



# 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 Entropic Optimal Transport and Gradient Flows.

## Interests

Optimal Transport, Gradient Flows in Metric Spaces, 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 a 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 Machine Learning, 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: derivation of the differential equation corresponding to the gradient flow of a potential energy, its main properties and long-time behavior, numerical implementation and comparison with the Wasserstein case. Entropic Optimal Transport, Gradient Flows, 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. 2021

### 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 AlphaAI 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](#)

[Riemannian Manifold Hamiltonian Monte Carlo](#)

[Generalized Sliced Distances for Probability Distributions](#)

[FibreD: 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](#)