Antonio Álvarez-López

Curriculum Vitae

📞 (+34) 622692163
✉ antonioalvarezlopez98@gmail.com
🖥 Web page

Personal Details

Date of birth **March 1, 1998**.

Citizenship **Spanish**.

Education

2022– **PhD**, *FAU Erlangen-Nürnberg/Universidad Autónoma de Madrid (UAM)*, Germany/Spain. Advisor: Enrique Zuazua Iriondo. Co-advisor: Rafael Orive Illera.

Oct–Nov 2022 **Research Internship**, *Chair for Dynamics, Control, Machine Learning and Numerics*, Friedrich-Alexander-Universität, (hosted by Prof. Enrique Zuazua).

2021–2022 **Master's degree in Advanced Mathematics**, *Universidad Complutense de Madrid*, Spain.

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

Scientific production

Published articles

Interplay between depth and width for interpolation in neural ODEs, *with Arselane Hadj Slimane and Enrique Zuazua*, Neural Networks, Volume 180, 106640, 2024. https://doi.org/10.1016/j.neunet.2024.106640

Cluster-based classification with neural ODEs via control, *with Rafael Orive-Illera and Enrique Zuazua*, Journal of Machine Learning, Volume 4(2), 128-156, 2025. https://doi.org/10.4208/jml.241114

Constructive approximate transport maps with normalizing flows, *with Borjan Geshkovski and Domènec Ruiz-Balet*, Applied Mathematics and Optimization, Volume 92, 33, 2025. https://doi.org/10.1007/s00245-025-10299-7

Preprints (submitted)

Continuous Temporal Learning of Probability Distributions via Neural ODEs with Applications in Continuous Glucose Monitoring Data, *with Marcos Matabuena*, arXiv:2505.08698.

Invited talks (Conferences & workshops)

27th Aug 2024 **Cluster-based classification with neural ODEs via control.** *Conference X Partial differential equations, optimal design and numerics* (Centro de Ciencias de Benasque Pedro Pascual).

26th Aug 2024 **Interplay between depth and width for interpolation in neural ODEs.** *Conference X Partial differential equations, optimal design and numerics* (Centro de Ciencias de Benasque Pedro Pascual).

21st June 2024 **Controllability of neural ODEs for data classification.** *21 French-German-Spanish Conference on Optimization* (Universidad de Oviedo).

14th Nov 2023 **Neural ODEs and data classification.** *V BYMAT Conference* (ICMAT).

1st March 2023 **On the separability of two finite sets of random points using hyperplanes.** *Mini-workshop between Technische Universität München (Applied Numerical Analysis group) and FAU-DCN*.

Invited talks (Seminars)

29th Sept 2025 **Entropy-driven control of the continuity equation for normalizing flows.** *Machine Learning and Scientific Computing Seminar.* **National University of Singapore**.

16th Sept 2025 **Entropy-driven control of the continuity equation for normalizing flows.** *Nonlinear PDE seminar.* Department of Mathematics. **Texas A&M University**.

2024–2025 **Presentations in lecture seminars:** *Learning Rate — Machine Learning Research Discussion Series* (FAU - UAM), 4 sessions (29.10.2024; 05.11.2024; 30.05.2025; 13.06.2025).

1st April 2024 **Controllability of neural differential equations.** *Seminario Fontán de Matemáticas.* **USC**.

22th Feb 2024 **Stable Architectures for Deep Neural Networks.** *Mathematics for Deep Learning reading group.* **Universities of Bath, Cambridge, and University College London**.

25th Jan 2024	**Efficient classification and interpolation with neural ODEs.** *Mathematics Seminar.* School of Mathematics. **Sichuan University.**
28th Feb 2023	**Breaking the curse of dimensionality with Barron Spaces.** *Applied PDEs Seminar.* Applied Mathematics and Mathematical Physics Section. **Imperial College London.**
14th Nov 2022	**Breaking the curse of dimensionality with Barron Spaces.** *FAU-DCN.*
4th April 2021	**Formation of singularities in the incompressible Euler fluid equations.** *Seminarios de Iniciación a la Investigación.* Instituto de Matemáticas. **USC.**

Poster presentations

7th–10th Oct 2024	Fudan University, Shanghai. ***2024 Conference on Control, Inversion and Numerics for PDEs***. Title: **Controllability of Neural ODEs for Classification.**
10th Sept 2024	Casa Convalescència, Barcelona. ***Mathematical Aspects of Learning Theory – 20 years later***. Title: **Simultaneous Control of Neural ODEs for Data Classification.**
9th July 2024	Fields Institute, Toronto. ***Fourth Symposium on Machine Learning and Dynamical Systems***. Title: **Simultaneous Control of Neural ODEs for Data Classification.**
12th June 2024	FAU. ***Trends in Mathematical Sciences* (Conference)**. Title: **Optimized Classification with Neural ODEs.**
25th March 2024	Engineers' House, Bristol. ***Dynamics, Data and Deep Learning Workshop*. Title: Optimized Classification with Neural ODEs.** Best Poster Award.
11th Dec 2023	George Mason University, Fairfax. ***Mathematical Opportunities in Digital Twins* (Workshop)**. Title: **Optimized Classification with Neural ODEs.**

Awards

2025	**Student travel award**, *2025 IMS International Conference on Statistics and Data Science (ICSDS)*.
2024	**Best poster award**, *Workshop Dynamics, Data and Deep Learning, Bristol*.
2018	**Academic excellence award**, *Best qualifications of Galician University System 2017/18*.
2016	**USC's A Ponte program award**, *Top students in the University Entrance Exam*.
2014	**National Award**, *Compulsory Secondary Education 2013/14*.

