

Dr. Mattia Zanella

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Department of Mathematical Sciences
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Personal

Born on July 29, 1987 in Ferrara (Italy).

Italian Citizen.

Education

Ph.D. Mathematics, University of Ferrara, 2017

Thesis: "Boltzmann-type and mean-field modeling of social dynamics: numerics, control, uncertainty quantification", advisor Prof. Lorenzo Pareschi. Final grade: Approved cum laude.

M.Sc. Mathematics, University of Milano, 2012. Final grade: 110/110 cum laude.

Academic positions

Assistant Professor in Mathematical Physics (SSD MAT/07) 2018-now

Ricercatore a Tempo Determinato di Tipo A

Politecnico di Torino, Department of Mathematical Sciences "G. L. Lagrange"

Corso Duca degli Abruzzi 24, 10129, Torino (Italy)

Postdoctoral Fellow 2017-2018

Politecnico di Torino, Department of Mathematical Sciences "G. L. Lagrange"

Corso Duca degli Abruzzi 24, 10129, Torino (Italy)

Funding agency: Compagnia di San Paolo.

Research Assistant 2012–2013,

University of Milano, Department of Mathematics

Via Saldini 50, 20133, Milano (Italy)

Qualifications

National Scientific Qualification (ASN - Abilitazione Scientifica Nazionale) as Associate Professor in Mathematical Physics

Validity: July 13, 2018 – July 13, 2024

Awards

Winner of the “Nicolò Copernico Acknowledgments 2018” to young PhD fellows distinguished for innovative thesis in sciences and technologies.

SIAM Travel Award 2015

SIAM Travel Award 2017

Visiting periods

Hausdorff Research Institute for Mathematics, Research Program *Kinetic Theory*, May-August 2019.

Institut Mittag-Leffler, Research Program *Mathematical Biology*, October 2018 (1 week).

RWTH Aachen University (Prof. Michael Herty), November 2017 (1 week).

University of Sussex (Prof. Bertram Duering), October 2017 (1 week).

RWTH Aachen University (Prof. Michael Herty), May 2017 (2 weeks).

Imperial College (Prof. José Antonio Carrillo), February–March 2016 (1 month).

Institut Mittag-Leffler, Research Program *Interactions between Partial Differential Equations & Functional Inequalities*, October 2016 (1 week).

RWTH Aachen University (Prof. Michael Herty), June 2015 (1 month).

University of Wisconsin–Madison (Prof. Shi Jin), February–May 2015 (3 months)

Grants

INdAM GNCS Research Project *Metodi numerici per problemi di controllo multiscala e applicazioni*, 2018. (Participant)

DAAD–MIUR Joint Mobility Program 2017–2018 (Participant)

INdAM GNCS Grant for Young Researchers 2017 *Uncertainty quantification and control for nonlinear nonlocal PDEs for aggregation–diffusion problems* (Principal investigator)

INdAM GNCS Research Project *Metodi numerici per la quantificazione dell’incertezza in equazioni iperboliche e cinetiche*, 2017 (Participant)

5x1000 Research Grant for Young Researchers 2015 (Principal investigator)

Publications

Submitted

- S3. L. Pareschi, G. Toscani, A. Tosin, M. Zanella. Hydrodynamic models of preference formation in multi-agent societies. Preprint [arXiv:1901.00486](https://arxiv.org/abs/1901.00486), 2018.
- S2. A. Tosin, M. Zanella. Kinetic-controlled hydrodynamics for traffic models with driver-assist vehicles. Preprint [arXiv:1807.11476](https://arxiv.org/abs/1807.11476), 2018.
- S1. G. Albi, L. Pareschi, M. Zanella. Boltzmann games in heterogeneous consensus dynamics. Preprint [arXiv:1712.03224](https://arxiv.org/abs/1712.03224), 2017.

