europass Curriculum vitae

PERSONAL INFORMATION

Giulia Bertaglia, Assistant Professor

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Gender F | Date of birth April 3, 1991 | Nationality Italian

RESEARCH INTERESTS

My research interests lie in computational modeling and numerical analysis, applied particularly to the fields of bio-mathematics and fluid dynamics. In recent years, my research has focused mainly on the development of numerical methods (both deterministic and stochastic) for solving differential equations governing evolutionary dynamics, especially multiscale hyperbolic balance laws and kinetic equations.
Current and past research activity includes the development of:

- Implicit-Explicit Runge-Kutta schemes,
- Finite Volume methods,
- Uncertainty Quantification methods,
- Physics-Informed Neural Networks (PINNs),
- Monte Carlo-type particle methods.

RESEARCH EXPERIENCE

01/07/2025 – present — Assistant Professor (Ricercatore Tenure Track, RTT)

At: Department of Environmental and Prevention Sciences, University of Ferrara, Italy
Scientific Disciplinary Area: Numerical analysis (MATH-05/A)

01/07/2022 – 30/06/2025 — Assistant Professor (Ricercatore a Tempo Determinato di tipo a, RTDa)

At: Department of Environmental and Prevention Sciences, University of Ferrara, Italy
Research topics: Development of Finite Volume Methods, Monte Carlo-type schemes, Physics-Informed Neural Networks, and Uncertainty Quantification techniques for hyperbolic balance laws with relaxation terms and multiscale problems, with particular interest in applications in the field of bio-mathematics.
Scientific Disciplinary Area: Numerical analysis (MATH-05/A)

01/10/2021 – 30/06/2022 — Post-doc research fellow of Istituto Nazionale di Alta Matematica “Francesco Severi”

At: Department of Mathematics and Computer Science, University of Ferrara, Italy
Research advisor: Prof. Lorenzo Pareschi
Research project title: *Uncertainty quantification for hyperbolic balance laws on networks*
Research topics: Development of uncertainty quantification and Monte Carlo-type particle methods for hyperbolic balance laws; development of asymptotic-preserving physics-informed neural networks for multiscale problems
Scientific Disciplinary Area: Numerical analysis (MATH-05/A)

01/11/2020 – 30/09/2021 — Post-doc research fellow of University of Ferrara

At: Department of Mathematics and Computer Science, University of Ferrara, Italy
Research advisor: Prof. Lorenzo Pareschi
Research project title: *IMEX Runge-Kutta methods for hyperbolic systems for fluid-structure interaction in blood flow and uncertainty quantification*
Research topics: Development of uncertainty quantification methods for hyperbolic balance laws structured on networks, with particular interest in applications in the areas of socio-epidemic modeling
Scientific Disciplinary Area: Numerical analysis (MATH-05/A)

01/11/2019 – 31/10/2020

Post-doc research fellow of University of Ferrara

At: Department of Mathematics and Computer Science, University of Ferrara, Italy
Research advisor: Prof. Lorenzo Pareschi
Research project title: *IMEX Runge-Kutta methods for hyperbolic systems for fluid-structure interaction in blood flow*
Research topics: Development of uncertainty quantification methods for hyperbolic balance laws structured on networks, with particular interest in applications of cardiovascular modeling and bio-mathematics
Scientific Disciplinary Area: Numerical analysis (MATH-05/A)

VISITING RESEARCH STAYS

13/05/2025 – 18/05/2025

Research visiting period at UniZar

At: Department of Materials and Fluids Science and Technology, University of Zaragoza, Spain
Research topic: Development of IMEX schemes for physics-based wildfire propagation models
Local host: Prof. Adrián Navas-Montilla

08/07/2024 – 14/07/2024

Research visiting period at CUHK

At: Department of Mathematics, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong
Research topic: Development of uncertainty quantification methods for kinetic equations
Local host: Prof. Liu Liu

13/09/2021 – 15/11/2021

Post-doc visiting period at NYU

At: Courant Institute of Mathematical Sciences, New York University, U.S.A.
Research topic: Development of Monte Carlo-type particle methods for systems of hyperbolic equations with relaxation terms
Local research advisor: Prof. Russel E. Caflisch

18/01/2019 – 31/05/2019

Ph.D. visiting period at UniZar

At: Department of Materials and Fluids Science and Technology, University of Zaragoza, Spain
Research topic: Development of computational models of fluid dynamics characterizing aspects of elastic and viscoelastic fluid-structure interaction applied to blood flow equations
Local supervisors: Prof. Javier Murillo and Prof. Pilar García Navarro

EDUCATION

01/11/2016 – 31/10/2019

Ph.D. in Engineering Science

At: Department of Engineering, University of Ferrara, Italy
Thesis title: *1D augmented fluid-structure interaction systems with viscoelasticity: from water pipelines to blood vessels*
PhD supervisors: Prof. Alessandro Valiani and Prof. Valerio Caleffi
Final result: Ph.D. title approved cum laude with the additional title of *Doctor Europaeus*
Thesis defense: March 19, 2020

09/2013 – 17/12/2015

Master in Civil Engineering

At: Department of Engineering, University of Ferrara, Italy

Erasmus exchange period: From February to July 2014 at Instituto Superior Técnico (IST), Lisbon, Portugal

Thesis title: *Analisi computazionale del risalto idraulico diretto e ondulato (Computational analysis of the direct and undular hydraulic jump)*

Final grade: 110/110 cum laude and special mention

09/2010 – 09/10/2013

Bachelor in Civil and Environmental Engineering

At: Department of Engineering, University of Ferrara, Italy

Thesis title: *Criteri di analisi di strutture murarie lesionate per la definizione delle modalitá di intervento (Analysis criteria of damaged masonry structures for the definition of intervention methods)*

