

Antonio Álvarez-López

Curriculum Vitae

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Profile

Machine learning researcher with a PhD in Mathematics, working on the mathematical foundations and computational applications of neural ODEs, transformers, generative models, and time-series analysis. Postdoctoral Researcher at **Nanyang Technological University (NTU)**.

Education

Dec 2022–Jun 2026 **PhD in Mathematics**, *Universidad Autónoma de Madrid (UAM)*, Madrid, Spain.
Thesis: *Deep Learning with Controlled Flows: Expressivity, Generalization and Generation*.
Advisors: Enrique Zuazua Iriondo, Rafael Orive Illera. **Cum Laude, International Mention**

2021–2022 **M.Sc. in Advanced Mathematics**, *Universidad Complutense de Madrid*, Madrid, Spain.
Thesis: *Parker's Problem in Magnetohydrodynamics and transition maps for force-free fields*.
Advisor: Alberto Enciso.

2016–2021 **Bachelor's double degree in Mathematics and Physics**, Universidade de Santiago de Compostela (USC), Spain, Academic year 2019–2020 in Universidad de Granada.
Highest Honors in 19 out of 59 courses.

Experience

Sep 2026– **Postdoctoral Researcher**, *School of Physical and Mathematical Sciences, NTU*, Singapore.
Supervisors: J.-P. Ortega and Florian Rossmannek.

Apr 2024–Apr 2026 **Research Associate**, *Chair for Dynamics, Control, Machine Learning and Numerics (FAU-DCN), Friedrich-Alexander-Universität Erlangen–Nürnberg*, Erlangen, Germany.

Jun–Jul 2021 **Machine Learning Research Intern**, *CiTIUS*, Santiago de Compostela, Spain.
Advisor: Paulo F. Lamas. Project: Pattern recognition in cardiovascular diseases using machine learning.

Jul–Sep 2020 **Severo Ochoa–ICMAT Research Intern**, *ICMAT*, Madrid, Spain.
Advisor: Alberto Enciso. Project: Mathematical problems in fluid mechanics.

Research Visits

2022–2026 **NTU** (Sep–Nov 2026); **National University of Singapore** (Aug–Nov 2025); **Sorbonne Université** (May–Jul 2025); **Sichuan University** (Jan 2024); **Massachusetts Institute of Technology** (Aug–Sep 2023); **Imperial College London** (Feb–Mar 2023); and **FAU-DCN** (recurrent visits since 2022).

Papers

Published and Accepted

2026 **Gaussian mixture models in Hilbert spaces via kernel methods**, *Daniel López-Montero*[*], ***Antonio Álvarez-López***[*], *Marcos Matabuena*, Advances in Neural Information Processing Systems (NeurIPS) 2026.
([*]Shared first authorship + Equal contribution). NeurIPS 2026 official accepted-paper listing.

2026 **Perceptrons and localization of attention's mean-field landscape**, ***Antonio Álvarez-López***, *Borjan Geshkovski, Domènec Ruiz-Balet*, Proceedings of the 43rd International Conference on Machine Learning (ICML 2026), PMLR 306:2180–2206.
Spotlight paper (top 2.2% of all submissions). PMLR publication.

2025 **Constructive approximate transport maps with normalizing flows**, ***Antonio Álvarez-López***, *Borjan Geshkovski, Domènec Ruiz-Balet*, Applied Mathematics and Optimization, 92, 33.
DOI: 10.1007/s00245-025-10299-7.

2025 **Cluster-based classification with neural ODEs via control**, ***Antonio Álvarez-López***, *Rafael Orive-Illera, Enrique Zuazua*, Journal of Machine Learning, 4(2), 128–156.
DOI: 10.4208/jml.241114.

2024 **Interplay between depth and width for interpolation in neural ODEs**, ***Antonio Álvarez-López***, *Arselane Hadj Slimane, Enrique Zuazua*, Neural Networks, 180, 106640.
DOI: 10.1016/j.neunet.2024.106640.

Submitted

2026 **Point interpolation and distributional universality in flow-based generative models**, ***Antonio Álvarez-López***, *Jingpu Cheng, Liyan Zhang, Qianxiao Li*.
arXiv:2611.04207.

2026 **Constructive interpolation and generalization rates for neural ODEs: A control perspective**, ***Antonio Álvarez-López***, *Lorenzo Liverani, Enrique Zuazua*.
arXiv:2606.00469.

2026 **Continuous-time learning of probability distributions: A case study in a digital trial of young children with type 1 diabetes**, ***Antonio Álvarez-López***, *Marcos Matabuena*.
Best Student Paper Award. arXiv:2603.24427.

2025 **Convergence, design and training of continuous-time dropout as a random batch method**, ***Antonio Álvarez-López***, *Martín Hernández*.
arXiv:2510.13134.

Selected Talks and Presentations

Invited Seminars

Jun 2026 *Perceptrons and localization of attention's mean-field landscape*. Math Machine Learning Seminar, MPI MiS & UCLA.

May 2026 *Deep Learning with Controlled Flows: Expressivity, Generalization and Generation*. Machine Learning Seminar, UAM.

Sep 2025 *Entropy-driven control of the continuity equation for normalizing flows*. Machine Learning and Scientific Computing Seminar, NUS.

Sep 2025 *Entropy-driven control of the continuity equation for normalizing flows*. Nonlinear PDE Seminar, Department of Mathematics, Texas A&M University.

Jul 2025 *New deep learning models and perspectives for continuous-time glucose monitoring*. DeustoCCM Seminar, University of Deusto (DeustoTech).

