Dario Trevisan
Curriculum Vitae

Personal information

Family name: Trevisan
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Current position

Since 30 October 2024, I have been a full professor in the sector of Probability and Mathematical Statistics (MATH-03/B) at the Department of Mathematics of the University of Pisa (UNIPI).

Research interests

My current research interests focus on several interconnected areas, in particular stochastic analysis and optimal mass transport. These topics find application in combinatorial optimization problems, in quantum information and, more recently, in machine learning theory.

Over the years I have dedicated myself to the analysis of partial differential equations of transport or diffusion and the associated stochastic processes, exploring the links with differential equations with irregular coefficients and also in infinite-dimensional contexts, also contributing to the geometric measure theory in irregular geometries and infinite dimensions.

Past positions

2022 - 10/2024	Associate professor at UNIPI
2018 - 2021	Tenured researcher at UNIPI
2015 - 2018	Untenured researcher at UNIPI

PhD and scientific abilitiation

28/11/2023	Italian scientific abilitiation (ASN) for area 01/A3 I fascia (full professor).
03/04/2018	ASN for area 01/A3 - II fascia (associate professor).
22/12/2014	PhD in mathematics at SNS, mark 70/70 cum laude. Supervisors: Luigi Ambrosio and Maurizio Pratelli.

Prizes

2021	*Guido Fubini* prize, awarded by Mathesis Association, for "Probability and its role in analysis and mathematical physics".
2025	*Bruno De Finetti (A series)* prize, awarded by Italian Mathematical Union, for "Probability and its applications".

Teaching activity

As a full professor, I am required to provide at least 120 hours of lectures per academic year. During my years of service at UNIPI I have taught courses at various levels for students of degree courses in Mathematics, Robotics and Automation Engineering, Computer Science and Chemistry. In addition to the 120 hours of service, almost every year I have provided at least one course on advanced probability or similar topics.

Thesis supervisor

- Starting from 2015, I have been supervisor (or co-supervisor) for 16 master's theses in mathematics, one master's thesis in robotics and automation engineering at UNIPI, and co-supervisor for a master thesis at the Carlo Alberto college in Turin. I have also supervised more than 20 bachelor's theses in mathematics. The high-quality results contained in some of these thesis works have been published in international journals.
- I am supervisor of a PhD student in mathematics at UNIPI (jointly with Andrea Agazzi, University of Bern).

Commissions of trust

- Starting from 01/31/2025 I am Area Coordinator for Internationalization (CAI) at the UNIPI mathematics department.
- Starting from 05/19/2021, I am an alternate member of the equal opportunities commission (CUG) of UNIPI. During this period, I actively participated in several meetings of the body contributing to its decision-making activities.
- I am currently a member of the UNIPI MATHEMATICS PhD college and UNIPI HIGH PERFORMANCE SCIENTIFIC COMPUTING PhD college.
- I was a member of Area Commission 01 in the two-year period 2021-2022. I actively participated in research evaluations in the fields of mathematics and computer science, in particular for the criteria and assignment of teacher rating points and for the evaluation of University Research Projects (PRA) for the years 2022-2023.
- Since 2018, I have been evaluator of 3 doctoral theses (two in Italy and one in Germany), member of the evaluation commission for 4 doctoral theses (three in Italy and one in Germany).

Scientific projects

I am member of the GNAMPA-INdAM group and UMI. Current scientific projects:

- Local coordinator for PRIN 2022 *Understanding the Learning Process of Quantum Neural Networks (LeQun)* (P.I. Giacomo de Palma)
- Participant to the Galileo project G24-202 of the Italian-French University *Variational methods for geometric and optimal matching problems* (P.I. Matteo Novaga)
- Participant to the *SPOKE 10-HPC, Big Data and Quantum Computing - Simulations, High-Performance Computing, and Data Analysis* (P.I. Massimo D'Elia)
- Participant to the SPOKE 1 "Human-centered AI" in "FAIR - Future Artificial Intelligence Research" (P.I. Dino Pedreschi)

Past projects:

2024	Participant to the GNAMPA-INdAM project *Analytical and Probabilistic Techniques in Quantum Information Theory* (P.I. Sonia Mazzucchi)

2023	Participant to the GNAMPA-INdAM project *Limit Theorems for Stochastic Gradient Descent Dynamics: Convergence and Generalization* (P.I. Andrea Agazzi)
2022	Participant to the GNAMPA-INdAM project *Temi di Analisi Armonica Subellittica* (P.I. Gian Maria Dall'Ara)
2020	Participant to the GNAMPA-INdAM project *Problemi di ottimizzazione con vincoli via trasporto ottimo e incertezza*, (P.I. Lina Mallozzi)
2019	Participant to the GNAMPA-INdAM project *Proprietà analitiche e geometriche di campi aleatori*, (P.I. Maurizia Rossi)
2018	Participant to the PRA UNIPI 2018 project *Analisi geometrica ed equazioni alle derivate parziali in ambiti singolari e non Euclidei*, (P.I. Valentino Magnani)
2017	P.I. of the GNAMPA-INdAM project *Campi vettoriali, superfici e perimetri in geometrie singolari*
2016	Participant to the PRA UNIPI 2016 project *Singular Phenomena and Singular Geometries* (P.I. Marco Romito)
2013	Participant PRIN 2010-2011 (P.I. Gianni dal Maso)
2011	Participant PRIN 2008 (P.I. Marco Frittelli)

Scientific events

Co-organizer for the following events:

2026	•	Thematic Program on *Optimal Transport in Natural Sciences and Statistics*, July 1 - December 31, 2026
2025	•	Mini workshop *Understanding Quantum Machine Learning* at GGI institute, Florence 25-27 June 2025
	•	IPAM thematic semester *Non-commutative Optimal Transport*, March-June 2025
2024	•	Workshop INdAM *Quantum Optimal Transport and Applications*, Cortona, 2-6 September 2024
	•	4th Italian Meeting on Probability and Mathematical Statistics, invited session on *Quantum Probability*, 10-14 June 2024
	•	SPOKE 10 - Quantum Computing seminars, Pisa
	•	Mathematics Department colloquia, UNIPI
2023	•	XXII UMI congress, thematic session *Probability and Statistics*, Pisa
2022	•	Workshop *Optimal Transport and Uncertainty II*, Università di Napoli
2021	•	Mini-workshop *Optimal Transport and Uncertainty*, at UNIPI
2020	•	mini-workshop online *Stochastic Analysis Brats*
2019	•	Workshop *Some topics of Geometric Analysis and Geometric Measure Theory*, at CRM de Giorgi, Pisa
2018	•	Mini-workshop *Vector Fields, Surfaces and Perimeters in Singular Geometries*, at Università degli Studi di Ferrara
2017	•	Summer school *Mathematical Modeling in Life Sciences*, at CRM de Giorgi,
2016	•	Workshop *Singular Phenomena and Singular Geometries*, at UNIPI

Editorial activity

I am currently editor for the Nonlinear Analysis journal, Springer.

I have been reviewer for many scientific journals, including *Annals of Probability*, *Probability Theory and Related Fields*, *Communications in Mathematical Physics*, *Duke Mathematical Journal*, *Journal of Functional Analysis*, *Electronic Journal of/Communications in Probability*, *Journal of Statistical Physics*, *Journal of Fourier Analysis and Applications*, *Quantum*, *Physical Review A*.

