Michele Salvi

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Personal

Born on March 22, 1985 in Rome, Italy.

Italian Citizenship.

Education and academic positions

- 2023-... Associate Professor, Mathematics Department, Universitá degli Studi di Tor Vergata, Rome.
- **2020- 2023** Ricercatore di tipo B (assistant professor), Mathematics Department, Universitá degli Studi di Tor Vergata, Rome.
- **2019- 2020** Maître de conférences (assistant professor), Laboratoire de Probabilités, Statistiques et Modélisations (LPSM), Paris Diderot university – Université de Paris.
- 2018-2019 Postdoc in Mathematics, École Polytechnique and INRA, Paris.
- 2016-2018 Marie Skłodowska-Curie Individual Fellowship, Paris-Dauphine University.
- 2013-2015 Postdoc in Mathematics, TU Munich.
- **2010-2013** Ph.D. in Mathematics, TU Berlin, *summa cum laude*. Thesis: *The Random Conductance Model: local times large deviations, law of large numbers and effective conductance*. Supervisor: Prof. Dr. Wolfgang König. Date of defense: 22nd April 2013.
- **2012** Visitor of Prof. Marek Biskup at UCLA (US) in April and October, supported by an ESF Exchange grant (RGLIS).
- **2007-2009** Master degree in Mathematics, Roma 3 University, 110/110 magna cum laude. Thesis: *The Cut-off phenomenon for Monte Carlo Markov chains*, supervised by Prof. Fabio Martinelli.
- 2008 Erasmus student, Universidad Complutense, Madrid.

2004-2007 Bachelor of Mathematics degree, Roma 3 University, 110/110 magna cum laude.

Funding and grants

- 2023 Participant to the PRIN project "GRAFIA: Geometry of RAndom FIelds and Applications".
- 2023 Participant to the GNAMPA project "Limiting Behavior of Stochastic Dynamics in the Schelling Segregation Model", 2500€.
- 2022 PI of the project ASPRO, Asymptotic Properties in Probability, funded by Tor Vergata University, 7200€.
- 2016-2018 Marie Skłodowska-Curie Individual Fellowship.

- **2012** (October) ESF Short Visit grant for visiting Prof. Marek Biskup at UCLA, in the context of the program Random Geometry of Large Interacting Systems and Statistical Physics (RGLIS).
- **2012** (April and May) ESF Exchange grant for visiting Prof. Marek Biskup at UCLA, in the context of the program Random Geometry of Large Interacting Systems and Statistical Physics (RGLIS).

Research abroad

- 2022 NUS, Singapore (Singapore) collaboration with Prof. Rongfeng Sun, three months.
- 2019 NYU Shangai, Shangai (China) collaboration with Dr. Joseba Dalmau, two weeks.
- **2015-2019** La Sapienza university, Rome (Italy) collaboration with Prof. Alessandra Faggionato, about three weeks per year.
- 2016 NYU, New York City (US) collaboration with Prof. Scott Armstrong, one week.
- 2013 Aix-Marseille university, Marseille (France) collaboration with Dr. Alexandre Gaudillière, one week.
- 2012 UCLA, Los Angeles (US) collaboration with Prof. Marek Biskup, two months.

Awards

- 2015 Prize as best Teaching Assistant in Mathematics at TU Munich (2nd place).
- 2010 BMS (Berlin Mathematical School) "Initiative of Excellence" Scholarship.
- 2007 INdAM (National Institute for Advanced Mathematics "Francesco Severi") Scholarship in Mathematics (4th classified in Italy).
- 2004 Roma 3 University Scholarship for first year Mathematics students (1st classified).

Teaching and professional activities

Academic responsibilities

2023-... Member of the doctoral board for the Ph.D. in Data Science of University of Rome, Tor Vergata.

Supervision

- **2024** Supervision of the master thesis of Marco Cotugno De Palma, Master degree in Mathematics, University of Tor Vergata: *Theoretical bounds and efficient algorithms for private measures and synthetic data*.
- **2024** Co-supervision of the master thesis of Flora Angileri, Master degree in Mathematics, University of Tor Vergata: *Reinforcement Learning for investigating graph conjectures*.
- **2022** Stage of Flavia Carafone, Master degree in Physics, University of Tor Vergata: *Tempo di mixing su grafi a conduttanze crescenti*.
- **2022** Co-supervision of the bachelor thesis of Massimo Chialastri, Bachelor degree in Mathematics, University of Tor Vergata: *La disuguaglianza di Grothendieck: un approccio probabilistico*.
- **2019** Co-supervision of Etienne Pinsard, Master 2 at Université Paris Diderot, Paris Sorbonne, Paris-Sud. 4 months stage: *Large random graphs: simulation and data analysis for the study of infections spread*.