Scholarships

Aug 2025-Nov 2026	**FPU Mobility Supplement**, *Ministerio de Universidades, Spain*. Ranked #1 (6 awards nationwide).
Dec 2022–Dec 2026	**FPU Predoctoral fellowship**, *Ministerio de Universidades*, Spain. Ranked #6 (18 awards nationwide).
Sept 2021–June 2022	**Research fellowship for Master's degree "JAE Intro SOMdM 2021"**, *Supervisor: Prof. Alberto Enciso. Subject: Mathematical analysis*, Institute of Mathematical Sciences (ICMAT). 7 awards nationwide.
July 2021	**Summer research scholarship**, *Supervisor: Prof. Paulo Félix Lamas. Subject: Pattern recognition in cardiovascular diseases using machine learning techniques*, CiTIUS (USC).
July–Sept 2020	**Scholarship Severo Ochoa-ICMAT for introduction to research**, *Supervisor: Prof. Alberto Enciso. Project: "Mathematical problems in fluid mechanics"*, ICMAT.

Visits (at least one week)

Aug–Nov 2025	**National University of Singapore**, *Singapore*, hosted by Prof. Qianxiao Li.
May–July 2025	**Sorbonne Université, Laboratoire Jacques-Louis Lions**, *Paris, France*, hosted by Dr. Borjan Geshkovski.
May–June 2024	**FAU-DCN**, *Erlangen, Germany*, hosted by Prof. Enrique Zuazua.
Jan 2024	**Sichuan University, School of Mathematics**, *Chengdu, China*, hosted by Prof. Qi Lü.
Aug–Sept 2023	**Massachusetts Institute of Technology, Department of Mathematics**, *Cambridge, USA*, hosted by Dr. Borjan Geshkovski.
Feb–March 2023	**Imperial College London, Applied Mathematics and Mathematical Physics Section**, *London, United Kingdom*, hosted by Domènec Ruiz-Balet.

Participation in scientific events

23rd–26th June 2025	**Workshop**, *Mean Field Games, Optimal Transport, and Machine Learning*, NYU - Paris, Paris, France.
28th–30th April 2025	**Workshop**, *Machine Learning and PDEs*, FAU, Erlangen, Germany.
24th–29th Nov 2024	**Seminar**, *Oberwolfach Seminar: Control and Machine Learning*, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany.
7th–10th Oct 2024	**Conference**, *2024 Conference on Control, Inversion and Numerics for PDEs*, Fudan University, Shanghai, China.
9th–13th Sept 2024	**Conference**, *Mathematical Aspects of Learning Theory – 20 years later*, Centre de Recerca Matemàtica, Barcelona, Spain.
19th Aug–30th Aug 2024	**Conference**, *X Partial differential equations, optimal design and numerics*, Centro de Ciencias de Benasque Pedro Pascual, Huesca, Spain.
22nd–26th July 2024	**Summer School**, *C.I.M.E. Session on "PDEs, Control and Deep Learning"*, Cetraro, Italy.
8th–12th July 2024	**Conference**, *Fourth Symposium on Machine Learning and Dynamical Systems*, Fields Institute, Toronto, Canada.
18th–21st June 2024	**Conference**, *21 French-German-Spanish Conference on Optimization*, Universidad de Oviedo, Spain.
10th–15th June 2024	**Conference**, *Trends in Mathematical Sciences*, FAU, Erlangen, Germany.
25th–26th March 2024	**Workshop**, *Dynamics, Data and Deep Learning Workshop*, Engineers' House, Bristol, UK.
11th–13th Dec 2023	**Workshop**, *Mathematical Opportunities in Digital Twins*, George Mason University, Fairfax, Virginia.
13th–16th Nov 2023	**Conference**, *V BYMAT Conference*, ICMAT, Madrid, Spain.
10th–11th July 2023	**Summer School**, *XV International ICMAT Summer School on Geometry, Dynamics and Field Theory*, ICMAT, Madrid, Spain.
3rd–7th July 2023	**Summer School**, *Escuela JAE de Matemáticas 2023*, ICMAT, Madrid, Spain.
22nd Feb 2023	**Workshop**, *Exploring foundation models*, The Alan Turing Institute, London, United Kingdom.
12th–14th Sept 2022	**Workshop**, *Fall workshop on nonlinear and nonlocal PDEs*, UAM, Madrid, Spain.
21st Aug–2nd Sept 2022	**Conference**, *IX Partial differential equations, optimal design and numerics*, Centro de Ciencias de Benasque Pedro Pascual, Huesca, Spain.

Teaching (assistant)

Jan–May 2025	**Calculus II**, *Bachelor's Degree in Data Science and Engineering*, UAM.
Jan–May 2025	**Probability and Statistical Inference**, *Bachelor's Degree in Computer Science*, UAM.
Feb–May 2024	**Numerical Calculus**, *Bachelor's double degree in Mathematics and Computer Science*, UAM.
Feb–May 2023	**Data Analysis**, *Bachelor's degree in Biology*, UAM.

Organization of scientific events

2024–2025	**Machine Learning Seminars, Junior coloquia, Lecture group "Learning Rate"**, *ICMAT, UAM, FAU-DCN*.
2024	**Two young researchers sessions**, *Benasque, Spain. Conference X Partial differential equations, optimal design and numerics*.

Peer reviews

Mathematical Control, Signals and Systems; Neural Networks.

Languages

Spanish	**Native**
Galician	**Native**
English	**C2 Proficiency**
French	**Delf B2**

Skills

Technology	**Matlab, Python, R, Latex**

Languages **Spanish, Galician (Native), English (C2 Proficiency), French (Delf B2)**