Final grade: 110/110 cum laude

TEACHING EXPERIENCE IN UNIVERSITY COURSES

A.Y. 2024/2025

Doctoral Course Lecturer

At: Department of Mathematics and Computer Science, University of Ferrara, Italy

Course: *An introduction to uncertainty quantification for PDEs*, Doctoral course in mathematics of the Universities of Ferrara, Modena-Reggio Emilia and Parma (lecturer for 6h, 1.5 ECTS)

A.Y. 2024/2025

Master Course Lecturer

At: Department of Architecture, University of Ferrara, Italy

Course: *Applied Mathematics*, Master Degree in Architecture (50h, 5 ECTS)

A.Y. 2024/2025

Bachelor Course Lecturer

At: Department of Environmental and Prevention Sciences, University of Ferrara, Italy

Course: *Mathematics*, Bachelor Degree in Biological Sciences (24h, 3 ECTS)

A.Y. 2023/2024

Doctoral Course Lecturer

At: Department of Mathematics and Computer Science, University of Ferrara, Italy

Course: *An introduction to uncertainty quantification for PDEs*, Doctoral course in mathematics of the Universities of Ferrara, Modena-Reggio Emilia and Parma (lecturer for 6h, 1.5 ECTS)

A.Y. 2023/2024

Master Course Lecturer

At: Department of Architecture, University of Ferrara, Italy

Course: *Applied Mathematics*, Master Degree in Architecture (40h, 4 ECTS)

A.Y. 2023/2024

Bachelor Course Lecturer

At: Department of Environmental and Prevention Sciences, University of Ferrara, Italy

Course: *Mathematics*, Bachelor Degree in Biological Sciences (24h, 3 ECTS)

A.Y. 2022/2023

Master Course Lecturer

At: Department of Architecture, University of Ferrara, Italy

Course: *Exercises in Applied Mathematics*, Master Degree in Architecture (30h, 3 ECTS)

A.Y. 2022/2023

Bachelor Course Lecturer

At: Department of Environmental and Prevention Sciences, University of Ferrara, Italy

Course: *Mathematics*, Bachelor Degree in Biological Sciences (16h, 2 ECTS)

A.Y. 2021/2022 **Doctoral Course Lecturer**

At: Department of Mathematics and Computer Science, University of Ferrara, Italy

Course: *An introduction to uncertainty quantification for PDEs*, Doctoral course in mathematics of the Universities of Ferrara, Modena-Reggio Emilia and Parma (lecturer for 4h, 1 ECTS)

A.Y. 2021/2022 **Contract Professor**

At: Department of Architecture, University of Ferrara, Italy

Course: *Exercises in Applied Mathematics*, Master Degree in Architecture (30h, 3 ECTS)

A.Y. 2020/2021 **Contract Professor**

At: Department of Architecture, University of Ferrara, Italy

Course: *Exercises in Applied Mathematics*, Master Degree in Architecture (30h, 3 ECTS)

OTHER TEACHING ACTIVITIES

03/2022 – 04/2022 **Lecture series speaker**

At: Department of Mathematics and Computer Science, University of Ferrara, Italy

Lecture series: Laboratory of *Mathematical modeling of socio-epidemic dynamics* organized in the context of the Scientific Degree Plan (Piano Lauree Scientifiche, PLS) with Liceo Scientifico A. Roiti of Ferrara (12h)

04/2021 – 05/2021 **Lecture series speaker**

At: Department of Mathematics and Computer Science, University of Ferrara, Italy

Lecture series: Laboratory of *Socio-epidemic dynamics* organized in the context of the Scientific Degree Plan (Piano Lauree Scientifiche, PLS) with Liceo Scientifico A. Roiti of Ferrara (11.5h)

HONORS AND AWARDS

March 2025 Winner of the *SIMAI "Fausto Saleri" Prize*. Awarded by the Italian Society of Applied and Industrial Mathematics (SIMAI) during the 2025 edition of the bi-annual Congress of the Society (September 1–5, 2025, Trieste, Italy).

January 2025 Nomination as member of the European Mathematical Society Young Academy (EMYA) for the years 2025-2028.

March 2023 Winner of a financial support (covering registration fee) for participating to the 10th International Congress on Industrial and Applied Mathematics (ICIAM 2023), held at Waseda University, Tokyo, Japan. Awarded by the Congress Committee.

July 2021 Winner of the *11th ECCOMAS PhD Olympiad* for the best PhD Thesis presentation. Awarded by the European Community on Computational Methods in Applied Sciences (ECCOMAS) during the VI ECCOMAS Young Investigators Conference (July 7–9, 2021, Universitat Politècnica de València, Spain).

March 2021 Finalist for the *ECCOMAS PhD Award 2020* as a nominee of the Italian Association of Theoretical and Applied Mechanics (AIMETA).

March 2021 Winner of the *GIMC 2020 Award* for the Best Doctoral Thesis in Computational Fluid Mechanics. Awarded by the Italian Group of Computational Mechanics (GIMC) of the Italian Association of Theoretical and Applied Mechanics (AIMETA).

SCIENTIFIC QUALIFICATIONS

National Scientific qualification (ASN) National Scientific qualification as Associate Professor in the Italian higher education system, in the call 2021/2023 for the disciplinary field of 01/A5 - Numerical Analysis.