Journal Articles

- A12. J. A. Carrillo, L. Pareschi, M. Zanella. Particle based gPC methods for mean-field models of swarming with uncertainty. *Communications in Computational Physics*, 25(2): 508-531, 2019.
DOI:10.4208/cicp.0A-2017-0244
- A11. M. Herty, A. Tosin, G. Visconti, M. Zanella. Hybrid stochastic kinetic description of two-dimensional traffic dynamics. *SIAM Journal on Applied Mathematics*, 78(5): 2737-2762, 2018.
DOI:10.1137/17M1155909
- A10. G. Toscani, A. Tosin, M. Zanella. Opinion modeling on social media and marketing aspects. *Physical Review E*, 98(2): 022315, 2018.
DOI:10.1103/PhysRevE.98.022315
- A9. A. Tosin, M. Zanella. Boltzmann-type models with uncertain binary interactions. *Communications in Mathematical Sciences*, 16(4): 962-984, 2018.
10.4310/CMS.2018.v16.n4.a3
- A8. L. Pareschi, M. Zanella. Structure preserving schemes for nonlinear Fokker-Planck equations and applications. *Journal of Scientific Computing*, 74(3): 1575-1600, 2018.
DOI:10.1007/s10915-017-0510-z
- A7. P. Vellucci, M. Zanella. Microscopic modeling and analysis of collective decision-making: equality bias leads suboptimal solutions. *Annali dell'Università di Ferrara – Sezione VII Scienze Matematiche*, 64(1): 185-207, 2018.
DOI:10.1007/s11565-017-0280-4
- A6. M. Herty, M. Zanella. Performance bounds for the mean-field limit of constrained dynamics. *Discrete and Continuous Dynamical Systems – Series A*, 37(4): 2023-2043, 2017.
DOI:10.3934/dcds.2017086
- A5. L. Pareschi, P. Vellucci, M. Zanella. Kinetic models of collective decision-making in the presence of equality bias. *Physica A: Statistical Mechanics and its Applications*, 467: 201-217, 2017.
DOI:10.1016/j.physa.2016.10.003
- A4. G. Albi, L. Pareschi, M. Zanella. Opinion dynamics over complex networks: kinetic modelling and numerical methods. *Kinetic and Related Models*, 10(1): 1-32, 2017.
DOI:10.3934/krm.2017001
- A3. D. Morale, M. Zanella, V. Capasso, W. Jaeger. Stochastic modelling and simulation of ion transport through channels. *SIAM Journal on Multiscale Modeling & Simulation*, vol. 14(1): 113-137, 2016.
DOI:10.1137/15M1010907
- A2. G. Albi, L. Pareschi, M. Zanella. Uncertainty Quantification in control problems for flocking models. *Mathematical Problems in Engineering*, vol. 2015, 14 pp., 2015.
DOI:10.1155/2015/850124
- A1. G. Albi, L. Pareschi, M. Zanella. Boltzmann-type control of opinion consensus through leaders, *Philosophical Transactions of the Royal Society A: Mathematical Physical and Engineering Sciences*, 372(2028), 2014.
DOI:10.1098/rsta.2014.0138

Book Chapters

- C2. G. Dimarco, L. Pareschi, M. Zanella. Uncertainty quantification for kinetic models in socio-economic and life sciences. In *Uncertainty Quantification for Hyperbolic and Kinetic Equations*, S. Jin, L. Pareschi Eds., SEMA SIMAI Springer Series, vol. 14, pp. 151-191, 2017.
DOI:10.1007/978-3-319-67110-9_5
- C1. G. Albi, L. Pareschi, G. Toscani, M. Zanella. Recent advances in opinion modeling: control and social influence. In *Active Particles Volume 1. Advances in Theory, Models and Applications*, N. Bellomo, P. Degond, and E. Tadmor Eds., Birkhäuser-Springer, 2017.
DOI:10.1007/978-3-319-49996-3_2

