

Curriculum Vitae

Mario Maurelli

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1 Contact data and position

Affiliation and work address: Dipartimento di Matematica ‘Federigo Enriques’, Università degli Studi di Milano (“La Statale”), via Saldini 50, 20133 Milano, Italy

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Current position: Associate professor (professore di seconda fascia) in Probability and Mathematical Statistics (MAT/06).

2 Education and career

Apr 2022 – today Associate professor (professore di seconda fascia) in Probability and Mathematical Statistics (MAT/06), at Dipartimento di Matematica, Università degli Studi di Milano (“La Statale”), Italy

Apr 2019 – Mar 2022 Assistant professor (ricercatore tipo B, 3-year tenure track) in Probability and Mathematical Statistics (MAT/06), at Dipartimento di Matematica, Università degli Studi di Milano.

Aug 2018 – Mar 2019 Lecturer in applied probability at School of Mathematics, University of Edinburgh, UK (on leave).

Apr 2018 – Mar 2019 Research fellow at Department of Mathematics, University of York, UK.

Apr 2015 – Mar 2018 Research assistant (wissenschaftlicher Mitarbeiter; half position) at Institut für Mathematik, Technische Universität Berlin (TUB), Germany.

Oct 2014 – Mar 2018 Research assistant (wissenschaftlicher Mitarbeiter; half position from Apr 2015) at Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Berlin, Germany.

Nov 2011 – Sep 2014 PhD scholarship in Mathematics at Scuola Normale Superiore, Pisa, Italy.
Mar 18, 2016: Diploma di Perfezionamento (PhD degree) in Mathematics at Scuola Normale Superiore, Pisa, Italy, with marks 70/70 cum laude, with thesis “Regularization by noise in finite dimension”, advisor Prof. F. Flandoli.

Oct 2006 – Sep 2011 Bachelor's and Master's student in Mathematics at Università di Pisa and at Scuola Normale Superiore.

- Dec 19, 2012: Diploma di Licenza in Mathematics at Scuola Normale Superiore, with marks 70/70 (this is the final degree obtained at Scuola Normale Superiore after completion of Bachelor's and Master's studies).
- Sep 30, 2011: Laurea Magistrale (Master's degree) in Mathematics at Università di Pisa, with marks 110/110 cum laude, with thesis "Stochastic differential equations with rough coefficients", advisor Prof. F. Flandoli.
- Sep 25, 2009: Laurea Triennale (Bachelor's degree) in Mathematics at Università di Pisa, with marks 110/110 cum laude, with thesis "Stochastic flows and isotropic Brownian motion" (in Italian), advisor Prof. F. Flandoli.

3 Research topics

- Stochastic PDEs in fluid dynamics: stochastic Euler equations, in particular in 2D; geometric viewpoint; Kraichnan model of passive scalars.
- McKean-Vlasov SDEs and corresponding interacting diffusions: large deviations for interacting diffusions; relations with rough paths; application to a battery model.
- Regularization by noise for ODEs and PDEs: regularization for linear transport equations; regularization for scalar conservation laws; zero-noise selection; non-explosion by noise.

4 Publications, preprints and thesis

Publications:

- CDFGGM21 M. Coghi, W. Dreyer, P.K. Friz, P. Gajewski, C. Gohlke, M. Maurelli, A McKean-Vlasov SDE and particle system with interaction from reflecting boundaries, arXiv:2102.12315v2 (2021), accepted for publication on SIAM J. Math. Anal.
- M20 M. Maurelli, Non-explosion by Stratonovich noise for ODEs, Electron. Commun. Probab. 25 (2020), no. 68, 1–10.
- CDFM20 M. Coghi, J.-D. Deuschel, P.K. Friz, M. Maurelli, Pathwise McKean-Vlasov theory with additive noise, Ann. Appl. Probab. 30 (2020), no. 5, 2355–2392.
- CM20 M. Coghi, M. Maurelli, Regularized vortex approximation for 2D Euler equations with transport noise, Stoch. Dynam. (2020).
- BFGM19 L. Beck, F. Flandoli, M. Gubinelli, M. Maurelli, Stochastic ODEs and stochastic linear PDEs with critical drift: regularity, duality and uniqueness, Electron. J. Probab. 24 (2019), no. 136, 1–72.

