Aldric Labarthe

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Education

- **Ecole Normale Supérieure de Paris Saclay** *2022 - today*
  Bachelor and Master's degree Gif-Sur-Yvette, France
  - 2024 - 2025 : Master's degree *Mathematiques, Vision, Apprentissage (MVA)* in applied mathematics and AI
    Relevant courses: convex optimization, computational statistics, probabilistic graphical models, geometric data analysis, reinforcement learning, time series, graphs, bayesian models.
  - 2023 - 2024 : Master's degree *Master of Economics* in quantitative economics and mathematics.
    Relevant courses: computer science (Python, R, C++), linear algebra, analysis, convex optimization, optimal control, microeconomics, econometrics, macroeconomics, game theory.
  - 2022 - 2023 : Bachelor's degree, major in quantitative economics and electives in mathematics and management.
    Relevant courses: microeconomics, market finance, measure theory, probability theory, statistics, econometrics, corporate finance, macroeconomics, game theory.

- **Lycée Turgot** *2020 - 2022*
  Preparatory class Paris, France
  - Intensive 2-year class preparing for entrance examinations to the French Grandes Ecoles with first class honours.
  - I studied mathematics, macroeconomics, microeconomics, economic history and philosophy.
  - At the end of my scholarship, I was admitted into the Ecole Normale Supérieure de Paris Saclay, as major in the competitive exam.

- **Université Panthéon-Sorbonne** *2020 - 2022*
  University Education Paris, France
  - A two-year cursus in quantitative economics with first class honours.
  - I studied macroeconomics, microeconomics, public accounting, and mathematics (linear algebra and statistics).
  - Grade: 17,19 / 20 (86%)

- **Institution Saint-Charles** *2020*
  Secondary Education Athis-Mons, France
  - Baccalauréat [High-school diploma] in Mathematics and Economics with first class honours.
  - Grade: 18,91 / 20 (94,55%), ranked first

Work Experience

- **Applied Complexity Group - University of Geneva [🌐]** *june 2025 - september 2025*
  Invited researcher Geneva, Switzerland
  - I have been invited by Prof. Roland Bouffanais to join their research efforts on modeling social networks, especially on understanding the underlying topological properties of networks. This research extends their existing works on signal diffusion on graphs.

- **Centre Borelli - Ecole Normale Supérieure Paris-Saclay [🌐]** *april 2025 - september 2025*
  Research intern Paris, France
  - Research internship supervised by Prof. Julien Randon-Furling on topology aware representation learning algorithms for social networks.

- **Université Panthéon-Sorbonne [🌐]** *january 2024 - today*
  Teaching assistant Paris, France
  - Writing and designing lectures and teaching materials on analysis, linear algebra, convex optimization and microeconomics for bachelor students.

◦ 96 hours of teaching per year, with 5 groups of students (∼150 students per year).

- **BeyondSolutions [🌐]** *may 2023 - september 2023*
  Financial Analyst Intern Paris, France
  ◦ Conducting an econometric study on the success causes of employee incentive plans in France over the past 10 years. The report required data collecting and processing from public and private sources and data analysis with linear models on time series.

Teaching Experience

- **Mathematics: Multivariate analysis and metric spaces topology** *2025-*
  Second year, Bachelor of mathematics (Université Panthéon-Sorbonne) Teaching Assistant of G. Groce
- **Microeconomics: Uncertainty, insurance and game theory** *2024-*
  Third year, Bachelor of economics (Université Panthéon-Sorbonne) Teaching Assistant of F. Bloch
- **Microeconomics: Decision theory and consumer theory** *2024-*
  First year, Bachelor of mathematics (Université Panthéon-Sorbonne) Teaching Assistant of S. Gauthier

Patents and Publications

C=Conference, J=Journal, P=Patent, S=In Submission, T=Thesis

[S.1] Aldric Labarthe, Yann Kerzreho (2024). **Generating social networks with static and dynamic utility-maximization approaches**. ArXiv preprint: *arXiv:2411.16464*.