Proceedings

- P3. A. Tosin, M. Zanella. Control strategies for road risk mitigation in kinetic traffic modelling. *IFAC-PapersOnLine*, 51(9): 67-72, 2018.
DOI:10.1016/j.ifacol.2018.07.012
- P2. L. Pareschi, M. Zanella. Structure preserving schemes for mean-field equations of collective behavior. In: Klingenberg C., Westdickenberg M. (eds) *Theory, Numerics and Applications of Hyperbolic Problems II. HYP 2016*. Springer Proceedings in Mathematics & Statistics, vol 237, pp. 405-421, Springer, Cham.
DOI:10.1007/978-3-319-91548-7_31
- P1. G. Albi, L. Pareschi, M. Zanella. On the optimal control of opinion dynamics on evolving networks. In *System Modeling and Optimization. CSMO 2015. IFIP Advances in Information and Communication Technology*, L. Bociu, J. A. Désidéri, A. Habbal Eds., vol. 494, Springer, Cham.
DOI:10.1007/978-3-319-55795-3_4

Interdisciplinary collaborations

- I3. A. Venerandi, M. Zanella, O. Romice, J. Dibble, S. Porta. Form and urban change – An urban morphometric study of five gentrified neighbourhoods in London. *Environment and Planning B: Urban Analytics and City Science*, 44(6): 1056-1076, 2017.
DOI:10.1177/0265813516658031.
- I2. J. Dibble, A. Prelorndjos, O. Romice, M. Zanella, E. Strano, M. Pagel, S. Porta. Urban morphometrics: Towards a science of urban evolution. *City as Organism: New Visions for Urban Life*, 2, pp. 1143-1154. Proceedings of the 22nd International Seminar on Urban Form, Rome.
- I1. J. Dibble, A. Prelorndjos, O. Romice, M. Zanella, E. Strano, M. Pagel, S. Porta. On the origin of spaces: Morphometric foundations of urban form evolution. *Environment and Planning B: Urban Analytics and City Science*, to appear.
DOI:10.1177/2399808317725075

Popularization papers

2. A. Tosin, M. Zanella. La popolarità delle opinioni. *MaddMath - MaddSpot*, June 2018 (in Italian).
1. G. Albi, M. Zanella. Manuale per un leader: strategie di controllo dell'opinione pubblica. *Gli Stati Generali*, May 2015 (in Italian).

Referee Activity

I served as referee for the following journals: *Acta Applicandae Mathematicae*, *Aerospace Science & Technology*, *Analysis and Applications*, *Applied Mathematical Modelling*, *Communications in Mathematical Sciences*, *Communications in Nonlinear Science and Numerical Simulation*, *Entropy*, *International Journal of Automation and Computing*, *Kinetic and Related Models*, *Mathematical Methods in the Applied Sciences*, *Nonlinearity*, *Physica A*, *Physics Letters A*, *PLOS ONE*, *Processes*, *SEMA–SIMAI Springer Series*.

Certified referee activity <https://publons.com/a/1271086/>.

Communications

Forthcoming talks

- FT6. December 2019 Trimester Quantum and Kinetic Problems: Modeling, Analysis, Numerics and Applications, Workshop 3: “Emergent phenomena - from Kinetic Models to Social Hydrodynamics”, Institute for Mathematical Sciences, National University of Singapore.
- FT5. September 2019 XXI Congresso UMI (Unione Matematica Italiana) - Section 9: “Models and applications”, University of Pavia, Italy.
- FT4. May 2019 Workshop “Asymptotic methods and numerical approximations of multi-scale evolutions problems, and uncertainty quantification”, ENS Rennes, France.
- FT3. July 2019 ICIAM, MS “Mathematical descriptions of traffic flow: micro, macro and kinetic models for a complex phenomenon”, Valencia, Spain.
- FT2. July 2019 ICIAM, MS “Novel concepts in model-driven optimization and control of agent-based systems”, Valencia, Spain.
- FT1. December 2018 Workshop on Innovative Trends in the Numerical Analysis and Simulation of Kinetic Equations, Mathematisches Forschungsinstitut Oberwolfach, Germany.

