Dr. Andrea Medaglia

Postdoctoral Research Associate, Mathematical Institute, University of Oxford

Personal website: *www.andreamedaglia.eu*

Email: andrea.medaglia@maths.ox.ac.uk

Address:	Woodstock Rd, Oxford, UK	Scopus ID:	57313769100
Phone:	(+39) 3381540104	Orcid ID:	0000-0002-6086-5765
Born:	27-04-1994, Brescia (BS), Italy	Google Scholar:	Profile
Citizenship:	Italian	ResearchGate:	Profile

Research Interests

My research is devoted to the numerical analysis and simulation of kinetic equations and multiagent systems in presence of random parameters. In particular, I work on the Landau and the Boltzmann equations for plasma and rarefied gas dynamics with uncertainties. I am also interested in the mathematical modelling and control of agent-based models with applications in life sciences.

Academic Positions

- 01-10-2024/Now: **Postdoctoral Research Associate**.
  University of Oxford, Mathematical Institute.
  Andrew Wiles Building, Woodstock Rd, Oxford OX2 6GG, UK.
- 01-11-2023/30-09-2024: **Postdoctoral Fellow**.
  University of Pavia, Department of Mathematics "F. Casorati".
  Via Ferrata 5, 27100 Pavia, Italy.

Education

- 01-10-2020/30-09-2023: **Ph.D. in Computational Mathematics and Decision Sciences**.
  International Ph.D. Program, University of Pavia (UniPv) & University of Italian Switzerland (USI).
  Title of the thesis: "*Uncertainty quantification and data-oriented approaches in collisional kinetic models*".
  Supervisor: Prof. Mattia Zanella (UniPv).
  Grade: Approved cum laude.
  Ph.D. Defence: 22-02-2024.
- 09-04-2020: **MSc** in Physics.
  University of Milan "La Statale" (UniMi).
  Title of the thesis: "*Kinetic-Controlled non-Maxwellian Traffic Models with Driver-Assist Vehicles*".

Supervisors: Prof. Mattia Zanella (UniPv), Prof. Davide Emilio Galli (UniMi), Prof. Andrea Tosin (PoliTo).
Grade: 110/110 cum Laude.

- 20-04-2017: **BSc** in Physics.
  University of Milan "La Statale" (UniMi).
  Title of the thesis: "*Studio numerico di un modello FPU per la simulazione di un solido vetroso*".
  Supervisor: Prof. Andrea Carati (UniMi).

Visiting Study Periods

- Prof. José Antonio Carrillo de la Plata, Mathematical Institute & Queen's College, University of Oxford, March 1-9 2024, and October 2-31 2022.
- Prof. Lorenzo Pareschi, Department of Mathematics, University of Ferrara, September 12-17 2022, and November 29 - December 4 2021.
- Prof. Vittorio Romano and Dr. Giovanni Nastasi, University of Catania, November 6-16 2023, and April 17-21 2023.
- Prof. Liu Liu, The Chinese University of Hong Kong, July 8-14, 2024.

Grants

- Progetto Giovani GNFM-INdAM (National Institute of High Mathematics) 2023.
  Title: Uncertainty Quantification for kinetic models describing physical and socio-economical phenomena.
  Role: Co-Principal Investigator (Principal Investigator Dr. Giovanni Nastasi).
  Grant: 2500€
- Royal Society International Exchanges.
  Title: Kinetic Opinion Formation Models for Digital Societies.
  Role: Participant (Principal Investigator Dr. Marie-Therese Wolfram, Co-Principal Investigator Dr. Mattia Zanella).
  Grant: 12k£
- PRIN2020 (Research Projects of Relevant National Interest).
  Title: Integrated Mathematical Approaches to Socio-Epidemiological Dynamics.
  Role: Participant of the Research Unit of the University of Pavia (Coordinator of the Research Unit: Dr. Mattia Zanella).
  Grant: 465k€
- Travelling Grant GNFM 2023-2024.
  Grant: 400€
- Travelling Grant GNFM 2021-2022.
  Grant: 500€
- Travelling Grant GNFM 2020-2021.
  Grant: 800€

Publications

Ongoing Works

1. A. Medaglia, L. Pareschi, and M. Zanella, Direct simulation Monte Carlo methods for the space non-homogeneous Landau-Fokker-Planck equation.