PUBLICATIONS

Refereed journal articles

1. Alla A., **Bertaglia G.**, Calzola E. A PINN approach for the online identification and control of unknown PDEs. *Journal of Optimization Theory and Applications*, 206:8, 2025. DOI: 10.1007/s10957-025-02686-5

2. **Bertaglia G.**, Pareschi L., Caflisch R.E. Gradient-based Monte Carlo methods for relaxation approximations of hyperbolic conservation laws. *Journal of Scientific Computing*, 100(3):60, 2024. DOI: 10.1007/s10915-024-02614-1

3. Boscheri W., **Bertaglia G.** Local Virtual Element basis functions for space-time Discontinuous Galerkin schemes on unstructured Voronoi meshes. *Communications in Computational Physics*, 36(2):348-388, 2024. DOI: 10.4208/cicp.OA-2024-0015

4. **Bertaglia G.**, Bondesan A., Burini D., Eftimie R., Pareschi L., Toscani G. New Trends on the Systems Approach to Modeling SARS-CoV-2 Pandemics in a Globally Connected Planet. *Mathematical Models and Methods in Applied Sciences*, 34(11):1995-2054, 2024. DOI: 10.1142/S0218202524500301

5. **Bertaglia G.**, Pareschi L., Toscani G. Modelling contagious viral dynamics: a kinetic approach based on mutual utility, *Mathematical Biosciences and Engineering* 21(3):4241–4268, 2024. DOI: 10.3934/mbe.2024187

6. **Bertaglia G.**, Pareschi L. Multiscale constitutive framework of one-dimensional blood flow modeling: Asymptotic limits and numerical methods. *Multiscale Modeling and Simulation*, 21(3):1237–1267, 2023. DOI: 10.1137/23M1554230

7. Celant M., Toro E.F., **Bertaglia G.**, Cozzio S., Caleffi V., Valiani A., Blanco P.J., Müller L.O. Modeling essential hypertension with a closed-loop mathematical model for the entire human circulation. *International Journal for Numerical Methods in Biomedical Engineering*, e3748, 2023. DOI: 10.1002/cnm.3748

8. Boscheri W., Chiozzi A., Carlino M.G., **Bertaglia G.** A new family of semi-implicit Finite Volume / Virtual Element methods for incompressible flows on unstructured meshes. *Computer Methods in Applied Mechanics and Engineering*, 414:116140, 2023. DOI: 10.1016/j.cma.2023.116140

9. **Bertaglia G.**, Lu C., Pareschi L., Zhu X. Asymptotic-Preserving Neural Networks for multiscale hyperbolic models of epidemic spread. *Mathematical Models and Methods in Applied Sciences*, 32(10):1949–1985, 2022. DOI: 10.1142/S0218202522500452

10. Piccioli F., **Bertaglia G.**, Valiani A., Caleffi V. Modeling blood flow in networks of viscoelastic vessels with the 1-D augmented fluid-structure interaction system. *Journal of Computational Physics*, 464:111364, 2022. DOI: 10.1016/j.jcp.2022.111364

11. **Bertaglia G.**, Liu L., Pareschi L., Zhu X. Bi-fidelity stochastic collocation methods for epidemic transport models with uncertainties. *Networks & Heterogeneous Media*, 17(3):401–425, 2022. DOI: 10.3934/nhm.2022013

12. **Bertaglia G.**, Boscheri W., Dimarco G., Pareschi L. Spatial spread of COVID-19 epidemic outbreak in Italy using multiscale kinetic transport equations with uncertainty. *Mathematical Biosciences and Engineering* 18(5):7028–7059, 2021. DOI: 10.3934/mbe.2021350

13. **Bertaglia G.**, Pareschi L. Hyperbolic compartmental models for epidemic spread on networks with uncertain data: application to the emergence of Covid-19 in Italy. *Mathematical Models and Methods in Applied Sciences*, 31(12):2495–2531, 2021. DOI: 10.1142/S0218202521500548

14. **Bertaglia G.**, Pareschi L. Hyperbolic models for the spread of epidemics on networks: kinetic description and numerical methods. *ESAIM: Mathematical Modelling and Numerical Analysis* 55(2):381–407, 2021. DOI: 10.1051/m2an/2020082

15. **Bertaglia G.**, Caleffi V., Pareschi L., Valiani A. Uncertainty quantification of viscoelastic parameters in arterial hemodynamics with the a-FSI blood flow model. *Journal of Computational Physics* 430:110102, 2021. DOI: 10.1016/j.jcp.2020.110102

16. **Bertaglia G.**, Navas-Montilla A., Valiani A., Monge García M. I., Murillo J., Caleffi V. Computational hemodynamics in arteries with the one-dimensional augmented fluid-structure interaction system: viscoelastic parameters estimation and comparison with in-vivo data. *Journal of Biomechanics* 100(C):109595, 2020. DOI: 10.1016/j.jbiomech.2019.109595

17. **Bertaglia G.**, Caleffi V., Valiani A. Modeling blood flow in viscoelastic vessels: the 1D augmented fluid-structure interaction system. *Computer Methods in Applied Mechanics and Engineering* 360(C):112772, 2020. DOI: 10.1016/j.cma.2019.112772

18. **Bertaglia G.**, Ioriatti M., Valiani A., Dumbser M., Caleffi V. Numerical methods for hydraulic transients in visco-elastic pipes. *Journal of Fluids and Structures* 81(C):230–254, 2018. DOI: 10.1016/j.jfluidstructs.2018.05.004

Book chapters

19. **Bertaglia G.** Asymptotic-Preserving Neural Networks for hyperbolic systems with diffusive scaling. In: *Advances in Numerical Methods for Hyperbolic Balance Laws and Related Problems*, edited by Albi G., Boscheri W. & Zanella M., SEMA SIMAI Springer Series, pp. 23–48, 2023. DOI: 10.1007/978-3-031-29875-2_2

20. Albi G., **Bertaglia G.**, Boscheri W., Dimarco G., Pareschi L., Toscani G., Zanella M. Kinetic modelling of epidemic dynamics: social contacts, control with uncertain data, and multiscale spatial dynamics. In: *Predicting Pandemics in a Globally Connected World, Volume 1. Toward a Multiscale, Multidisciplinary Framework through Modeling and Simulation*, edited by Bellomo N. & Chaplain M., Birkhauser-Springer Series: Modeling and Simulation in Science, Engineering and Technology, pp. 43–108, 2022. DOI: 10.1007/978-3-030-96562-4_3

Conference papers

21. **Bertaglia G.** Solving multiscale problems with neural networks: the importance of asymptotic-preservation. *Proceedings of the 22nd ECMI Conference on Industrial and Applied Mathematics - ECMI2023*, in press, 2024.