- DFMS18 J.-D. Deuschel, P.K. Friz, M. Maurelli, M. Slowik, The enhanced Sanov theorem and propagation of chaos, *Stoch. Proc. Appl.* 128 (2018), no. 7, 2228–2269.
- GM18 B. Gess, M. Maurelli, Well-posedness by noise for scalar conservation laws, *Comm. PDEs* 43 (2018), no. 12, 1702–1736.
- GGMFD18 C. Gohlke, P. Gajewski, M. Maurelli, P.K. Friz, W. Dreyer, Stochastic model for LFP-electrodes, *Cont. Mech. Thermodyn.* 30 (2018), no. 3, 593–628.
- BFM16 Z. Brzezniak, F. Flandoli, M. Maurelli, Existence and uniqueness for stochastic 2D Euler flows with bounded vorticity, *Arch. Ration. Mech. Anal.* 221 (2016), no. 1, 107–142.
- FMN14 F. Flandoli, M. Maurelli, M. Neklyudov, Noise prevents infinite stretching of the passive field in a stochastic vector advection equation, *J. Math. Fluid Mech.* 16 (2014), no. 4, 805–822.
- M11 M. Maurelli, Wiener chaos and uniqueness for stochastic transport equation, *C. R. Math. Acad. Sci. Paris* 349 (2011), no. 11-12, 669–672.

Preprints:

- HHMT20 J. Hoeksema, T. Holding, M. Maurelli, O. Tse, Large deviations for singularly interacting diffusions, *arXiv:2002.01295* (2020).
- BM19 Z. Brzezniak, M. Maurelli, Existence for stochastic 2D Euler equations with positive H^{-1} vorticity, *arXiv:1906.11523* (2019).
- DM19 F. Delarue, M. Maurelli, Zero noise limit for multidimensional SDEs driven by a pointy gradient, *arXiv:1909.08702* (2019).
- MMS19 M. Maurelli, K. Modin, A. Schmeding, Incompressible Euler equations with stochastic forcing: a geometric approach, *arXiv:1909.09982* (2019).

PhD thesis:

- PhDTh M. Maurelli, Regularization by noise in finite dimension, PhD Thesis, 2016.

5 Projects and funding

Mar 2021 - today Head of the probability and statistics unit in the SEED project “SciCult” (Mathematical modelling and scientific analysis for cultural heritage: forecasting and preventing chemical and mechanical degradation of monumental stones in outdoor environment), principal investigator C. Cavaterra. The SEED projects are funded by La Statale and involve several departments of La Statale.

Aug 2020 - Dec 2021 Member of the GNAMPA 2020 project “SPDEs in fluidodinamica”, principal investigator L.A. Bianchi. The project funded related research expenses.

- Oct - Dec 2019 Co-applicant and member of the group “Stochastic fluid dynamics” in the junior trimester program “Randomness, PDEs and nonlinear fluctuations” at the Hausdorff Research Institute in Bonn. The trimester program funded my subsistence expenses in Bonn and supported the workshop “Stochastic fluid dynamics” and the invitation of some guests.
- Apr 2018 - Mar 2019 Principal investigator of the Newton International Fellowship “Stochastic Euler Equations and the Kraichnan model”, with Z. Brzezniak at University of York as UK sponsor. The fellowship funded my position at University of York and related research expenses.
- Oct 2014 - Mar 2018 Member of the Matheon projects C-SE8 (until May 2017) and C-SE17 (from June 2017) “Stochastic methods for the analysis of lithium-ion batteries”, heads J-D. Deuschel (from June 2017), W. Dreyer, P.K. Friz, C. Gohlke (from June 2017). The projects funded my position at WIAS and related research expenses.
- Apr 2015 - Jul 2016 Member of ERC Starting Grant “Rough path theory, differential equations and stochastic analysis”, head P.K. Friz. The project funded my position at TUB and related research expenses.