Preprint

2. A. Medaglia, G. Nastasi, V. Romano, and M. Zanella, Uncertainty quantification for charge transport in GNRs through particle Galerkin methods for the semiclassical Boltzmann equation. arxiv:2404.19602, [physics.comp-ph], (2024), 1-26.

1. R. Bailo, J.A. Carrillo, A. Medaglia, and M. Zanella, Uncertainty Quantification for the Homogeneous Landau-Fokker-Planck Equation via Deterministic Particle Galerkin methods. arxiv:2312.07218, [math.NA], (2023), 1-23.

Journal Articles

6. A. Medaglia, L. Pareschi, M. Zanella, Particle simulation methods for the Landau-Fokker-Planck equation with uncertain data. *J. Comput. Phys.*, **503** (2024), 112845 https://doi.org/10.1016/j.jcp.2024.112845

5. J. Franceschi, A. Medaglia, and M. Zanella, On the optimal control of kinetic epidemic models with uncertain social features. *Optim. Control Appl. Meth.*, 1-29 (2023). https://doi.org/10.1002/oca.3029

4. A. Medaglia, L. Pareschi, and M. Zanella, Stochastic Galerkin particle methods for kinetic equations of plasmas with uncertainties. *J. Comput. Phys.*, **479** (2023), 112011. https://doi.org/10.1016/j.jcp.2023.112011.

3. A. Medaglia, and M. Zanella, Kinetic and macroscopic epidemic models in presence of multiple heterogeneous populations. In: P. Barbante, F. D. Belgiorno, S. Lorenzani, L. Valdettaro (eds) *From Kinetic Theory to Turbulence Modeling*. Springer INdAM Series 51, Springer, 2023. https://doi.org/10.1007/978-981-19-6462-6-15.

2. A. Medaglia, A. Tosin and M. Zanella, Monte Carlo stochastic Galerkin methods for non-Maxwellian kinetic models of multiagent systems with uncertainties. *Partial Differ. Equ. Appl.*, **3**, 51 (2022). https://doi.org/10.1007/s42985-022-00189-w.

1. A. Medaglia, G. Colelli, L. Farina, A. Bacila, P. Bini, E. Marchioni, S. Figini, A. Pichiecchio, and M. Zanella, Uncertainty quantification and control of kinetic models of tumour growth under clinical uncertainties. *Int. J. Non-Linear Mech*, **141** (2022), 103933. https://doi.org/10.1016/j.ijnonlinmec.2022.103933.

Communications

Forthcoming Talks

1. December 17-19, 2024. **Numerical Aspects of Hyperbolic Balance Laws and Related Problems – Young Researchers Conference**.
   Ferrara, Italy.

Talks

22. August 5-11, 2024. **Recent Advances in Kinetic Theory: Modeling, Computation and Analysis**.
    Institute for Theoretical Sciences (ITS), Westlake University, Hangzhou, China.
    Title of the talk: "*Stochastic Galerkin Particle Methods for Kinetic Equations of Plasmas with Uncertainties*".

21. July 15-19, 2024. **International Conference on Scientific Computation and Differential Equations**.
    National University of Singapore, Singapore.
    Title of the talk: "*Stochastic Galerkin Particle Methods for Kinetic Equations of Plasmas with Uncertainties*".

20. July 8-14, 2024. **Workshop on Scientific Computing and Data Science**
    The Chinese University of Hong Kong, Hong Kong.
    Title of the talk: "*Kinetic models in mathematical epidemiology: optimal control in the presence of behavioural uncertainties*".

19. June 3-7, 2024. **9th European Congress on Computational Methods in Applied Sciences and Engineering ECCOMAS 2024**.
    Lisbon, Portugal.
    Minisymposium: "*Novel Kinetic Approaches in Optimization and Uncertainty Quantification*".
    Title of the talk: "*Stochastic Galerkin Particle Methods for Kinetic Equations of Plasmas with Uncertainties*".