22. Piccioli F., **Bertaglia G.**, Valiani A., Caleffi V. Consistent treatment of boundary conditions for blood flow modeling in networks of viscoelastic vessels. *Proceedings of the 7^{th} International Conference on Computational and Mathematical Biomedical Engineering - CMBE2022*, pp. 156–159, 2022. ISBN: 978-0-9562914-6-2

23. **Bertaglia G.**, Caleffi V., Pareschi L., Valiani A. The value of viscoelasticity in computational hemodynamics: Uncertainty quantification and comparison with in-vivo data. *Proceedings of the 7^{th} International Conference on Computational and Mathematical Biomedical Engineering - CMBE2022*, pp. 152–155, 2022. ISBN: 978-0-9562914-6-2

24. **Bertaglia G.** Multiscale kinetic transport models for the spread of epidemics with uncertain data. *Proceedings of the 8^{th} European Congress on Computational Methods in Applied Sciences and Engineering, ECCOMAS Congress 2022*, 1–12, 2022. DOI: 10.23967/eccomas.2022.191

25. Piccioli F., **Bertaglia G.**, Valiani A., Caleffi V. Modellazione del flusso sanguigno in reti di vasi viscoelastici. *Atti del XXXVII Convegno Nazionale di Idraulica e Costruzioni Idrauliche*, 2021. ISBN: 9788894379914

26. **Bertaglia G.**, Navas-Montilla A., Valiani A., Monge García M. I., Murillo J., Caleffi V. Modellazione del flusso sanguigno con sistema a-FSI: stima dei parametri e validazione in-vivo. *Atti del XXXVII Convegno Nazionale di Idraulica e Costruzioni Idrauliche*, 2021. ISBN: 9788894379914

27. **Bertaglia G.**, Caleffi V., Valiani A. Modellazione del flusso sanguigno in vasi viscoelastici. *Atti del XXXVII Convegno Nazionale di Idraulica e Costruzioni Idrauliche*, 2021. ISBN: 9788894379914

28. **Bertaglia G.** Augmented fluid-structure interaction systems for viscoelastic pipelines and blood vessels. *Proceedings of the YIC 2021 – VI ECCOMAS Young Investigators Conference*, pp. 431–439, 2021. DOI: 10.4995/YIC2021.2021.13450

29. Müller L. O., Celant M., Toro E. F., Blanco P. J., **Bertaglia G.**, Caleffi V., Valiani A. The Selfish-Brain Hypothesis as possible cause of arterial hypertension: a modeling study. *Proceedings of the 6^{th} International Conference on Computational and Mathematical Biomedical Engineering - CMBE2019*, pp. 592–595, 2019. ISBN: 978-0-9562914-5-5

30. **Bertaglia G.**, Ioriatti M., Valiani A., Dumbser M., Caleffi V. Modelli numerici per lo studio di fenomeni transitori idraulici in condotte viscoelastiche. *Atti del XXXVI Convegno Nazionale di Idraulica e Costruzioni Idrauliche*, 2018. ISBN: 9788894379907

31. **Bertaglia G.**, Valiani A., Caleffi V. The augmented FSI system for blood flow in compliant vessels. *Proceedings of the 5^{th} IAHR Europe Congress — New Challenges in Hydraulic Research and Engineering*, pp. 153–154, 2018. DOI: 10.3850/978-981-11-2731-1_074-cd. ISBN: 9789811127311

32. **Bertaglia G.**, Ioriatti M., Valiani A., Dumbser M., Caleffi V. A comparison of numerical methods for compressible flows in viscoelastic pipes. *Proceedings of the 5^{th} IAHR Europe Congress — New Challenges in Hydraulic Research and Engineering*, pp. 17–18, 2018. DOI: 10.3850/978-981-11-2731-1_075-cd. ISBN: 9789811127311

PhD Thesis

33. **Bertaglia G.** 1D augmented fluid-structure interaction systems with viscoelasticity: from water pipelines to blood vessels. Department of Engineering, University of Ferrara, 2020.

INVITED LECTURES AND TALKS

Conferences and Workshops

01/09/2025 – 05/09/2025 Plenary Lecturer as recipient of the 2025 SIMAI "Fausto Saleri" Prize at the 2025 edition of the bi-annual *Congress of the Italian Society of Applied and Industrial Mathematics* (SIMAI 2025), Trieste, Italy.

Title of the talk: *TBA*

19/02/2025 – 21/02/2025 Invited speaker at the *3C Conference: Challenges in Computational methods for Complex environmental applications*, Université Savoie Mont Blanc, Chambéry, France.

Title of the talk: *Gradient-Based Monte Carlo Methods for Hyperbolic Systems*.

19/02/2025 – 21/02/2025 Invited speaker at the *Workshop "Mathematical and Numerical Challenges in Ecology and Biology"* organized by the Department of Mathematics of the the University of Bari, Italy.

Title of the talk: *Modeling the spread of infectious diseases on networks through multiscale systems*.

11/07/2024 – 12/07/2024 Invited speaker at the *Workshop on Scientific Computing and Data Science* organized by the Department of Mathematics of the The Chinese University of Hong Kong, China.