Talks

2025	•	Tutorial courses at *Non-commutative optimal transport*, IPAM, Los Angeles
	•	Talk at *Luxembourg Workshop in Stochastic Analysis (2nd edition)*, U. Luxembourg
2024	•	Talk at Workshop *Optimal Transport and Applications*, CRM De Giorgi, Pisa
	•	Talk (online) *On the interactions between Statistics and Geometry* Talk RoMaDS, Roma Tor Vergata
	•	Workshop *Mathematical Aspects of Quantum Information*, Politecnico di Torino
	•	*PRISMA-UMI* colloquium (online)
	•	Talk *HSE analysis seminar*, Moscow (online)
	•	CIRM Workshop *PDE and Probability in interaction*, Marseille
2023	•	Talk at *XXII Congresso UMI*, Pisa
	•	Mini-course *Summer school on Quantum Machine Learning*, Trento
	•	Talk *Bocconi Analysis and Applied Mathematics Talk*, Milano
	•	Talk *Stochastic modelling in physics, biology and population dynamics Talk*, GSSI, L'Aquila
2022	•	Talk at Workshop *Optimal Transport and Applications*, CRM De Giorgi, Pisa
	•	Lecturer at school *Optimal Transport on Quantum Structures*, Erdös center, Budapest
	•	Talk at workshop *Analysis and Geometry of Point Processes*, Bielefeld (online)
2021	•	Talk at workshop *Pathwise Stochastic Analysis and Applications* CIRM, Marseille (online)
	•	Talk *PPGM* at Universidade Federal do Amazonas, Manaus (online)
2019	•	Talk at *Workshop 1 on Optimal Transport: from Geometry to Numerics*, Erwin Schrödinger Institute Wien
	•	*Miniconference on Mass Transportation*, HSE, Mosca
	•	Talk *Stochastic Analysis Talk*, Oxford University
	•	Conference *New Directions in Stochastic Analysis: Rough Paths, SPDEs and Related Topics*, Berlin
2018	•	Mini-colloquim *Rough differential calculus and weak geometric structures*, Moscow
	•	Talk at *9th International Conference on Stochastic Analysis and Its Applications*, Bielefeld
	•	Talk at workshop *Recent Advances in Random processes*, Rome
	•	Joint Analysis Talk, Aachen
	•	Talk at conference *Metric & Measure*, Sendai
2017	•	Workshop *Rough paths in Toulouse*, Toulouse

- Workshop *Geometric Measure Theory*, Warwick
- Talk al *Seventh Berlin-Oxford meeting*, Berlin
- Talk at *XXVII Convegno Nazionale di Calcolo delle Variazioni*, Levico Terme
- Talk at *TU Wien* stochastic analysis seminars,

2015
- Talk at *Oberseminars Stochastics*, Bonn

2014
- Talk at *XXXIV Convegno Nazionale di Analisi Armonica*, Pisa
- Talk at *Analysis Seminar at Mathematisches Institut*, Universität Basel

Bibliography

I am (co-)author of more than 45 scientific articles appeared on peer-reviewed international academic journals. H-index: 14, total citations 670 (source: Scopus).

Publications

2025

1. E. Mosig, A. Agazzi, and D. Trevisan, **Quantitative convergence of trained single layer neural networks to Gaussian processes**, accepted at NeurIPS 2025, preprint arXiv doi: 10.48550/arXiv.2509.24544

2. L. Ambrosio, F. Vitillaro, and D. Trevisan, **Sharp PDE estimates for random two-dimensional bipartite matching with power cost function**, in *Rendiconti Lincei*, vol. 35, no. 2, pp. 323–342, Nov. 2024, doi: 10.4171/rlm/1042

3. D. Trevisan, F.-Y. Wang, and J.-X. Zhu, **Wasserstein asymptotics for empirical measures of diffusions on four dimensional closed manifolds**, *Electronic Communications in Probability*, vol. 30, no. none, pp. 1–13, Jan. 2025, doi: 10.1214/25-ECP719

4. M. Mariani, D. Trevisan **Wasserstein asymptotics for Brownian motion on the flat torus and Brownian interlacements**, in *Stochastic Processes and their Applications*, Volume 183, doi:10.1016/j.spa.2025.104595

2024

5. N. Gigli, L. Tamanini, D. Trevisan **Viscosity solutions of Hamilton-Jacobi equation in $RCD(K,\infty)$ spaces and applications to large deviations**, in *Potential Analysis*, doi:10.1007/s11118-024-10168-y

6. D. Trevisan **Quantum optimal transport: an invitation**, in *Bollettino dell'Unione Matematica Italiana*, doi:10.1007/s40574-024-00428-5