Talks

- T27. November 2018 *Uncertainty Quantification for kinetic equations of collective behavior*, Autumn School “From Interacting Particle Systems to Kinetic Equations: Modelling, Control & Numerical Methods”, University of Verona, Italy. (Invited lecture)
- T26. October 2018 *Control strategies for road risk mitigation in kinetic and hydrodynamic traffic modelling*, Conference Kinetic and Transport Equations: Mathematical Advances and Applications, University of Parma, Parma, Italy. (Contributed talk)
- T25. October 2018 *Control strategies for road risk mitigation in kinetic and hydrodynamic traffic modelling*, Workshop Problems in discrete dynamics: from biochemical systems to rare events, networks, clustering and related topics - IV Edition, Arcidosso, Italy. (Invited talk)
- T24. September 2018 *Stochastic Galerkin methods for kinetic equations of the collective behavior*, Joint Meeting UMI–SIMAI–PTM, Session “Advances in Kinetic Theory”, Wrocław, Poland. (Invited talk)
- T23. July 2018 *Boltzmann games in heterogeneous consensus dynamics*, 28th IFIP TC7 Conference 2018, MS “Inverse problems and optimal control approaches in socio-economic applications”, University of Duisburg-Essen, Germany. (Invited talk)

- T22. July 2018 *Control strategies for road risk mitigation in kinetic and hydrodynamic traffic modelling*, 28th IFIP TC7 Conference 2018, MS "Modeling and optimization of networked systems", University of Duisburg-Essen, Germany. (Invited talk)
- T21. May 2018 *Stochastic Galerkin methods for kinetic equations of the collective behavior*, Workshop Kinetic Theory for Control, Games and Uncertainty, RWTH Aachen University, Aachen, Germany. (Invited talk)
- T20. February 2018 *Uncertainty quantification for kinetic and mean-field equations*, Convegno Nazionale GNCS 2018, Montecatini Terme, Italy. (Invited talk)
- T19. December 2017 *Uncertainty quantification and optimal control problems for multiagent systems*, Department of Mathematical Sciences G. L. Lagrange, Politecnico di Torino, Italy. (Dept. Seminar)
- T18. December 2017 *Opinion dynamics over kinetic networks*, SIAM Conference on Analysis of Partial Differential Equations, Baltimore, USA. (Invited talk)
- T17. November 2017 *Hybrid stochastic kinetic description of 2D traffic dynamic*, The Finite Volume Schemes and Traffic Modeling in Besançon, Université Franche-Comte, Besançon, France. (Invited talk)
- T16. November 2017 *Hybrid stochastic kinetic description of 2D traffic dynamics*, Department of Mathematics IGPM, RWTH Aachen University, Germany. (Dept. Seminar)
- T15. October 2017 *Uncertainty Quantification for kinetic and mean-field equations*, Department of Mathematics, University of Sussex, Brighton, UK. (Dept. Seminar)
- T14. October 2017 *Opinion dynamics over kinetic networks*, Workshop Problems in discrete dynamics: from biochemical systems to rare events, networks, clustering and related topics - III Edition, Arcidosso, Italy. (Invited talk)
- T13. September 2017 *Uncertainty Quantification for mean-field equations in social sciences*, XVII Italian Meeting on Hyperbolic Equations, University of Pavia, Pavia, Italy. (Contributed talk)
- T12. June 2017 *Opinion dynamics over kinetic networks*, 27th Biennial Numerical Analysis Conference, University of Strathclyde, UK. (Invited talk)
- T11. May 2017 *Structure preserving methods for mean-field equations with random inputs*, Warwick EPSRC Symposium: Emerging PDE models in Socio-Economic Sciences, University of Warwick, UK. (Contributed talk)
- T10. May 2017 *Structure preserving methods for mean-field equations with random inputs*, Department of Mathematics, RWTH Aachen University, Aachen, Germany. (Dept. Seminar)
- T9. April 2017 *Structure preserving methods for mean-field equations with random inputs*, School on Uncertainty Quantification for Hyperbolic Equations and Related Topics, GSSI, L'Aquila, Italy. (Invited lecture)
- T8. March 2017 *Uncertainty Quantification for Kinetic Equations in Socio-Economic Sciences*, SIAM CS&E 2017 Conference, Atlanta, USA. (Invited talk)
- T7. July 2016 *Uncertainty Quantification for Kinetic Models of Collective Behavior*, Summer School UQ for Applied Problems, Basque Center for Applied Mathematics (BCAM), Bilbao, Spain. (Contributed talk)
- T6. January 2016 *Modeling and Control of Opinion Dynamics on Networks*, International Workshop Kinetic Theory and Multiscale Phenomena: Modelling, Analysis and New Applications, Stellenbosch, South Africa. (Invited talk)
- T5. December 2015 *Stochastic Multiscale Modelling of Ion Transport Across Membranes*, Department of Mathematics, Politecnico di Milano, Milano, Italy. (Dept. Seminar)