6 Schools, workshops/conferences and periods of visit

Invited talks:

- 10/2021 Differential equations and numerical analysis seminar, Norwegian University of Science and Technology, Trondheim (talk Stochastic Euler equations: a geometric approach)
- 09/2021 INdAM workshop Mathematical modeling and Analysis of degradation and restoration in Cultural Heritage, Roma (talk Randomness in marble sulphation)
- 05/2021 Colloquium Applied Mathematics, Universität Münster (talk Stochastic 2D Euler equations with transport noise: bounded and measure-valued vorticity)
- 04/2021 Non-local operators, probability and singularities online seminars (talk Regularization by noise for transport PDEs: two results)
- 02/2021 PRISMA online seminars, UMI PRISMA group (joint talk with Franco Flandoli on Regularization by noise)
- 12/2020 seminar Analysis of fluids and related topics, Princeton University (talk Stochastic Euler equations: a geometric approach)
- 10/2020 Analysis and PDE seminar, University of Bergen (talk Regularization by noise)
- 06/2020 Bielefeld Stochastic Afternoon series, Universität Bielefeld (talk Stochastic Euler equations: a geometric approach)

- 07/2019 meeting Recent Trends in Stochastic Analysis and SPDEs, Università di Pisa (talk Existence of nonnegative vortex sheets for 2D stochastic Euler equations)
- 01/2019 meeting Stochastic analysis, University of Edinburgh (talk McKean-Vlasov SDEs with irregular drift: large deviations for particle approximation)
- 01/2019 winter school on Stochastic PDEs and Mean-Field Games, Università di Bologna (talk McKean-Vlasov SDEs with irregular drift: large deviations for particle approximation)
- 11/2018 workshop Calculus on Wasserstein Spaces and Related Fields, University of Edinburgh (talk Existence of vortex sheets for 2D stochastic Euler equations)
- 08/2018 BIRS workshop Regularity and Blow-up of Navier-Stokes Type PDEs using Harmonic and Stochastic Analysis, Banff, Canada (talk Existence of vortex sheets for 2D stochastic Euler equations)
- 03/2018 Stochastic Analysis Seminar, University of Oxford (talk McKean-Vlasov SDEs with irregular drift: large deviations for particle approximation)
- 01/2018 CASA colloquium, Technische Universiteit Eindhoven (talk A McKean-Vlasov SDE with reflecting boundaries)
- 12/2017 Probability, stochastic analysis and statistics seminars, Università di Pisa (talk A McKean-Vlasov SDE with reflecting boundaries)
- 09/2017 Séminaire de Probabilité et Statistiques, Laboratoire J.A. Dieudonné in Nice (talk Regularization by noise for scalar conservation laws)
- 02/2017 Stochastic analysis day, Università di Pisa (talk Regularization by noise for scalar conservation laws)
- 10/2016 Mathematical finance and stochastic analysis seminars, University of York (talk Regularization by noise for scalar conservation laws)
- 07/2016 AIMS Conference on Dynamical systems, differential equations and applications, Orlando (USA) (talk Regularization by noise for stochastic scalar conservation laws)
- 06/2016 Workshop on stochastic analysis, Universidade Estadual de Campinas, Brazil (talk Regularization by noise for transport-type equations via stochastic exponentials)
- 05/2016 meeting SPDEs and applications, Levico Terme, Italy (talk Regularization by noise for continuity equation via Young drivers)
- 04/2016 meeting Rough paths, regularity structures and related topics, Mathematisches Forschungsinstitut Oberwolfach (talk Enhanced Sanov theorem and large deviations for interacting particles)