Title of the talk: *Gradient-based Monte Carlo methods for hyperbolic equations*.

19/02/2024 – 23/02/2024 Invited speaker at the INdAM Workshop INSiDEs, *Innovations in the Numerical Treatment of Stiff Differential Equations*, University of Rome "La Sapienza", Italy.

Title of the talk: *Multiscale computational modeling of blood flow with asymptotic-preserving schemes*.

14/02/2024 – 16/02/2024 Invited speaker at the bi-annual GNCS Conference, Rimini, Italy.

Title of the talk: *Asymptotic-preserving methods for multiscale blood flow modeling*.

29/09/2022 – 30/09/2022 Young Plenary Lecturer at the GIMC SIMAI YOUNG 2022 Workshop, University of Pavia, Italy.

Title of the talk: *Uncertainty quantification methods for PDEs with applications to biomathematics*.

13/06/2022 – 17/06/2022 Invited speaker at Workshop 5 on "UQ in kinetic and transport equations and in high-frequency wave propagation" of the Thematic Programme on *Computational Uncertainty Quantification: Mathematical Foundations, Methodology & Data*, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), University of Vienna, Austria.

Title of the talk: *Uncertainty quantification of the spatial spread of epidemics described through kinetic models*.

15/12/2021 – 17/12/2021 Invited speaker at the *Numerical aspects of hyperbolic balance laws and related problems – Young Researchers Conference*, Department of Computer Science, University of Verona, Italy.

Title of the talk: *Hyperbolic models for the spatial spread of infectious diseases under uncertain data: kinetic description and numerical methods*.

08/06/2021 Invited speaker at the online workshop "Giovani alla Ricerca" organized by the Italian Association of Theoretical and Applied Mechanics (AIMETA).

Title of the talk: *1D augmented fluid-structure interaction systems with viscoelasticity: from water pipelines to blood vessels*.

Seminars

29/04/2025 Lecture series "Numerical Differential Modelling Seminars" organized by the Department of Mathematics, University of Rome "La Sapienza", Italy.

Title of the seminar: *Gradient-based Monte Carlo methods for hyperbolic conservation laws*.

09/03/2022 Lecture series "Young Researcher Seminars, Maths Applications & Models" organized by the Department of Computer Science, University of Verona, Italy.

Title of the seminar: *How to quantify the uncertainty that rules the world*.

10/01/2022 Online lecture series "Divulgazioni Notturne di Fisica Matematica".

Title of the seminar: *Perché l'incertezza domina il mondo e come possiamo quantificarla*.

07/12/2021 Lecture series organized by the Numerical Analysis group of the University of Iowa, U.S.A.

Title of the seminar: *Recent advances on mathematical and numerical modeling of the spatial spread of epidemics under uncertainty*.

21/10/2021 Lecture series organized by the Research and Training Group in Mathematical Modeling and Simulation of the Courant Institute of Mathematical Sciences, New York University, U.S.A.

Title of the seminar: *Hyperbolic models for the spatial spread of epidemics: Kinetic description, data uncertainty, and numerical approach*.

27/05/2021 Lecture series "Advances in Socio-Epidemic Mathematical Modelling" organized by the Socio-Epidemic Modeling group (MSE) of the Italian Mathematics Union (UMI).

Title of the seminar: *The need to model the spatial spread of epidemics on networks under uncertain data*.

26/04/2019 Lecture series organized by the Computational Hydraulics group of the University of Zaragoza, Spain.

Title of the seminar: *The augmented FSI system for blood flow in viscoelastic vessels*.

22/02/2019 Lecture series organized by the Computational Hydraulics group of the University of Zaragoza, Spain.

Title of the seminar: *Modeling FSI damping effects in viscoelastic pipes with hydraulic transients*.

TALKS IN CONFERENCES AND WORKSHOPS

15/06/2025 – 18/06/2025 *6th International Conference on Uncertainty Quantification in Computational Science and Engineering* (UNCECOMP 2025), Rhodes, Greece.

Invited talk in Minisymposium: "Multi-Order Monte Carlo approach leveraging hierarchies of IMEX Runge-Kutta schemes" (Minisymposium *Monte Carlo Sampling for Stochastic Solvers: Advances in Uncertainty Quantification*).

17/03/2025 – 20/03/2025 *23rd IACM Computational Fluids Conference* (CFC 2025), Santiago de Chile, Chile.

Invited talk in Minisymposium: "A multiscale framework for modeling blood flow in the cardiovascular system" (Minisymposium *The human circulation and associated diseases: models, methods and simulations*).

15/07/2024 – 19/07/2024 *International Conference on Scientific Computation and Differential Equations* (SciCADE 2024), National University of Singapore, Singapore.

Invited talk in Minisymposium: "Kinetic modeling of infectious viral dynamics based on mutual utility functions" (Minisymposium *Analysis and Numerical Computations for Kinetic Models*).

11/04/2024 – 12/04/2024 Kick-off Meeting of the PRIN 2022 PNRR project *Data-driven discovery and control of multiscale interacting artificial agent systems*, Verona, Italy.

Contributed talk: "Asymptotic-Preserving Neural Networks for Multiscale Problems" .

27/02/2024 – 01/03/2024 *SIAM Conference on Uncertainty Quantification* (SIAM UQ24), Trieste, Italy.

Invited talk in Minisymposium: "Stochastic Asymptotic-Preserving Bi-fidelity Method for Multiscale Spread of Epidemics Under Uncertainty" (Minisymposium *Multilevel and Asymptotic-Preserving Methods for Uncertainty Quantification in Multiscale Systems*).

11/09/2023 – 15/09/2023 *21^{st} IMACS (International Association for Mathematics and Computers in Simulation) World Congress* (IMACS2023), Rome, Italy.