7. A. Basteri, D. Trevisan **Quantitative Gaussian approximation of randomly initialized deep neural networks**, in *Machine Learning*, Volume 113, pages 6373–6393, Springer, doi:10.1007/s10994-024-06578-z

8. G. De Palma, D. Trevisan **Quantum optimal transport: quantum channels and qubits**, capitolo del volume *Optimal Transport on Quantum Structures*, BSMS, volume 29, ISBN 978-3-031-50465-5, Springer

9. G. De Palma, D. Trevisan **The generalized strong subadditivity of the von Neumann entropy for bosonic quantum Gaussian systems**, in *Journal of Mathematical Physics*, AIP, doi:10.1063/5.0131431

10. M. Goldman, D. Trevisan **On the concave one-dimensional random assignment problem and Young integration theory**, in *Annali Scuola Normale Superiore - Classe di Scienze*, doi:10.2422/2036-2145.202306_011

11. N. Puchkin, V. Spokoiny, E. Stepanov, D. Trevisan **Reconstruction of manifold embeddings into Euclidean spaces via intrinsic distances**, in *ESAIM: Control, Optimisation and Calculus of Variations* 30, 3, doi:10.1051/cocv/2023088

2023

12. M. Correddu, D. Trevisan **On minimum spanning trees for random Euclidean bipartite graphs**, in *Combinatorics, Probability and Computing* 33.3, 319-350, doi:10.1017/S0963548323000445

13. M. Goldman, D. Trevisan **Optimal transport methods for combinatorial optimization over two random point sets**, in *Probability Theory and Related Fields*, 188, pp. 1315–1384, doi:10.1007/s00440-023-01245-1

14. G. Alberti, E. Stepanov, D. Trevisan **Integration of nonsmooth 2-forms: from Young to Itô and Stratonovich**, in *Journal of Functional Analysis*, 286(2), doi:10.1016/j.jfa.2023.110212

15. G. De Palma, D. Trevisan **The Wasserstein Distance of Order 1 for Quantum Spin Systems on Infinite Lattices**, in *Annales Henri Poincaré*, 24, No. 12, doi:10.1007/s00023-023-01340-y

16. M. Huesmann, F. Mattesini, D. Trevisan, **Wasserstein asymptotics for the empirical measure of fractional Brownian motion on a flat torus**, in *Stochastic Processes and their Applications*, 155, 1-26, doi:10.1016/j.spa.2022.09.008

2022

17. L. Ambrosio, M. Goldman, D. Trevisan, **On the quadratic random matching problem in two-dimensional domains**, in *Electron. J. Probab.* 27: 1-35 (2022), doi: 10.1214/22-EJP784

18. E. Stepanov, D. Trevisan, **On exterior differential systems involving differentials of Hölder functions**, in *Journal of Differential Equations*, doi: 10.1016/j.jde.2022.07.037

19. C. Rigoni, E. Stepanov, D. Trevisan, **Lie brackets of nonsmooth vector fields and commutation of their flows**, in *Journal of the London Mathematical Society*, doi:10.1112/jlms.12597

2021

20. M. Goldman, D. Trevisan, **Convergence of asymptotic costs for random Euclidean matching problems**, *Probability Theory and Mathematical Physics*, doi: 10.2140/pmp.2021.2.121

21. G. De Palma, M. Marvian, D. Trevisan, S. Lloyd, **The Quantum Wasserstein Distance of Order 1**, *IEEE Transactions on Information Theory*, doi: 10.1109/TIT.2021.3076442

22. G. De Palma, D. Trevisan, **Quantum Optimal Transport with Quantum Channels**, *Annales Henri Poincare*, doi: 10.1007/s00023-021-01042-3

2020

23. E. Stepanov, D. Trevisan, **Towards Geometric Integration of Rough Differential Forms**, *The Journal of Geometric Analysis*, doi:10.1007/s12220-020-00375-5

2019

24. M. Huesmann, D. Trevisan, **A Benamou-Brenier formulation of martingale optimal transport**, *Bernoulli*, vol. 25, n. 4 A, pp. 2729–2757, doi:10.3150/18-bej1069