- 04/2016 Berlin-Leipzig workshop in analysis and stochastics, Max Planck Institute for Mathematics in the Sciences, Leipzig (talk Enhanced Sanov theorem and robust propagation of chaos)
- 01/2016 Oberseminar Analysis - Probability, Max Planck Institute for Mathematics in the Sciences, Leipzig (talk Regularization by noise for linear SPDEs)
- 12/2015 workshop Stochastic limit analysis for reacting particle systems, Weierstrass Institute in Berlin (joint talk with Wolfgang Dreyer on Theory of many-particle electrodes)
- 10/2015 Stochastic analysis seminar, Imperial College London (talk Enhanced Sanov theorem for Brownian rough paths and an application to interacting particles)
- 07/2014 Berlin-Oxford young researcher meeting on applied stochastic analysis, Oxford-Man Institute (talk Regularization by noise for SDEs: the Hörmander case)
- 12/2013 Berlin-Oxford young researcher meeting on applied stochastic analysis, Weierstrass Institute in Berlin (talk Regularization by noise for ODEs: regularity implies path-by-path uniqueness, via duality)
- 06/2013 East Midlands stochastic analysis seminar, University of York (talk Regularization by noise: uniqueness and regularity via transport equation)

Periods of visit (at least two weeks):

- 10 to 12/2019 Hausdorff Research Institute for Mathematics in Bonn, as member of the group ‘Stochastic fluid dynamics’ in the junior trimester program ‘Randomness, PDEs and nonlinear fluctuations’
- 06/2018 Mathematisches Forschungsinstitut Oberwolfach, for the Research in pairs program with G. dos Reis and J. Tugaut, on a metastability problem for a McKean-Vlasov SDE
- 05/2018 Stefan Banach International Mathematical Center in Warsaw, invited as junior scientific leader in the Simons semester ‘PDEs/SPDEs and functional inequalities’
- 06 to 07/2013 Hausdorff Center for Mathematics in Bonn, to work with L. Beck and to attend M. Hairer’s Lipschitz lectures on renormalization theory and stochastic PDEs
- 10 to 12/2010 École Normale Supérieure Paris, to study generalized stochastic flows under the supervision of Y. Le Jan

Schools attended:

- 04/2017 CIRM school on Stochastic Dynamics out of Equilibrium, Marseille, lectures by C. Landim on hydrodynamic limit of interacting particle systems, P. Dai Pra on Stochastic mean-field dynamics and applications to life sciences, B. Leimkuhler on Molecular and particle dynamics simulation and P. Degond on Collective dynamics in life sciences.

- 08/2016 CIME school on Singular random dynamics, Cetraro (Italy), lectures by M. Hairer on regularity structures , M. Gubinelli on energy solutions, P. Souganidis on Hamilton-Jacobi equations with rough signals and N. Tzvetkov on nonlinear dispersive equations with random initial data.
- 02/2014 Schools on Rough paths and PDEs and on Deterministic and stochastic Navier-Stokes equations, in Toulouse.
- 06/2013 School on KPZ equation and rough paths, at Lebesgue Center in Rennes, lectures by M. Hairer on regularity structures and KPZ equation and P. Friz on rough paths theory.
- 12/2012 School on stochastic analysis and control of fluid flow, at IISER in Trivandrum (India).
- 07/2010 Summer school at Saint-Flour (France), lectures (among others) by F. Flandoli on random perturbation of PDEs.