Invited talk in Minisymposium: "Multiscale Constitutive Framework of Blood Flow: Modeling and Numerics" (Minisymposium *Recent trends in numerical methods for evolutionary problems*).

28/08/2023 – 01/09/2023 2023 edition of the bi-annual *Congress of the Italian Society of Applied and Industrial Mathematics* (SIMAI 2023), Matera, Italy.

Invited talks in Minisymposia: "A multiscale constitutive framework of computational blood flow modeling" (Minisymposium *Models and methods for biomedical applications*);
"Solving inverse and forward problems of multiscale epidemic spread with neural networks" (Minisymposium *Recent Advances on the mathematical and numerical modeling of epidemics*).

20/08/2023 – 25/08/2023 *10^{th} International Congress on Industrial and Applied Mathematics* (ICIAM 2023), Tokyo, Japan.

Invited talk in Minisymposium: "Asymptotic-preserving neural networks for kinetic equations in socio-epidemics" (Minisymposium *Many-agent systems and mean-field models for socio-economic and life sciences dynamics*).

26/06/2023 – 30/06/2023 *22^{nd} ECMI (European Consortium for Mathematics in Industry) Conference on Industrial and Applied Mathematics* (ECMI2023), Wroclaw, Poland.

Invited talk in Minisymposium: "Solving multiscale problems with neural networks: the importance of asymptotic-preservation" (Minisymposium *Neural network-based numerical solution of ODEs and PDEs*).

19/06/2023 – 21/06/2023 *7^{th} ECCOMAS Young Investigators Conference* (YIC2023), Porto, Portugal.

Invited talk in Minisymposium: "A bi-fidelity collocation approach for kinetic epidemic models with random inputs" (Minisymposium *Uncertainty quantification of differential equations with random parameters: methods and applications*).

22/05/2023 – 26/05/2023 *Sharing High-order Advanced Research Know-how on Finite Volume Conference* (SHARK-FV 2023), Minho, Portugal.

Contributed talk: "Computational blood flow modeling: A multiscale constitutive framework".

18/05/2023 – 19/05/2023 *Workshop MSE (Modellistica Socio-Epidemiologica)*, Complesso Monumentale Sant'Anna dei Lombardi, Napoli, Italy.

Contributed talk: "Asymptotic-Preserving Neural Networks for inverse and forward problems in multiscale epidemic dynamics".

24/11/2022 – 26/11/2022 *Matematica per l'Intelligenza Artificiale e il Machine Learning - Giovani Ricercatori*, Politecnico di Torino, Italy.

Contributed talk: "Asymptotic-Preserving Neural Networks for multiscale hyperbolic models".

29/09/2022 – 30/09/2022 *GIMC SIMAI YOUNG 2022 Workshop*, University of Pavia, Italy.

Invited talk in Minisymposium: "On mathematical models and methods for 1D fluid-structure interaction problems in computational hemodynamics" (Minisymposium *Mechanics of Biological Systems: Models and Experiments*).

28/06/2022 – 29/06/2022 *7^{th} International Conference on Computational and Mathematical Biomedical Engineering – CMBE2022*, Politecnico di Milano, Italy.

Invited talk in Minisymposium: "The value of viscoelasticity in computational hemodynamics: Uncertainty quantification and comparison with in-vivo data" (Minisymposium *Computational modeling and simulation of cardiovascular physiology*).

20/06/2022 – 24/06/2022 *XVIII International Conference on Hyperbolic Problems: Theory, Numerics, Applications* (HYP2022), University of Málaga, Spain

Contributed talk: "Asymptotic-preserving neural networks for hyperbolic transport models: Application to epidemic dynamics".

05/06/2022 – 09/06/2022 *8^{th} European Congress on Computational Methods in Applied Sciences and Engineering, ECCOMAS Congress 2022*, Oslo, Norway.

Invited talk in Minisymposium: "Multiscale kinetic transport models for the spread of epidemics with uncertain data" (Minisymposium *Mathematical and numerical modelling of COVID-19 epidemic*).

11/05/2022 – 13/05/2022 *Efficient high-order time discretization methods for PDEs*, Villa Orlandi, Anacapri (NA), Italy.

Contributed talk: "Physics-informed neural networks for multiscale hyperbolic models for the spatial spread of infectious diseases".

04/04/2022 – 08/04/2022 *European Workshop on High Order Numerical Methods for Evolutionary PDEs: Theory and Applications* (HONOM 2022), Vila Galé, Braga, Portugal.

Contributed talk: "Physics-Informed Neural Networks for multiscale hyperbolic systems: Application to epidemic dynamics".

30/08/2021 – 03/09/2021 *SIMAI 2020+21, XV biannual Congress of SIMAI (Italian Society of Applied and Industrial Mathematics)*, University of Parma, Italy.

Invited talk in Minisymposium: "Stochastic hyperbolic transport models for the spatial propagation of infectious diseases on networks" (Minisymposium *Novel approaches in the mathematical understanding of COVID-19 epidemic*).

26/07/2021 – 30/07/2021 *Numerical methods for hyperbolic problems* (NUMHYP 2021), Depaetment of Civil, Environmental and Mechanical Engineering, University of Trento, Italy.

Contributed talk: "Stochastic asymptotic-preserving IMEX Finite Volume methods for viscoelastic models of blood flow".

07/07/2021 – 09/07/2021 *VI ECCOMAS Young Investigators Conference*, online conference originally scheduled at Universitat Politècnica de València, Spain.

Invited talk in Minisymposium: "Augmented fluid-structure interaction systems for viscoelastic pipelines and blood vessels" (Minisymposium *PhD Olympiads*).

