatory classes for Grandes Ecoles – Henri IV & Louis Le Grand**

(*MPSI* and *PSI**)

Technical Skills

ML: PyTorch, generative modeling (GANs), Reinforcement Learning, OT-based ML

Optimization: Large-scale optimization, stochastic programming, operator splitting, Distributional Robust Optimization

Scientific Computing: Python, NumPy, Numba, CUDA, MPI, C/C++ (basics), Gurobi

Tools: Docker, Jupyter, Git

Languages

French: Native **English:** Fluent (C2) **German:** Proficient (B1) **Hebrew:** Learning

Interests

Chess (Elo 1575), **Piano** (10y), **Football** (team captain), **Judo** (10y in competition), **Magic** (performed shows)

Publications

Main themes: Computational Optimal Transport (Wasserstein barycenters, balanced/unbalanced constrained OT, nested distances), with applications to machine learning and stochastic optimization.
Reproducible code for all articles is available at dan-mim.github.io.

Journal Articles

- **Mimouni, D., Malisani, P., Zhu, J., de Oliveira, W. (2024). Computing Wasserstein Barycenters via Operator Splitting: the Method of Averaged Marginals.**
SIAM Journal on Mathematics of Data Science (SIMODS). DOI:10.1137/23M1584228
New algorithm for fast and scalable computation of exact Wasserstein barycenters. Wasserstein barycenters are used in imaging, biomedical data alignment and model aggregation; the library is built to be domain-agnostic and scalable.
- Mimouni, D, de Oliveira, W., Sempere, G. M. (2025). **On the Computation of Constrained Wasserstein Barycenters.**
Pacific Journal of Optimization, special issue in honor of R. T. Rockafellar. [In press]
Extention of MAM to tackle barycenter computations when convex and non-convex constraints are added to the barycenter.
- Mimouni, D, Malisani, P., Zhu, J., de Oliveira, W. (2024). **Scenario Tree Reduction via Wasserstein Barycenters.**
Annals of Operations Research [Submitted].
OT-based reduction method — using the nested distance (a generalization of the Wasserstein distance); achieves $\times 10$ speed-ups on large scenario trees and improves stability in multistage stochastic models.
- Mimouni, D, Malisani, P., Zhu, J., de Oliveira, W. (2025). **A Comparative Study of Multi-Stage Stochastic Optimization Approaches for an Energy Management System.**
IEEE Transactions on Control Systems Technology [Submitted]
RL vs stochastic optimization to EMS - an industrial application case.

Patent

- **Robust Energy Management System** [in preparation] RL and DRO-based pipeline for multi-stage energy management for IFPEN.

Open-Source Software

- **Wasserstein Barycenters – MAM** Python package of the MAM algorithm for exact computation of Wasserstein barycenter (WB) via operator splitting (SIMODS 2024).
- **Constrained Barycenters** Solvers for barycenter problems under convex and non-convex constraints. Also visit the **mam-GAN project** for other industrial applications.
- **Nested Tree Reduction** Efficient implementation of the nested Wasserstein-based reduction method. 10 \times speed-up of the boosted proposed version over classic Kovacevic and Pichler's baseline.
- **EMS-RL-DRO** RL and DRO-based solver for multi-stage energy management. Already industrially deployed in IFPEN's EMS-Lab.

Selected Talks and Conferences

- **ICSP 2025** – Int. Conference on Stochastic Programming *How Optimal Transport can sharpen multi-stage decisions: Boosting scenario tree algorithms*
- **ICCOPT 2025** – Int. Conf. on Continuous Optimization *Optimization framework for Energy Management Systems: RL vs Stochastic Programming*
- **ISMP 2024** – Int. Symposium on Mathematical Programming *Computing Wasserstein Barycenters via Operator Splitting*
- **EUROPT 2024** – *New Approach to Optimal Transport problems* (with W. de Oliveira)
- **PGMO 2023 & 2024** – Gaspard Monge Program Days (EDF/INRIA) *Boosting Scenario Tree Reduction via nested distance – Computing Balanced Barycenters*
- **CIROQUO 2023** – Poster: *Wasserstein Barycenter Computation*