

# Raphaël Barboni

PhD candidate

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🌐 [rbarboni.github.io](https://rbarboni.github.io)

## Education

- Since 2022 **PhD candidate**, *École Normale Supérieure – PSL, Department of Mathematics*, Paris  
“Convergence and implicit bias of deep Residual Neural Networks”, supervised by **G. Peyré** and **F-X. Vialard**
- 2018 – 2022 **“Élève fonctionnaire stagiaire”**, *École Normale Supérieure – PSL*, Paris, France  
Department of Mathematics (DMA)
- 2020–2021 **M.Sc. Mathematics for Machine Learning and Data Science (MVA)**, *ÉNS Paris-Saclay*  
**Thesis**: “Convergence properties of Gradient Descent in the training of Deep Residual Networks”  
(supervised by G. Peyré and F-X. Vialard)
- 2018–2019 **Bachelor degree in mathematics**, *École Normale Supérieure – PSL*, Paris, with honors  
**Thesis**: “Mean curvature flow, an introduction to geometrical flows” (supervised by T. Ozuch)
- 2016–2018 **Scientific preparation for competitive exams**, *Lycée Henri IV*, Paris  
Mathematics, Physics, Computer science (MPSI-MP\*)

## Research internships

- 2022 **Statistical to computational gaps in Tensor PCA**, *ETH, Mathematic Department*, Zürich,  
supervised by **A.Bandeira**
- 2021 **Convergence and Implicit biases in training Deep Residual Networks**, *ÉNS DMA - CNRS*,  
Paris, supervised by **G.Peyré** and **F-X.Vialard**
- 2020 **Hydrodynamical models for red tides phenomena in Quellón's bay**, *Center for Mathematical Modeling (CMM) - CNRS*, Santiago, Chile, supervised by **C.Conca**

## Teaching

- Since 2021 **Teaching assistant**, *Paris Science Lettres (PSL)*, Paris  
“Cycle Pluridisciplinaire d'Études Supérieure” (CPES), undergrad.
- 2018–2022 **Preparation for oral exams**, *Lycée Henri IV*, Paris

## Publications

- Barboni, Raphaël, Gabriel Peyré, and François-Xavier Vialard (2024). “Understanding the training of infinitely deep and wide ResNets with Conditional Optimal Transport”. In: *(journal submission)*.
- (2022). “On global convergence of ResNets: From finite to infinite width using linear parameterization”. In: *Advances in Neural Information Processing Systems* 35, pp. 16385–16397.

## Skills

### Programming

Python Scientific computing and machine learning  
Github Developing open source code

### Languages

French Mother tongue  
English, Professional skills  
German

## Conferences

### Oral presentation

- SIGMA (Signal-Image-Geometry-Modeling-Approximation), June 2024, Luminy, France,
- PDE Methods in Machine Learning (Birs event), June 2024, Granada, Spain.

### Poster presentation

- Learning and Optimization in Luminy, June 2024, Luminy, France,
- Workshop on Optimal Transport, from Theory to Applications, March 2024, Berlin, Germany,
- Conference on Neural Information Processing Systems (Neurips), November 2022, New Orleans, USA,
- International Conference on Curves and Surfaces, June 2022, Arcachon, France.