# Mathis Hardion

Research Intern, MSc Student


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Currently in my last year of master's degree at ENS Paris-Saclay's MVA and Research Intern at Bocconi University from mid April to early October, I am seeking a PhD position to pursue my research in Optimal Transport and Calculus of Variations.

## Interests

Optimal Transport, Gradient Flows and Calculus of Variations, Stochastic models, Machine Learning & Statistics, MCMC methods, Optimization, Topological and Geometric Data Analysis

## Education

Sept. 2023 - 2024 — **Master MVA (Mathematics, Vision, Learning)**

*École Normale Supérieure de Paris-Saclay (Gif-sur-Yvette, France)*

Research-oriented degree in data science through the mathematical lens, wide spectrum of courses followed in the above domains of interest

Sept. 2020 - 2024 — **MSc in Applied Mathematics**

*Télécom Paris (Palaiseau, France)*

Stochastic Modelling and Numerical Analysis, Signal Processing and Artificial Intelligence, 4.0 CGPA

Sept. 2018 - Aug. 2020 — **French "Classe Préparatoire au Grandes Écoles"**

*Lycée Carnot (Dijon, France)*

MPSI/MP* - Intensive courses in Mathematics, Physics and Computer Science

## Professional experience

April 2024 - October 2024 (Current) — **Research Intern**

*Bocconi University (Milan, Italy)*

Gradient flows in the geometry of the Sinkhorn divergence: numerical implementation of the Sinkhorn-JKO scheme and comparison with Wasserstein-JKO, theoretical analysis of the continuous limit. Entropic optimal transport, Calculus of variations, Functional analysis, Riemannian geometry, RKHS, numerical optimization & visualization (python).

July 2023 - Sept. 2023 — **Front Office Support**

*Axpo Solutions AG (Brussels, Belgium)*

Constrained algorithmic financial optimization of multi-asset heat, power and CO2 production schedules for greenhouses. Applied research, Mathematical modelling, Numerical optimization (python, LP/MILP, Simulated annealing, Evolutionary algorithm), FTP communication, Predictive price curve evaluation and comparison.

July 2021 - Aug. 2022 — **Education Intern**

*Learning Robots (Gif-sur-Yvette, France)*

Design and improvement of high-school and post-secondary level practical sessions and videos teaching artificial intelligence algorithms and ethics through robots. Development of new features for the AlphAI robot and software (Python).

## Languages

**French** - Native

**English** - C1

**German** - B2

## Skills

**Python**

`pytorch`, `matplotlib`, `numpy`, `pandas`, `scipy`, `sklearn`, `cvxpy`, etc.

**R**

**LaTeX**

**Git**

**C++**

**Office 365**

**Research**

Various research projects at Télécom Paris and MVA, Applied research at Axpo

**Teamwork**

8-student team project at Télécom Paris, Close-knit team environment at Learning Robots, Two-man tool development at Axpo

**Autonomy**

**Rigor**

## Academic work

Some of my academic reports and presentations can be found on my website, including the following:

Neural Optimal Transport

Variational Learning of Inducing Variables in Sparse Gaussian Processes

Riemanniann Manifold Hamiltonian Monte Carlo

Generalized Sliced Distances for Probability Distributions

FibeRed: Fiberwise Dimensionality Reduction of Topologically Complex Data with Vector Bundles

Sparse representation of multivariate extremes with applications to anomaly detection

Mean Curvature Motion of Point Cloud Varifolds