2024–2025 *Learning Rate — Machine Learning Series* (4 lectures), FAU-DCN.

Apr 2024 *Controllability of neural differential equations*. Seminario Fontán de Matemáticas, USC.

Feb 2024 *Stable architectures for deep neural networks*. Mathematics for Deep Learning Reading Group, Universities of Bath, Cambridge & UCL.

Jan 2024 *Efficient classification and interpolation with neural ODEs*. Mathematics Seminar, School of Mathematics, Sichuan University.

Mar 2023 *On the separability of two finite sets of random points using hyperplanes*. Joint Mini-Workshop, Technische Universität München & FAU-DCN.

Feb 2023 *Breaking the curse of dimensionality with Barron spaces*. Applied PDE Seminar, Imperial College London.

Nov 2022 *Breaking the curse of dimensionality with Barron spaces*. FAU-DCN.

Apr 2021 *Formation of singularities in the incompressible Euler fluid equations*. Seminarios de Iniciación a la Investigación, Instituto de Matemáticas, USC.

Conference Talks

Jun 2026 *Perceptrons and localization of attention's mean-field landscape*. Machine Learning and PDEs Workshop, FAU MoD, Erlangen, Germany.

Jun 2026 *Perceptrons and localization of attention's mean-field landscape*. Control, PDEs and Machine Learning: Conference in Honour of Enrique Zuazua's 65th Birthday, University of Deusto, Bilbao, Spain.

Dec 2025 *Continuous-time learning of probability distributions via neural ODEs with applications in continuous glucose monitoring data*. International Conference on Statistics and Data Science, Universidad de Sevilla, Spain (**Best Student Paper Award**).

Aug 2024 *Cluster-based classification with neural ODEs via control* and *Interplay between depth and width for interpolation in neural ODEs*. X Partial Differential Equations, Optimal Design and Numerics, Centro de Ciencias de Benasque Pedro Pascual, Huesca, Spain.

Jun 2024 *Controllability of neural ODEs for data classification*. 21st French-German-Spanish Conference on Optimization, Universidad de Oviedo, Spain.

Nov 2023 *Neural ODEs and data classification*. V BYMAT Conference, ICMAT, Madrid, Spain.

Poster Presentations

Sep 2026 *Perceptrons and localization of attention's mean-field landscape*. IAS Frontiers Conference on Geometry, Dynamics and Learning (GDL2026), NTU, Singapore.

Jul 2026 *Perceptrons and localization of attention's mean-field landscape*. ICML 2026, Seoul, South Korea (**Spotlight Paper**).

Oct 2024 *Controllability of neural ODEs for classification*. Conference on Control, Inversion and Numerics for PDEs, Fudan University, Shanghai, China.

Sep 2024 *Simultaneous control of neural ODEs for data classification*. Mathematical Aspects of Learning Theory — 20 Years Later, Centre de Recerca Matemàtica, Barcelona, Spain.

Jul 2024 *Simultaneous control of neural ODEs for data classification*. Fourth Symposium on Machine Learning and Dynamical Systems, Fields Institute, Toronto, Canada.

Jun 2024 *Optimized classification with neural ODEs*. Trends in Mathematical Sciences, FAU-DCN, Erlangen, Germany.

Mar 2024 *Optimized classification with neural ODEs*. Dynamics, Data and Deep Learning Workshop, Engineers' House, Bristol, United Kingdom (**Best Poster Award**).

Dec 2023 *Optimized classification with neural ODEs*. Mathematical Opportunities in Digital Twins, George Mason University, Fairfax, USA.

Academic Service

2026 **Substitute Lecturer**, *Dynamical Systems and Learning*, NTU Singapore (with Prof. Florian Rossmannek).

2026 **Teaching Assistant**, *Statistics*, BSc Environmental Sciences, UAM.

2025 **Teaching Assistant**, *Calculus II*, BSc Data Science and Engineering, UAM.

2025 **Teaching Assistant**, *Probability and Statistical Inference*, BSc Computer Science, UAM.

2024 **Teaching Assistant**, *Numerical Calculus*, BSc Mathematics and Computer Science, UAM.

2023 **Teaching Assistant**, *Data Analysis*, BSc Biology, UAM.

2024–2025 **Co-organizer**, *Machine Learning Seminars and Junior Colloquia at UAM, and Lecture Group at FAU-DCN*.

Awards and Fellowships

2026 **ICML Spotlight Paper**, *Top 2.2% of submissions*.

2025–2026 **FPU Mobility Supplement (research visit at NUS)**, *Ministerio de Universidades*, Spain.
Ranked #1 nationwide.

2025 **Best Student Paper Award**, *2025 IMS International Conference on Statistics and Data Science (ICSDS)*.

2024 **Best Poster Award**, *Dynamics, Data and Deep Learning Workshop, Bristol*.

2022–2026 **FPU Predoctoral Fellowship**, *Ministerio de Universidades*, Spain.
Ranked #6 nationwide.

2021 **Research Fellowship "JAE Intro SOMdM 2021"**, *ICMAT, Madrid*.
Awarded to 7 students nationwide.

2018 **Academic Excellence Award**, *Galician University System*.
Highest academic record (GPA) in the cohort.

2016 **USC's A Ponte Award**, *Top students in the University Entrance Exam*.

2014 **National Award for Academic Achievement**, *Spanish Lower Secondary Education*.
Awarded to 25 students nationwide.

Technical Skills

Languages **Spanish (Native), Galician (Native), English (C2), French (B2), German (Basic).**

Programming **Python, Matlab, R, Fortran**