25. L. Ambrosio, F. Stra, D. Trevisan, **A PDE approach to a 2-dimensional matching problem**, *Probability Theory and Related Fields*, 2019, vol. 173, n. 1-2, pp. 433-477, doi: 10.1007/s00440-018-0837-x

26. L. Ambrosio, F. Glaudo, D. Trevisan, **On the optimal map in the 2-dimensional random matching problem**, *Discrete and Continuous Dynamical Systems- Series A*, 2019, vol. 39, n. 12, pp. 7291-7308, doi: 10.3934/dcds.2019304

2018

27. L. Ambrosio, E. Bruè, D. Trevisan, **Lusin-type approximation of Sobolev by Lipschitz functions, in Gaussian and $RCD(K,\infty)$ spaces**, *Adv. in Math.*, vol. 339, pp. 426–452, doi: 10.1016/j.aim.2018.09.033

28. G. De Palma, D. Trevisan, V. Giovannetti, L. Ambrosio, **Gaussian optimizers for entropic inequalities in quantum information**, Journal of Math. Physics, vol. 59, doi: 10.1063/1.5038665

29. G. De Palma, D. Trevisan, V. Giovannetti, **The One-Mode Quantum-Limited Gaussian Attenuator and Amplifier have Gaussian Maximizers**, *Annales Henri Poincaré*

30. V. Magnani, E. Stepanov, D. Trevisan, **A rough calculus approach to level sets in the Heisenberg group**, *Journal of London Mathematical Society*, (online) doi: 10.1112/jlms.12115

31. G. de Palma, D. Trevisan, **The Conditional Entropy Power Inequality for Bosonic Quantum Systems**, *Communications in Mathematical Physics*, n. 360, p. 639-662, doi: 10.1007/s00220-017-3082-8

2017

32. G. de Palma, D. Trevisan, V. Giovannetti, **Gaussian States Minimize the Output Entropy of One-Mode Quantum Gaussian Channels**, *Physical Review Letters*, vol. 118, n. 16, doi: 10.1103/physrevlett.118.160503

33. L. Ambrosio, D. Trevisan, **Lecture notes on the DiPerna-Lions theory in abstract measure spaces**, *Ann. Fac. Sci. Toulouse*, vol. XXVI, p. 729-766, doi: 10.5802/afst.1551

34. V. Magnani, D. Trevisan, **On Lipschitz vector fields and the Cauchy problem in homogeneous groups**, *Communications in Contemporary Mathematics*, (online), doi: 10.1142/S0219199717500572

2016

35. E. Musta, M. Pratelli, D. Trevisan, **Functional Cramér–Rao bounds and Stein estimators in Sobolev spaces, for Brownian motion and Cox processes**, *Journal of Multivariate Analysis*, vol. 154, pp. 135–146, doi: 10.1016/j.jmva.2016.10.011

36. E. Stepanov, D. Trevisan, **Three superposition principles: currents, continuity equations and curves of measures**, *Journal of Functional Analysis*, vol. 272, n.3, doi: 10.1016/j.jfa.2016.10.025

37. G. De Palma, D. Trevisan, V. Giovannetti, **Gaussian states minimize the output entropy of the one-mode quantum attenuator**, *IEEE Transactions on Information Theory*, vol. 63, n. 1, pp. 728–737, doi: 10.1109/TIT.2016.2621748

38. L. Ambrosio, F. Stra, D. Trevisan, **Weak and strong convergence of derivations and stability of flows with respect to MGH convergence**, *Journal of Functional Analysis*, vol. 272, n. 3, doi: 10.1016/j.jfa.2016.10.030

39. G. De Palma, D. Trevisan, V. Giovannetti, **Passive states optimize the output of bosonic Gaussian quantum channels**, *IEEE Transactions on Information Theory*, vol. 62, n. 5, pp. 2895–2906, doi: 10.1109/TIT.2016.2547426

40. D. Trevisan, **Well-posedness of multidimensional diffusion processes with weakly differentiable coefficients**, *Electronic Journal of Probability*, vol. 21, doi: 10.1214/16-EJP4453