14/06/2021 – 16/06/2021 *XXXVII Convegno Nazionale di Idraulica e Costruzioni Idrauliche*, online edition.

Contributed talk: "Modellazione del flusso sanguigno con sistema a-FSI: stima dei parametri e validazione in-vivo".

01/03/2021 – 05/03/2021 *2021 SIAM Conference on Computational Science and Engineering*, online conference originally scheduled in Fort Worth, Texas, U.S.A.

Invited talk in Minisymposium: "A stochastic AP-scheme for non-conservative blood flow models with uncertainties" (Minisymposium *Shallow water flows: moment models, numerical schemes and applications*).

08/05/2019 – 10/05/2019 *Efficient high-order time discretization methods for PDEs*, Villa Orlandi, Anacapri (NA), Italy.

Contributed talk: "The augmented FSI system for blood flow in viscoelastic vessels solved with IMEX schemes".

01/04/2019 – 05/04/2019 *European Workshop on High Order Numerical Methods for Evolutionary PDEs: Theory and Applications* (HONOM 2019), Escuela Técnica Superior de Ingenieros de Minas y Energía, Universidad Politécnica de Madrid, Spain.

Contributed talk: "Accuracy-preserving IMEX schemes applied to the augmented FSI system for blood flow in viscoelastic vessels".

12/09/2018 – 14/09/2018 *XXXVI Convegno Nazionale di Idraulica e Costruzioni Idrauliche*, Universitá Politecnica delle Marche, Ancona, Italy.

Contributed talk: "Modelli numerici per lo studio di fenomeni transitori idraulici in condotte viscoelastiche".

12/06/2018 – 14/06/2018 5^{th} IAHR Europe Congress, *New challenges in hydraulic research and engineering*, University of Trento, Italy.

Contributed talks: "The augmented FSI system for blood flow in compliant vessels";
"A comparison of numerical methods for compressible flows in viscoelastic pipes".

SCIENTIFIC RESPONSIBILITY OF FUNDS AND RESEARCH PROJECTS

Competitive calls

2024 – 2025 "Bando Giovani anno 2024 (finanziato con il contributo 5x1000 dell'anno 2022)", Department of Environmental and Prevention Sciences, University of Ferrara

Total funded: 2.177 €

2023 – 2025 MUR (Italian Ministry of University and Research) PRIN 2022 PNRR

Project title: *Data-driven discovery and control of multi-scale interacting artificial agent systems*

Code: F53D23010050001

Total funded: 224.775 €

Role: Local coordinator of Ferrara's research unit (responsible for 16.500 € of funding)

2023 – 2025 "Fondo per l'Incentivazione alla Ricerca Dipartimentale" (FIRD) year 2023, University of Ferrara

Project title: *Caratterizzazione dell'interazione fluido-struttura nella modellistica cardiovascolare: sviluppo di legami costitutivi innovativi mediante tecniche di Machine Learning* (Characterization of fluid-structure interaction in cardiovascular modeling: development of novel constitutive laws using Machine Learning)

Total funded: 14.478 €

2023 – 2024 "Bando Giovani anno 2023 per progetti di ricerca finanziati con il contributo 5x1000 anno 2021", University of Ferrara

Project title: *Epidemie e benessere equo e sostenibile: analisi statistiche, modellistica e simulazioni computazionali* (Epidemics and equitable and sustainable well-being: statistical analysis, modeling and computational simulations)

Total funded: 6.500 €

2023 – 2024 "Bando per Progetti di Ricerca GNCS 2023" of the Italian National Group for Scientific Computing (INdAM–GNCS)

Project title: *Numerical methods for multiscale differential problems: high order schemes, optimization, control*

Code: E53C22001930001

Total funded: 2.500 €

2021 – 2022 "Finanziamento Giovani Ricercatori 2021-2022 GNCS" of the Italian National Group for Scientific Computing (INdAM–GNCS)

Project title: *Uncertainty quantification methods for hyperbolic balance laws*

Total funded: 1.500 €

2021 – 2022 Postdoctoral Fellowship of the Italian National Institute of High Mathematics "Francesco Severi" (INdAM), activity lines of the National Group for Scientific Computing (GNCS)

Project title: *Uncertainty quantification methods for hyperbolic balance laws on networks*

2019 – 2021 "Bando Giovani Ricercatori 2019 per il finanziamento di progetti di ricerca e mobilità internazionale (fondi 5x1000 anno 2017)", University of Ferrara

Project title: *Estensione della modellazione del flusso sanguigno nella rete cardiovascolare umana con sistemi aumentati di interazione fluido struttura* (Extension of blood flow modeling in the human cardiovascular network with augmented fluid-structure interaction systems)

Total funded: 5.500 €

Non-competitive calls

2024 – 2026 "Fondo di Ateneo per la Ricerca" (FAR) year 2024, University of Ferrara

Project title: *Unconventional numerical approaches for multiscale evolutionary dynamics in bio-mathematics: particle methods, uncertainty quantification, and data-driven optimal control problems.*

Total funded: 3.677 €

2023 – 2025 "Fondo di Ateneo per la Ricerca" (FAR) year 2023, University of Ferrara

Project title: *Unconventional numerical approaches for multiscale problems in bio-mathematics*

Total funded: 2.977 €

PARTICIPATION IN RESEARCH PROJECTS

Competitive calls

2025 – 2027 "Fondo per l'Incentivazione alla Ricerca Dipartimentale" (FIRD) year 2025, University of Ferrara

Project title: *Approcci computazionali e di apprendimento automatico per lo studio di dinamiche affette da incertezza* (Computational and machine learning approaches for studying dynamics affected by uncertainty)

2024 – 2025 PNRR Cascade Call "Future Artificial Intelligence Research (FAIR)" – Spoke 8 "Pervasive AI", University of Bologna