7 Teaching activities

Teaching:

- 2020-21 Exercise classes (24 hours) in the module Probability, second year of Bachelor degree in Mathematics, La Statale.
- 2020-21 Lectures and exercise classes (16 hours) in the module Probability and Statistics, first year of Bachelor degree in Environmental Science and Policy, La Statale.
- 2020-21 Lectures and exercise classes (16 hours) in the module Probability and Statistics, first year of Bachelor degree in Biology, La Statale.
- 2019-20 Exercise and computer lab classes (34 hours) in the module Probability and mathematical statistics 1, second year of Bachelor degree in Mathematics, La Statale.
- 2019-20 Lectures and exercise classes (16 hours) in the module Probability and Statistics, first year of Bachelor degree in Environmental Science and Policy, La Statale.
- 2019-20 Lectures and exercise classes (16 hours) in the module Probability and Statistics, first year of Bachelor degree in Biology, La Statale.
- 2019-20 Lectures (15 hours) in the module Regularization by noise, PhD degree in Mathematics, La Statale.
- 2018-19 Computer lab classes (12 hours) in the module Probability and mathematical statistics 1, second year of Bachelor degree in Mathematics, La Statale.
- 2018-19 Lectures and exercise classes (16 hours) in the module Probability and Statistics, first year of bachelor degree in Environmental Science and Policy, La Statale.

- 2017-18 Lectures in the module Advanced topics in stochastics - Regularization by noise, Master and PhD degree in Mathematics, Technische Universität Berlin.
- 2016-17 Exercise classes in the module Measure and integration theory, Bachelor and Master degree in Mathematics, Technische Universität Berlin.
- 2016-17 Tutoring in the module Numerical mathematics for Engineers II, Master degree in Engineering, Technische Universität Berlin.
- 2011-14 Tutoring in Mathematics for first year Bachelor students in Mathematics and Physics, Scuola Normale Superiore.
- 2012-13 Exercise classes for part of the module Istituzioni di probabilità (on stochastic processes and SDEs), first year of Master degree in Mathematics, Università di Pisa.
- 2011-12 Exercise classes for part of the module Introduction to measure and integration theory, third year of Bachelor degree in Mathematics, Scuola Normale Superiore.

Advisor for Master theses:

- 2020 A. Ubiali, ‘Modelli matematici per il degrado dei monumenti: verso un approccio stocastico’ (on deterministic and stochastic models on deterioration of monuments), Master degree (laurea magistrale) in Mathematica at La Statale (co-advisor with D. Morale and S. Ugolini).
- 2019 C. Li, ‘Mean field SDEs and interacting agent models’, Master degree in Computational Mathematical Finance, University of Edinburgh.
- 2019 X. Niu, ‘Mean field SDEs and applications to systemic risk’, Master degree in Computational Mathematical Finance, University of Edinburgh.
- 2019 Y. Yang, ‘Fractional Brownian Motion and Stochastic Volatility Models’, Master degree in Financial Modelling and Optimization, University of Edinburgh.

8 Organization activities and memberships

- Organizer, with C. Orrieri, M. Rossi, M. Zanella, of the Pavia Milano Seminar series on Probability and Mathematical Statistics, Apr 2021-today.
- Organizer, with L.A. Bianchi and M. Zanella, of the workshop “Stochastic fluid dynamics”, at Hausdorff Research Institute for Mathematics in Bonn, Nov 11-15, 2019.
- Organizer, with P.K. Friz, T. Lyons, T. Nilssen, of the “Berlin-Oxford young researcher meeting on applied stochastic analysis”, at Weierstrass Institute and at Technische Universität in Berlin, May 18-20, 2017.

- Organizer, with H. Boedihardjo, K. Chouk, P.K. Friz, T. Lyons, H. Oberhauser, of the “Berlin-Oxford young researcher meeting on applied stochastic analysis”, at Weierstrass Institute in Berlin, Jan 27-29, 2015.
- Member of “Unione Matematica Italiana” (Italian Mathematical Union), group “PRISMA” (PProbability In Statistics, Mathematics and Applications), Sep 2020-today.
- Member of “Istituto Nazionale di Alta Matematica” (INdAM, which groups together most of Italian mathematicians), group “GNAMPA” (analysis, probability and their applications), 2012-today.

9 Languages

Italian (native); English (fluent); German (basic).