18. March 25-29, 2024. **Theoretical and Analytical Aspects of Kinetic equations in Plasmas**.
    Centre International de Rencontres Mathématiques (CIRM), Marseille, France.
    Title of the talk: "*Particle stochastic-Galerkin methods for the Landau equation with random inputs*".

17. February 27-March 1, 2024. **SIAM Conference on Uncertainty Quantification (UQ24)**.
    Trieste, Italy.
    Title of the talk: "*Stochastic Galerkin Particle Methods for Kinetic Equations of Plasmas with Uncertainties*".

16. February 19, 2024. **First Italo-Korean Symposium**.
    University of Pavia, Pavia, Italy.
    Title of the talk: "*Uncertainty quantification and data-oriented approaches in collisional kinetic models*".

15. January 29-31, 2024. **Integrated Mathematical approaches to Socio-Epidemiological Dynamics**.
    University of Trento, Trento, Italy.
    Title of the talk: "*Kinetic models in mathematical epidemiology: optimal control in the presence of behavioural uncertainties*".

14. January24-25, 2024. **Incontro Annuale dei Ricercatori in Matematica UNIPV**.
    University of Pavia, Pavia, Italy.
    Title of the talk: "*Uncertainty quantification and data-oriented approaches in collisional kinetic models*".

13. November 9, 2023. **Seminar Prof. Vittorio Romano group**.
    Aula Anile, University of Catania, Catania, Italy.
    Title of the talk: "*Uncertainty quantification and data-oriented approaches in collisional kinetic models*".

12. August 28-September 1, 2023. **Congress of the Italian Society of Applied and Industrial Mathematics (SIMAI)**.
    University of Basilicata, Matera, Italy.
    Title of the talk: "*Particle stochastic Galerkin methods for uncertainty quantification of plasma equation*".

11. June 19-21, 2023. **VII ECCOMAS Young Investigators Conference YIC2023**.
    Faculty of Engineering FEUP, University of Porto, Porto, Portugal.
    Title of the talk: "*Uncertainty quantification and control of kinetic models of tumour growth with uncertain feature*".

10. May 22, 2023. **CompMat Spring Workshop 2023**.
    Aula Foscolo, University of Pavia (PV), Pavia, Italy.
    Title of the talk: "*Kinetic models in mathematical epidemiology: Optimal control in the presence of behavioural uncertainties*".

9. April 20, 2023. **Seminar Prof. Vittorio Romano group**.
    Aula Anile, University of Catania, Catania, Italy.
    Title of the talk: "*Stochastic Galerkin particle methods for kinetic equations with uncertainties*".

8. March 29, 2023. **Caffè Beltrami**.
    Aula Beltrami, University of Pavia, Pavia, Italy.
    Title of the talk: "*Ludwig Boltzmann vs John the Ripper*". With Jonathan Franceschi (UniPv).

7. October 12, 2022. **"Coffee Seminar" Prof. José Antonio Carrillo de la Plata group**.
    Queen's College, University of Oxford, Oxford, UK.
    Title of the talk: "*Stochastic Galerkin particle methods for kinetic equations with uncertainties*".

6. July 17-24, 2022. **Focused Research Group "Novel Perspectives in Kinetic Equations for Emerging Phenomena"**.
    Banff International Research Station (BIRS), Banff, Canada.
    Title of the talk: "*Stochastic Galerkin particle methods for kinetic equations of plasmas with uncertainties*".

5. June 28-July 1, 2022. **Kick-Off Meeting University of Warwick**.
    University of Warwick, Coventry, UK.
    Title of the talk: "*Monte Carlo stochastic Galerkin methods for non-Maxwellian kinetic models of multiagent systems with uncertainties*".

4. March 16, 2022. **CompMat Spring Workshop 2022**.
    Aula Volta, University of Pavia (PV), Pavia, Italy.
    Title of the talk: "*Uncertainty quantification and control of kinetic models of tumour growth under clinical uncertainties*".