Project title: *Advanced MATHematical methods for Artificial Intelligence* (MATH4AI)

Code: J33C22002830006 (FAIR)

2024 – 2025 "Bando per Progetti di Ricerca GNCS 2024" of the Italian National Group for Scientific Computing (INdAM–GNCS)

Project title: *Metodi numerici per le dinamiche incerte* (Numerical methods for uncertain dynamics)

Code: E53C23001670001

2023 – 2025 Horizon Europe Call "HORIZON-MSCA-2021-DN-01"

Project title: *DATAHYKING - Data-driven simulation, uncertainty quantification and optimization for hyperbolic and kinetic models*

Code: Grant Agreement n.101072546

2023 – 2024 "Bando Giovani anno 2022 per progetti di ricerca finanziati con il contributo 5x1000 anno 2020", University of Ferrara

Project title: *BIO-METAMAT: Modellazione e simulazione computazionale di metamateriali bio-ispirati* (BIO-METAMAT: Computational modeling and simulation of bio-inspired metamaterials)

2017 – 2022 MIUR (Italian Ministry of Education, University and Research) PRIN 2017

Project title: *Innovative numerical methods for evolutionary partial differential equations and applications*

Code: 2017KKJP4X

DISSEMINATION ACTIVITIES

2023
- *La matematica come faro della prevenzione*, dissemination talk at the 2023 European Night of Researchers, University of Ferrara.
- *Decifriamo il codice della salute cardiovascolare con la matematica*, dissemination talk in the context of the event "Gli Aperiscenza della Prevenzione", organized by the Department of Environmental and Prevention Sciences, University of Ferrara
- Interview for the podcast "Scientificast" on the functioning of neural networks (episode 471, Integratori Carbonicamente Neurali). Full interview available here.

2022
- *La biologia con gli occhi della matematica*, dissemination talk at the 2022 European Night of Researchers, University of Ferrara.

PROFESSIONAL ACTIVITIES AND MEMBERSHIPS

Supervision of Post-doctoral fellows

May 2025 – present *Raffaella Fiamma Cabini*, post-doc research grant (Assegno di Ricerca), University of Ferrara. Research project on Physics-Informed Neural Networks for applications in computational hemodynamics.

Participation in Ph.D. Committees and Referee for Doctoral Thesis

- Referee of Alessia Casalucci's Doctoral Thesis, Ph.D. in Fluid Dynamic and Environmental Engineering, University of Genova (February 2025).
- Member of the Committe of Pablo Solán-Fustero's Doctoral Thesis defense, Ph.D. in Fluid Mechanics, University of Zaragoza (November 2024).

Organization of Conferences

- *Workshop "Mathematics for Machine Learning: Applications to PDEs and Related Fields"*, Ferrara, Italy (24/03/2025 – 26/03/2025).
- *"Numerical Aspects of Hyperbolic Balance Laws and Related Problems" – 2nd Young Researchers Conference* (NumAspYoung24), Ferrara, Italy (17/12/2024 – 19/12/2024).

Organization of Minisymposia

- MS *"Advances in data-driven approaches for multiscale agent-based systems"* at the 8^{th} ECCOMAS Young Investigators Conference (YIC 2025), Pescara, Italy (17/09/2025 – 19/09/2025).
- MS *"Quantifying Uncertainty in Kinetic and Hyperbolic PDEs: Numerical Insights"* at the SIAM Conference on Uncertainty Quantification (UQ24), Trieste, Italy (27/02/2024 – 01/03/2024).
- MS *"Kinetic equations: numerical methods and applications"* at the 2023 edition of the biannual Congress of the Italian Society of Applied and Industrial Mathematics (SIMAI 2023), Matera, Italy (28/08/2023 – 01/09/2023).

Group Memberships

- Center for Modeling, Computing and Statistics (CMCS) of the University of Ferrara
- European Mathematical Society (EMS)
- European Mathematical Society Young Academy (EMYA)
- Istituto Nazionale di Alta Matematica "Francesco Severi" (INdAM), Gruppo Nazionale per il Calcolo Scientifico (GNCS)
- Società Italiana di Matematica Applicata e Industriale (SIMAI)
- Unione Matematica Italiana (UMI), "Socio-Epidemic Modeling" Group (MSE) and "Mathematics for Artificial Intelligence and Machine Learning" Group (AI&ML&MAT)

Guest Editor for Journals

- Mathematical Biosciences and Engineering (Special Issue: "Computational modeling and numerical methods in bio-mathematics and fluid dynamics")

Referee for Journals

Applied Mathematics and Computation • Applied Mathematics Letters • Applied Mathematical Modelling • Artificial Intelligence In Medicine • BioSystems • Communications in Computational Physics • Communications on Applied Mathematics and Computation • Computer Methods in Applied Mechanics and Engineering • Computer Methods in Biomechanics and Biomedical Engineering • Computer Modeling in Engineering and Sciences • Computers & Fluids • Computers & Mathematics with Applications • Computers and Mathematics with Applications • Ecology Letters • Epidemiologic Methods • Engineering Computations • Fluid Dynamics and Materials Processing • Heliyon • International Journal for Numerical Methods in Biomedical Engineering • International Journal of Nonlinear Sciences and Numerical Simulation • Journal of Advanced Research in Fluid Mechanics and Thermal Sciences • Journal of Computational Physics • Journal of Mathematical Biology • Journal of the Royal Society Interface • Mathematical Biosciences and Engineering • Multidiscipline Modeling in Materials and Structures • Nature Scientific Reports

BIBLIOMETRIC PARAMETERS

Scopus:	21 documents • 350 citations • h-index 12
Web Of Science:	18 documents • 275 citations • h-index 11

Ferrara, July 8, 2025