Reviewing

Referee reviewer for the Journal of Statistical Physics, Annales de l'Institut Henri Poincaré - Probabilits et Statistiques, Electronic Journal of Probability, Electronic Journal of Statistics, Electronic Communications in Probability, ALEA. Collaborator of Mathematical Reviews and Zentralblatt MATH.

Organization of conferences and events

- **2022-...** Coordinator of the Rome Centre on Mathematics for Modelling and Data ScienceS (RoMaDS) at University of Rome, Tor Vergata.
- **2024** 4th Italian Meeting on Probability and Mathematical Statistics, Rome, Italy (organising committee).
- **2023** Mini-course by Alain Durmus and Giovanni Conforti (École Polytechnique, Paris): An introduction to Score-based Generative Models, Tor Vergata University, Rome, Italy.
- **2023** 5th HPRT Summer school and workshop organized by the universities of Hokkaido, Pisa, Tor Vergata and Torino, Turin, Italy.
- **2023** Mini-course by Boris Hanin (Princeton): Neural Networks and Gaussian Processes, Tor Vergata University, Rome, Italy.
- **2022** Contributed session "Random processes on complex networks" at the 3^{*rd*} Italian Meeting on Probability and Mathematical Statistics, Bologna, Italy.
- 2022 Workshop: A Day on Random Graphs, Tor Vergata University, Roma, Italy.
- **2019** Mini-course by Scott Armstrong (NYU): An introduction to Quantitative Stochastic Homogenization, École Polytechnique, Paris, France.
- 2012 PhD seminars for the Berlin graduate school IRTG, Berlin, Germany.

Teaching

- 2023, 2024, 2025 Lecturer: Probability theory, Computer Science Department, Tor Vergata University.
- 2022, 2023, 2024, 2025 Lecturer: High Dimensional Probability and Statistics, Math Department, Tor Vergata University.
- 2021, 2022 (fall) Lecturer: Geometria, Engineering Department, Tor Vergata University.
- 2021 (spring) Lecturer for the course Geometria, Engineering Department, Tor Vergata University.
- 2020 Lecturer: Algebra 2, Paris-Diderot University.
- 2020 Main TA: Limit Theorems for Stochastic Processes, Paris-Diderot University.
- 2020 Main TA: Stochastic Processes, Paris-Diderot University.
- 2018 Lecturer: Statistics I, Paris-Dauphine University.
- 2015 Lecturer: Actuarial Risk, TU Munich.
- 2014, 2015 Main TA: Stochastic Analysis, TU Munich.
- 2014 Main TA: Probability Theory, TU Munich.
- 2011, 2012, 2013 Collaborator for the tutorials: Probability 2, TU Berlin.
- 2009, 2010 University tutor: Probability 2, Roma 3 University.

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2007, 2009 University tutor: Probability 1, Roma 3 University.

Internships

- 2015 Assenagon GmbH Equity Portfolio Management team. Main tasks: Statistical estimation of correlation matrices between stock prices; translation of new theoretical results into algorithms, programming in Matlab.
- 2013 Deutsche Bank, Quant Institute Risk Analytics & Instruments, Portfolio Validation team. Main tasks: Analysis of time-series related to Operational Risk of the bank; study of rating migration matrices in Credit Risk.

Research interests and publications

Probability Theory: Random Walks in Random Media, Random Graphs, Large Deviations, Homogenization Theory, Statistical Mechanics, Mixing Times for Markov Chains, Stochastic Algorithms, Neural Networks.