- T4. June 2015 *Mean-Field and Boltzmann Control of Socio-Economic Systems*, 27th IFIP TC7 Conference 2015, Sophia–Antipolis, France. (Invited talk)
- T3. June 2015 *Uncertainty Quantification in Control Problems for Flocking Models*, Department of Mathematics, RWTH Aachen University, Aachen, Germany. (Dept. Seminar)
- T2. March 2015 *Uncertainty Quantification in Control Problems for Flocking Models*, Department of Mathematics, University of Wisconsin-Madison, Madison, USA. (Dept. Seminar)
- T1. March 2015 *Uncertainty Quantification in Control Problems for Flocking Models*, SIAM CS&E 2015 Conference, Salt Lake City, USA. (Invited talk)

Organization activity

- 5. Co-organizer of the Summer School *Trails in kinetic theory: foundational aspects and numerical methods*, May 20-24, 2019, Hausdorff Research Institute for Mathematics, Bonn, Germany.
- 4. Co-organizer of the Workshop *Recent Trends in Kinetic Modelling and Related Fields*, Politecnico di Torino, October 25-26, 2018, Politecnico di Torino, Italy.
- 3. Co-organizer of the special session *Models and Numerical Methods in Kinetic Theory*, 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications, July 2018, Taipei, Taiwan.
- 2. Organizing committee *Numerical Aspects of Hyperbolic Balance Laws and Related Problems*, April 2018, University of Ferrara, Ferrara, Italy.
- 1. Organizing committee *Numerical Aspects of Hyperbolic Balance Laws and Related Problems*, December 2015, University of Ferrara, Ferrara, Italy.

Teaching

Self-contained Mini Courses

- MC3. April 2017–May 2017: *An Introduction to Numerical Methods for Stochastic Computations*, University of Ferrara, Italy
- MC2. April 2016–May 2016: *Stochastic Calculus and Financial Markets: Laboratory of Numerical Methods*, University of Ferrara, Italy.
- MC1. April 2015–May 2015: *Stochastic Calculus and Financial Markets: Laboratory of Numerical Methods*, University of Ferrara, Italy.

Teaching Assistant

- TA8. March 2019–June 2019: Rational Mechanics, B. Sc. in Civil Engineering, Politecnico di Torino.
- TA7. October 2018–January 2019: Calculus, M. Sc. in Architecture, Politecnico di Torino.
- TA6. October 2016–December 2016: Calculus I, M.Sc. in Architecture, University of Ferrara.
- TA5. September 2016–December 2016: Continuous Mechanics, M.Sc. in Mathematics, University of Ferrara.
- TA4. October 2015–December 2015: Calculus I, M.Sc. in Architecture, University of Ferrara.
- TA3. September 2015–December 2015: Continuous Mechanics, M.Sc. in Mathematics, University of Ferrara.

TA2. October 2014–December 2014: Calculus II, B.Sc. in Civil Engineering, University of Ferrara.

TA1. February 2013–June 2013: Stochastic Calculus and Applications, M.Sc. in Mathematics, University of Milan.

Last updated: 3rd January 2019