

Nemo Fournier

Curriculum vitæ

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Education

- 2021 – 2024 **PhD Student at the Paris Brain Institute.**
- 2017 – 2021 **Élève de l'École Normale Supérieure de Lyon.**
- 2018 – 2020 **Master Degree in Computer Science, ENS de Lyon, with highest honours.**
- 2017 – 2018 **Bachelor Degree in Computer Science, ENS de Lyon, with honours.**
- 2015 – 2017 **Classe Préparatoire Scientifique (C.P.G.E), Toulouse.**
- 2015 **Baccalauréat Scientifique.**

Internships

- March 2021 **5 Months Research Internship, Aramis Lab, Paris Brain Institute, supervised**
July 2021 **by Stanley Durrleman.**
Longitudinal Analysis for the Discovery of Neurodegenerative Diseases Subtypes
- September 2020 **5 Months Research Internship, IMAGES team, Telecom Paris, supervised**
February 2021 **by Pietro Gori, joint work with Jean Feydy and Pierre Roussillon.**
Tractogram Segmentation using Geometry Induced Metrics and Optimal Transport
- January – June 2020 **5 Months Research Internship, Empenn, Inria Rennes, co-supervised by**
Pierre Maurel and Julie Coloigner.
Graph-based Methods for Brain Structural Connectivity Analysis
- May – July 2019 **3 Months Research Internship, University of Edinburgh, supervised by**
Kartic Subr, joint work with Tatiana Lopez-Guevara.
Reinforcement Learning of Parameters in Complex Physical Systems
- June – July 2018 **6 Weeks Research Internship, IXXI, Lyon, co-supervised by Paulo Gonçalves**
and Patrick Flandrin.
Geometry and Statistics of the Time-Frequency Signature of *High-Frequency Oscillations* in EEG

Responsibilities

- Winter 2017-2018 **Organiser of a sport-study conference week.**
Logistic and scientific organisation of a week of conferences about current research topics in computer science, aimed at computer science students of the ENS de Lyon
- 2018 - 2020 **Head of the Hardware team for the Symbolibre project.**
Working on the conception of the first prototypes of the Symbolibre graphic calculator, from hardware selection and design to building the actual physical prototype.

Publications

- [1] Rémi Flamary, Nicolas Courty, Alexandre Gramfort, Mokhtar Z Alaya, Aurélie Boisbunon, Stanislas Chambon, Laetitia Chapel, Adrien Corenflos, Kilian Fatras, Nemo Fournier, et al. Pot: Python optimal transport. *Journal of Machine Learning Research*, 22(78):1–8, 2021.

Languages

French Fluent (*Mother Tongue*)
English C1 (*CAE, 2018*)

Spanish B2 (*School*)
Deutsch A1 (*School*)

Computer skills

Programming C, C++, PYTHON, MATLAB / OCTAVE, TORCH, TENSORFLOW, MPI
Tools \LaTeX , GIT, UNIX systems

Courses Attended

September 2017 **First Semester of Bachelor.**

- January 2018
- **Algorithms 1.** Algorithm design, complexity, NP-completeness, approximations
 - **Architecture and System.** Computer architecture from ISA to VHDL
 - **Computability.** Computation models, language theory, (in)decidability
 - **Programming theory.** Semantics of languages, typing, lambda calculus
 - **Project 1.** Programming class, with focus on good programming practices
 - **Algebra.** Duality, bilinear algebra, quadratic forms, groups and representations

January 2018 **Second Semester of Bachelor.**

- June 2018
- **Algorithms 2.** Emphasis on data structures, graph theory, algorithms on words
 - **System and Networks.** Operating system design, communication networks
 - **Logic.** Set theory, first-order logic, model theory, Peano's axioms, Gödel's theorems
 - **Probability.** Probability theory, Markov chains, randomized algorithms, statistics
 - **Preparation for ACM.** Training in the effective resolution of algorithmic problems
 - **Signal Processing.** Processes, spectral estimation, sampling, filtering, transforms
 - **Physics, Information and Computation.** Feynman's rules, quantum computations and algorithms and information theoretic approach, IBM Q

September 2018 **First Semester of Master.**

- January 2019
- **Performance Evaluation and Networks.** Random processes, queuing theory
 - **Compilers and Program Analysis.** Writing a compiler, static analysis of programs
 - **Information Theory.** Entropy, compression, Shannon's theorems, correcting codes
 - **Parallel and Distributed Algorithms.** PRAMs, ring and grids, MPI
 - **Optimisation, Approximation.** Linear programs, SDP, non-linear optimization

January 2019 **Second Semester of Master.**

- May 2019
- **Computational Geometry and Digital Images.** Image and shape representation and processing, computational geometry, data structures for geometry, rendering
 - **Computer Algebra.** Arithmetic of polynomials, structured and fast linear algebra
 - **Cryptography and Security.** Symmetric and asymmetric crypto, security proofs
 - **Machine Learning.** Standard methods, bounds and guaranties, boosting theory, non-parametric methods, metric learning, optimal transport
 - **Data Bases and Data Mining.** Relational model, functional relations, Armstrong's system, normalisation, data mining, clustering

September 2019 **Third Semester of Master.**

- January 2020
- **Machine Learning.** Theoretic machine learning, project on anomaly detection.
 - **Numerical Methods for Computer Graphics.** Tools for image processing (Poisson processing, Monte-Carlo Methods, Optimal Transport, Manifold Frameworks)
 - **Numerical Mechanics.** Theoretical and practical tools for simulation (Lagrangian mechanics, elasticity, inverse problems, slender structures, frictionnal contacts)
 - **Hidden Markov models for time series classification and filtering.** Markov models for the analysis of time series data, focus on Bayesian decision and filtering.
 - **Selected Topics in Information Theory.** Information theory, concentration inequalities, detection and estimation, hypothesis testing, decision-making processes, data compression, transmission and analysis.
 - **Quantum Information and Computation.** Quantum information (quantum circuits, Shor's algorithm, Grover's algorithm) to geometry of entangled states
 - **Modern Algorithms for Symbolic Summation and Integration.** Solving the problem "[50] Develop computer programs for simplifying sums that involve binomial coefficients." from Knuth's Art of Computer Programming Book

September 2020 **Extra courses followed as an *auditeur libre* or *self-study*.**

- Present
- **IMA 204** at Telecom Paris, overview of medical image modalities and processing
 - **Foundations of Distributed and Large Scale Computing Optimization** at Centrale Paris, non-differentiable optimization theory and numerical schemes
 - **Differential and Riemannian Geometry** (self-study)