2015

41. D. Trevisan, **Lagrangian flows driven by BV fields in Wiener spaces**, in *Probability Theory and Related Fields*, vol. 163, n. 1 (2015), doi: 10.1007/s00440-014-0589-1

2014

42. D. Trevisan, **A short proof of Stein's universal multiplier theorem**, in *Séminaire de Probabilités XLVI*

43. L. Ambrosio and D. Trevisan, **Well posedness of Lagrangian flows and continuity equations in metric measure spaces**, in *Analysis & PDE*, vol. 7, n. 5, doi: 10.2140/apde.2014.7.1179

44. G.M. Dall'Ara and D. Trevisan, **Uncertainty Inequalities on Groups and Homogeneous Spaces via Isoperimetric Inequalities**, in *The Journal of Geometric Analysis*, doi: 10.1007/s12220-014-9512-3

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45. D. Trevisan, **BV-regularity for the Malliavin derivative of the maximum of the Wiener process** in *Electronic Communications in Probability*, vol. 18, doi: 10.1214/ECP.v18-2314

46. D. Trevisan, **Zero noise limits using local times**, in *Electronic Communications in Probability*, vol. 18, doi: 10.1214/ECP.v18-2587

2012

47. M. Pratelli and D. Trevisan, **Functions of bounded variation on the classical Wiener space and an extended Ocone-Karatzas formula**, in *Stochastic Processes and their Applications*, vol. 122, doi: 10.1016/j.spa.2012.03.010

Selected Research Contributions

My primary research contributions focus on the following areas:

- *ODEs in Gaussian and Metric Measure Spaces*: extending DiPerna-Lions theory by proving existence and uniqueness results for ODEs with irregular vector fields, including strong approximation results under synthetic Ricci curvature bounds, along with a probabilistic interpretation of the continuity equation.

  D. Trevisan, **Lagrangian flows driven by BV fields in Wiener spaces**, in *Probability Theory and Related Fields*, vol. 163, n. 1 (2015), , doi: 10.1007/s00440-014-0589-1

- *SDEs with Irregular Fields*: going beyond the martingale problem and flows for possibly degenerate Sobolev diffusion generators, establishing a general well-posedness theory both in finite and (some) infinite dimensional settings, and widely extending the so-called superposition principle for diffusions.

  D. Trevisan, **Well-posedness of multidimensional diffusion processes with weakly differentiable coefficients**, *Electronic Journal of Probability*, vol. 21, doi: 10.1214/16-EJP4453

- *Rough Paths Theory*: introducing rough ODEs in sub-Riemannian geometry and exploring high-dimensional integration techniques.

  E. Stepanov, D. Trevisan, **Towards Geometric Integration of Rough Differential Forms**, *The Journal of Geometric Analysis*, doi:10.1007/s12220-020-00375-5

- *Quantum Information Theory*: advancing fundamental inequalities in Gaussian Bosonic systems and exploring novel quantum Optimal Transport (OT) problems.

  G. de Palma, D. Trevisan, **The Conditional Entropy Power Inequality for Bosonic Quantum Systems**, *Communications in Mathematical Physics*, n. 360, p. 639-662, doi: 10.1007/s00220-017-3082-8

- *Optimal Transport*: investigating applications to random combinatorial optimization problems - e.g., random assignment roblems in Euclidean settings - proving convergence of asymptotic costs and structural properties of the optimizers.

  M. Goldman, D. Trevisan **Optimal transport methods for combinatorial optimization over two random point sets**, in *Probability Theory and Related Fields*, 188, pp. 1315–1384, doi:10.1007/s00440-023-01245-1

- *Gaussian Process Approximation in Neural Networks*: establishing explicit upper bounds in quadratic Wasserstein distance to quantify how hidden and output layer sizes influence Gaussian behavior.

  A. Basteri, D. Trevisan **Quantitative Gaussian approximation of randomly initialized deep neural networks**, in *Machine Learning*, Volume 113, pages 6373–6393, Springer, doi:10.1007/s10994-024-06578-z

Pisa, 22/04/2025,

Dario Trevisan