

MICHAEL SANDER

Born March 12th, 1995 in Paris (France)

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EDUCATION

Ecole Normale Supérieure de Paris, France

2020 – 2024 (expected)

Ph.D. candidate in Mathematics and Machine Learning

Dissertation: "Differentiable Efficient Learning through Discretized Dynamics"

Advisor: Gabriel Peyré

Sorbonne Université

2019 - 2020

M.S. in Mathematics: "Mathematics of the modeling" (Double degree)

ENS Paris-Saclay

2019 - 2020

M.S. in Applied Mathematics: Mathematics, Vision and Learning (MVA) (Double degree)

Ecole polytechnique

2016 - 2020

B.S. in Mathematics: "Cursus Ingénieur Polytechnicien"

Mathematics, Applied Mathematics, Computer Science

EXPERIENCE

Student Researcher, Google Research, Brain team, Paris

Differentiable programming with Mathieu Blondel

2022-2023

Teacher in Statistics and Probability theory, Ecole Normale Supérieure, Paris

In full charge of a mathematical course for students at Ecole Normale Supérieure de Paris.

2020 - 2022

Mathematical examiner for B.S. students at Lycée Henri IV, Paris

In charge of evaluating students on theoretical mathematical concepts during oral sessions.

2017 - 2020

Differentiable layers through compressed dynamics. DMA, Ecole Normale Supérieure, Paris.

M.S. internship. Study of deep invertible neural architecture in order to propose a model with a much smaller memory requirement.

April 2020 - September 2020

Mathematical modeling of color vision. Benhia Lab, Colombia University, New York.

Research internship supervised by Rudy Behnia. Study of how the processing properties of color pathways in the eye are best matched to the statistics of natural visual scenes.

April 2019 - August 2019

Statistical modeling of DNA sequencing. SOPHiA Genetics, Geneva.

B.S. internship

Application of statistical models on a large scale data set made of sequenced DNA.

June 2018 - September 2018

PUBLICATIONS

- [1] Michael E. Sander, Pierre Ablin, Gabriel Peyré. Do Residual Neural Networks discretize Neural Ordinary Differential Equations? *Advances in Neural Information Processing Systems 35*, 2022. PMLR
- [1] Samy Jelassi, Michael E. Sander, Yuanzhi Li. Vision Transformers provably learn spatial structure. *Advances in Neural Information Processing Systems 35*, 2022. PMLR
- [3] Michael E. Sander, Pierre Ablin, Mathieu Blondel, Gabriel Peyré. Sinkformers: Transformers with Doubly Stochastic Attention. *Proceedings of the 25th International Conference on Artificial Intelligence and Statistics*, 2022. PMLR 151
- [4] Michael E. Sander, Pierre Ablin, Mathieu Blondel, Gabriel Peyré. Momentum Residual Neural Networks. *Proceedings of the 38th International Conference on Machine Learning*, 2021. PMLR 139:9276-9287

SCIENTIFIC PROJECTS

Mathematical efficiency of Vision

Research project for the course of Jean-Pierre Nadal.

Shape deformation Analysis from the Optimal control viewpoint.

Research project for the course of Alain Trounev.

Parser creation for analysing grammatical structure of sentences.

Research project for the course of Emmanuel Dupoux and Benoît Sagot.

Gender Prediction using Electroencephalography signals.

Research project for the course of Stéphane Mallat at "Collège de France".

Smooth and sparse Optimal Transport.

Research project for the course of Gabriel Peyré.

Identification and study of Parkinson cerebral structures.

Ecole polytechnique, 4 months, supervised by Antoine Chaillet.

Image to pattern transformation of natural images.

Ecole polytechnique, 12 months, supervised by Rémi Michel.

Mathematical models for the heart's dynamics

Ecole polytechnique, 3 months, supervised by Jean-Frédéric Gerbeau.

COURSES IN MATHEMATICS AND THEIR APPLICATIONS

Real and Complex Analysis, Algebra and Galois Theory, Distributions, Spectral Theory and Quantum Mechanics, Functional Analysis, Function approximations and Variational methods, Algebraic Theory of Numbers, Geometry and Shape spaces.

Modeling of Random Phenomena, Control of Dynamical Systems, Random Models, Optimization, Statistical Learning, Operational Research, Partial Differential Equations, Optimal Transport, Learning Theory, Variational and Transport Problems.

Statistical Learning, Big Data Processing, Deep learning, Kernel Methods, Deep Convolutional Neural Networks, Speech and Natural Language Processing

PROFICIENCY IN CODING LANGUAGES

Python, Pytorch, Java, C++

LANGUAGES

French	Mother tongue
English	Fluent
Hebrew	Fluent
Chinese	Good speaking