Published articles and preprints

- [19] S. Di Lillo, D. Marinucci, M. Salvi, S. Vigogna, Fractal and Regular Geometry of Deep Neural Networks, arXiv:2504.06250 (2025).
- [18] A. Cipriani, R.S. Hazra, N. Malhotra, M. Salvi *The spectrum of dense kernel-based random graphs*, arXiv:2502.09415 (2025).
- [17] L. Makowiec, M. Salvi, R. Sun, Random spanning trees in random environment, arXiv:2410.16830 (2024).
- [16] F. Angileri, G. Lombardi, A. Fois, R. Faraone, C. Metta, M. Salvi, L.A. Bianchi, M. Fantozzi, S.g. Galfrè, D. Pavesi, M. Parton, F. Morandin, *A Systematization of the Wagner Framework: Graph Theory Conjectures and Reinforcement Learning*, Discovery Science. DS 2024. Lecture Notes in Computer Science, vol 15243. Springer, (2025).
- [15] S. Di Lillo, D. Marinucci, M. Salvi, S. Vigogna, Spectral complexity of deep neural networks, accepted for publication in SIAM Journal on Mathematics of Data Science (SIMODS), arXiv:2405.09541 (2024).
- [14] L. Makowiec, M. Salvi, R. Sun,
 Diameter of uniform spanning trees on random weighted graphs, to appear in Annales de l'Institut Henri Poincaré Probabilité et Statistiques (2024+).
- [13] V. Cammarota, D. Marinucci, M. Salvi, S. Vigogna, *A quantitative functional central limit theorem for shallow neural networks*, Modern Stochastics: Theory and Applications, 11, 85–108 (2024).
- [12] V. Bansaye, M. Salvi, Branching process and homogeneization for epidemics on spatial random graphs, Electronic Journal of Probability, 29: 1–37 (2024).

- [11] A. Cipriani, M. Salvi, *Scale-free percolation mixing time*, Stochastic Processes and their Applications, 167 (2024).
- Q. Berger, M. Salvi, Scaling limit of sub-ballistic 1D random walk among biased conductances: a story of wells and walls, Electronic Journal of Probability 25, 1–43 (2020).
- [9] J. Dalmau, M. Salvi, Scale-free percolation in continuous space: quenched degree and clustering coefficient, Journal of Applied Probability 58 (1), 106–127 (2021).
- [8] A. Faggionato, M. Salvi, On the regularity of velocity and diffusivity of 1d random walks in random environment, ALEA Lat. Am. J. Probab. Math. Stat. 16, 1213–1248 (2019).
- [7] Q. Berger, M. Salvi, Scaling of sub-ballistic 1d random walks among random conductances, Markov Processes and Related Fields, 25, 171–187 (2019).
- [6] A. Faggionato, N. Gantert, M. Salvi, Einstein Relation and linear response in one-dimensional Mott Variable Range Hopping, Annales de l'Institut Henri Poincaré - Probabilité et Statistiques, Vol. 55, No. 3, 1477–1508 (2019).
- [5] M. Salvi, F. Simenhaus, Random walk on a perturbation of the infinitely-fast mixing interchange process, Journal of Statistical Physics, 171(4), 656-678, (2018).
- [4] A. Faggionato, N. Gantert, M. Salvi, *The velocity of 1D Mott variable range hopping with external field*, Annales de l'Institut Henri Poincaré - Probabilité et Statistiques, Vol. 54, Nr. 3, 1165–1203, (2018).
- [3] M. Biskup, M. Salvi, T. Wolff, A central limit theorem for the effective conductance: I. Linear boundary data and small ellipticity contrasts, Commun. Math. Phys. 328, no. 2, 701–731, (2014).
- [2] N. Berger, M. Salvi, On the speed of Random Walk among Random Conductances, ALEA Lat. Am. J. Probab. Math. Stat., Vol. X, 1063-1083, (2013).
- [1] W. König, T. Wolff, M. Salvi, *Large deviations for the local times of a random walk among random conductances*, Electronic Communications in Probability 17, http://ecp.ejpecp.org/article/view/1820, (2012).

Other publications

- [O3] M. Salvi, The Random Conductance Model: Local times large deviations, law of large numbers and effective conductance, Ph.D. thesis under the supervision of Prof. Wolfgang König, 2013.
- [O2] M. Salvi, On the speed of Random Walk among Random Conductances, in Oberwolfach Reports no. 6/2012, 45-46, 2012.
- [O1] M. Salvi, The Cut-off phenomenon for Monte Carlo Markov chains, Master thesis, under the supervision of Prof. Fabio Martinelli, 2009.