3. February 3, 2022. **Scientific Evaluation VQR**.
   University of Pavia (PV), Pavia, Italy.
   Title of the talk: "*Uncertainty Quantification of Kinetic Models of Multiagent Systems*".

2. September 13-17, 2021. **1st Young Applied Mathematicians Conference**.
   Santa Maria di Leuca (LE), Italy.
   Title of the talk: "*A novel numerical approach to uncertainty quantification in multiagent systems*".

1. September 6-11, 2021. **XLVI Summer School on Mathematical Physics**.
   Ravello (SA), Italy.
   Title of the talk: "*Numerical methods for uncertainty quantification in kinetic models*".

Posters

2. June 12-18, 2022. **11th Summer School on Methods & Models of Kinetic Theory**.
   Pesaro (PU), Italy.
   Title of the poster: "*Monte Carlo stochastic Galerkin methods for non-Maxwellian kinetic models of multiagent systems with uncertainties*".

1. May 23-27, 2022. **Frontiers in Numerical Analysis of Kinetic Equations**.
   Isaac Newton Institute for Mathematical Sciences, Cambridge, UK.
   Title of the poster: "*Stochastic Galerkin particle methods for kinetic plasma models with uncertainties*".

Organization Activity

- June 3-7, 2024. **9th European Congress on Computational Methods in Applied Sciences and Engineering ECCOMAS 2024**.
  Lisbon, Portugal
  Minisymposium: "*Novel Kinetic Approaches in Optimization and Uncertainty Quantification*".
  Co-organizer: Giacomo Borghi (Heriot-Watt University).

- May 8, 2024. **CompMat Spring Workshop 2024**.
  Aula Magna, University of Pavia, Pavia, Italy.
  Co-organizers: Elena Ballante, Ngoc Mai Monica Huynh, Alen Kushova.

- December 6-7, 2022. **From Kinetic Theory to Data Science and Related Topics**.
  Aula Foscolo, University of Pavia, Pavia, Italy.
  Scientific Committee: Prof. Andrea Tosin (PoliTo), Prof. Mattia Zanella (UniPv).
  Organizing Committee: Jonathan Franceschi (UniPv), Andrea Medaglia (UniPv), Elisa Paparelli (PoliTo).

- **Caffè Beltrami - Internal Seminars**.
  Aula Beltrami, University of Pavia, Pavia, Italy.

Referee Activity

- **Acta Biotheoretica**, Springer Science & Business Media.

- **European Journal of Applied Mathematics**, Elsevier.

- **Journal of Computational Physiscs**, Elsevier.
- **Journal of Differential Equations**, Elsevier.

Supervisor & co-Supervisor Activity

- Giacomo Salvati, "*Compartmental epidemic modelling in the presence of uncertain data*".
  BSc in Mathematics, University of Pavia.
  Co-Supervisor (Supervisor Prof. Mattia Zanella).

Teaching Experiences

- 2023–2024: **Senior Tutor** "Calculus and Linear Algebra", 40 hours, degree course in Engineering, University of Pavia.
- 2022–2023: **Senior Tutor** "Linear Algebra", 40 hours, degree course in Engineering, University of Pavia.
- 2021–2022: **Seminar lectures** "Statistics", 6 hours, degree course in Biotechnology, University of Pavia.
- 2021–2022: **Exercise lectures** "Calculus", 20 hours, degree course in Geological Sciences, University of Pavia.
- 2021–2022: **Seminar lectures** "Calculus", 20 hours, degree course in Geological Sciences, University of Pavia.

Languages

- Italian (mother tongue).
- English (fluent).

Computer Skills

- Windows, Ubuntu: good knowledge.
- Microsoft Office (Work, Excel, Power Point): good knowledge.
- C, C++, MATLAB, Python, Git, Julia: good knowledge.
- LaTeX: good knowledge.

In compliance with the GDPR and the Italian Legislative Decree no. 196 dated 30/06/2003, I hereby authorize you to use and process my personal details contained in this document.

Andrea Medaglia