[T.1] Aldric Labarthe (2024). **Strategies and equilibria on selected markets: a multi-agent simulation and stochastic modeling approach**. Master thesis advised by J. Randon-Furling, graded 19/20 by the ENS Paris-Saclay jury (best thesis). *Currently working on a manuscript for a Physics journal.*

Active Research Projects

- **Conectomic analysis for the *Hôpitaux Universitaires Paris-Saclay AP-HP*** *november 2024 - today*
  Tools: statistics, probabilities, graph theory, Python
  ◦ I have developed a new statistical framework based on whole-body PET scans that recovers the link between organs based on the probabilistic distributions of their SUV scores.
  ◦ We work with the Orsay statistics lab (UMR 8628) on new methods to early detect diseases by looking to alterations of organs interactions. Our team is a collaboration between medical professors from the *Hopital Bicêtre* and statisticians from the *Université Paris-Saclay*.
  ◦ We are currently writing a paper for *Nature communications* (submission due for end summer). A founding request has been submitted for collecting new experimental data to expand the model.
- **Generalization of the Hotelling model on exotic topologies** *january 2025 - today*
  Tools: microeconomics, differential geometry, optimization, game theory
  ◦ We are working with Yann Kerzreho (ENS Paris-Saclay) on a generalization of the Hotelling model with N agents, and on a wide class of topologies. We study equilibria, but also the convergence process, and how the curvature of the space influences agents' behaviors.
- **Artificial social networks analysis** *november 2023 - today*
  Tools: convex optimization, graph theory, probabilities, C++, R [🌐 | GitHub]
  ◦ Developed two artificial social network generators from scratch in C++ (an optimizer and an agent-based model) that are able to reproduce human networks from empirical data and test hypothesis in dynamic simulations.
  ◦ Created with my colleague Yann Kerzreho (ENS Paris-Saclay) the mathematical framework with a latent space that justifies generators processes and relevance.
  ◦ Currently working on geometrical properties of the latent space, and on the consequences of this geometry on the shape of the network.
- **Reinforcement learning agents in artificial markets (oligopolies)** *2024*
  Tools: microeconomics, reinforcement learning (markov games, Deep deterministic gradient algorithm), C++ and R [🌐 | GitHub]
  ◦ Developed a simulator for artificial markets (Cournot and Stackelberg duopolies and oligopolies)
  ◦ Implemented a DDPG algorithm in a multi-agent setting
  ◦ Studied algorithmic collusion and gave some new insights on how the choice of the RL algorithm could affect the market outcome.

Certifications

- **International English Language Testing System (IELTS)** Score: 7.5 (CEFR: C1+) *november 2023*
- **TOEIC:** Score: 940 / 990 (CEFR: C1) *march 2022*

Skills

- ⋆ **Game Theory:** static games (Nash equilibrium : existence, selection, . . . , Bayesian Nash equilibrium), dynamic games (subgame-perfection, backwards induction, repeated games), signaling games, market design.
- ⋆ **Network analysis:** graphs (definition, usual properties and algorithms: Dijkstra, Euler, ...), laplacian, spectral graph theory, spectral clustering, Random Geometric Graphs (RGG) models, manifold learning on graphs, Graph convolutional networks, Graph attention layers, message passing, autoencoders on graphs.
- ⋆ **Probability:** set and measure theory, graphical models, bayesian inference, markov chains, stochastic geometry
- ⋆ **Generative models:** probabilistic graphical models, autoencoders, VAE, standard and riemannian latent spaces, adversarial models
- **Microeconomics:** decision theory, insurance, uncertainty and imperfect information, network economics
- **Programming Languages:** C++, R, Python, Stata, Matlab (and Java, PHP, html/CSS)
- **Analysis and optimization:** real and multivariate analysis, topology, convex analysis, convex optimization, primal/dual theorems, interior points methods, Newton methods, riemannian geometry
- **Algebra:** linear algebra, ODE, Cauchy-Lipschitz theorem
- **Statistics:** M-estimator, Z-estimator, maximum likelihood estimator, causal inference, tests, MCMC methods and Gibbs algorithm, inverse sampling, EM Algorithm
- **Econometrics:** generalized least square, panel data, causal inference, time series analysis (ARMA, VAR, ARIMA, DTW, and new ML methods), non-linear least square estimator, discrete choice models (probit, logit), parametric/non-parametric estimators
- **Dynamic Programming:** optimal control, intertemporal optimization, hamiltonian, Bellman equation, dynamic programming, viability theory, deep reinforcement learning, bandits, multi-agent markov games

Additional Information

Languages: French (Proficiency level), English (Proficiency level)
Interests: Hikking, climbing (indoor or outside, bouldering and lead climbing)

References

1. **Julien Randon-Furling**
   Full Professor,
   CPJ Mathematical Modelling[s] in the HSS,
   Centre Borelli, Department of Mathematics,
   ENS Paris Saclay, Université Paris-Saclay,
   Email: julien.randon-furling@ens-paris-saclay.fr
   Relationship: Thesis advisor, research advisor