Talks at conferences and seminar series

- 2025 (invited) Recent Developments in Spatial Interacting Random Systems, Berlin, Germany.
- 2025 (invited) SPA 2025, 44th Conference on Stochastic Processes and their Applications, Wroclaw, Poland.
- 2025 (invited) Kolmogorov meets Turing workshop, LUISS, Rome, Italy.
- 2024 (invited) Seminars in probability and finance, University of Padova, Padova, Italy.
- 2024 (invited) Workshop: Spatial Epidemic Models (Including Graphs and Graphons), Rice University, Paris, France
- 2024 (invited) Probability Seminars, Sapienza University, Rome, Italy.
- 2023 (invited) SPA 2023, 43rd Conference on Stochastic Processes and their Applications, Lisboa, Portugal.
- 2023 (invited) Workshop: Localization phenomena, CIRM, Marseille, France.
- 2022 NUS Probability Seminars, National University of Singapore, Singapore.
- 2022 Third Italian Meeting on Probability and Mathematical Statistics, Bologna, Italy.
- **2022** (invited) Pavia-Milano Seminar series on Probability and Mathematical Statistics (PMS)², Italy.
- 2021 Presentation seminars, Universitá di Tor Vergata, Rome, Italy.
- 2021 (invited) Seminars in Probability and Finance, Universitá degli studi di Padova, Italy.
- 2020 Seminari di probabilitá, Universitá di Tor Vergata, Rome, Italy.
- 2020 NetSci2020 satellite conference Statistical Mechanics Methods for Networks, online.
- 2020 (invited) Séminaire de probabilités d'Orsay, Paris-Sud university, France.
- 2020 Groupe de travail LPSM, Paris-Diderot, France.
- 2019 (invited) Probability and Statistics seminar series, TU Delft, Netherlands.
- 2019 (invited) LUISS seminars, LUISS Guido Carli, Rome, Italy.
- 2019 Journée de rentrée LPSM, Paris-Diderot, France.
- 2019 (invited) Séminaire "Grahps and epidemiology", École Polytechnique, Paris, France.
- 2019 Second Italian Meeting on Probability and Mathematical Statistics, Vietri sul mare, Italy.
- 2019 (invited) Probability seminars, NYU Shanghai, China.
- 2019 Réunion ANR CADENCE, Institute Systems Complexes, Paris, France.
- 2019 Séminaires unité MaIAGE, INRA, Paris, France.
- 2019 (invited) Séminaire de probabilités, statistique et applications LMA UMR 7348, Poitiers, France.
- 2018 (invited) Workshop FDT on Fluctuation-dissipation relations, FRUMAM, Marseille, France.
- 2018 (invited) Séminaires de Probabilités, École Polytechnique, Paris, France.
- 2017 (invited) Séminaires de Probabilités, UPEC, Paris, France.

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- 2017 39th Conference on Stochastic Processes and their Applications, Moscow, Russia.
- 2017 (invited) MIP, Leiden University, Netherland.
- 2017 (invited) Les Probas du Vendredi, LPMA, Paris, France.
- 2016 Séminaire Analyse-Probabilités, Université Paris-Dauphine, France.
- 2016 Probability World Congress, Fields Institute, Toronto, Canada.
- 2015 Stochastic Methods in Finance and Physics, Heraklion, Greece.
- 2015 (invited) YEP XII on Random walks in random environment, Eurandom, Eindhoven, Netherlands.
- 2014 PIMS Summer School, University of British Columbia, Canada.
- 2014 Columbia University Probability Seminars, New York City, US.
- 2013 LATP Séminaires de Probabilités et statistiques, Marseille, France.
- 2013 (invited) YEP X on Random Polymers, Eurandom, Eindhoven, Netherlands.
- 2012 (Poster) Workshop: Interacting Particle Systems and Related Topics, Firenze, Italy.
- 2012 UCLA Probability Seminars, Los Angeles, US.
- 2012 Workshop: Interplay of Analysis and Probability in Physics, Oberwolfach, Germany.
- 2011 7th Cornell Probability Summer School, Cornell University, US.
- 2011 IRTG Seminars, TU Berlin, Germany.

Other skills

Languages Italian (mothertongue), English (fluent), French (fluent), Spanish (good), German (good). Informatics LATEX, HTML, Office.

Programming C, R, Matlab.