

Giacomo Albi

Curriculum Vitae

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Dati Personali

Nato 22/02/1985

Cittadinanza Italiana

Impieghi

Attuale

11/2022– Professore Associato (G.S.D. 01/MATH-05/A - Analisi Numerica) presso il Dipartimento di Informatica, Università di Verona

Precedenti

- 11/2019 – Ricercatore a Tempo Determinato di tipo B (RTDb, S.C. 01/A5 - S.S.D. MAT/08, 11/2022 Analisi Numerica) presso il Dipartimento di Informatica, Università di Verona
- 05/2017– Ricercatore a Tempo Determinato di tipo A (RTDa, S.C. 01/A5 - S.S.D. MAT/08, 11/2019 Analisi Numerica) presso il Dipartimento di Informatica, Università di Verona
- 05/2014– Postdoc presso la Technische Universität München (TUM), Fakultät für Mathematik, all'interno del "ERC project: High-Dimensional Sparse Optimal Control" (Responsabile: M. Fornasier).
- 03/2017

Formazione

- 2014 **Dottorato di Ricerca in Matematica e Informatica**, 03/03/2014, con lode, Università di Ferrara,
Tesi: Approssimazione cinetica, stabilità e controllo del comportamento collettivo in sistemi auto-organizzati (Premio INdAM-SIMAI-UMI 2017).
Relatore: Prof. Lorenzo Pareschi.
- 2010 **Laurea Magistrale in Matematica**, 18/02/2010, Università di Padova,
Tesi: Legge dei grandi numeri e fluttuazioni per il modello random Curie-Weiss.
Tutor: Prof. Paolo Dai Pra.
- 2007 **Laurea Triennale in Matematica**, 19/09/2007, Università di Trento,
Tesi: Metodo delle Differenze Finite per opzioni pay-off con barriera discontinua.
Tutor: Prof. Aldo Tagliani.

Premi e Riconoscimenti

- 2023 ASN: Abilitazione scientifica nazionale al ruolo di Professore Ordinario in Analisi Numerica S.C. 01/A5 - S.S.D. MAT/08: 30/01/2023-30/01/2034.
- 2018 ASN: Abilitazione scientifica nazionale al ruolo di Professore Associato in Analisi Numerica S.C. 01/A5 - S.S.D. MAT/08: 31/08/2018-31/08/2024.
- 2017 Premio INdAM-SIMAI-UMI 2017 per la *Migliore Tesi di Dottorato in Matematica Applicata*.
- 2015 Premio per la *Migliore Tesi di Dottorato per il ciclo XXVI* Università di Ferrara.
- 2014 *Riconoscimento Nicolò Copernico* per tesi di dottorato innovative in scienze e tecnologia.

Competenze Informatiche

- Standard C, C++, PYTHON, FORTRAN, R, MAPLE, HTML, EXCEL, OFFICE.
- Avanzato MATLAB, MATHEMATICA, FREEFEM++, L^AT_EX.

Lingue Conosciute

- Italiano Madrelingua
- Inglese Avanzato
- Tedesco Intermedio

Pubblicazioni

Articoli accettati

- 32 *Impact of opinion formation phenomena in epidemic dynamics: kinetic modeling on networks*, G. Albi, E. Calzola, G. Dimarco, M. Zanella, SIAM Journal of Applied Mathematics, accepted, 2025
- 31 *Instantaneous control strategies for magnetically confined fusion plasma*, G. Albi, G. Dimarco, F. Ferrarese, L. Pareschi, Journal of Computational Physics, accepted, 2025.

- 30 [Exponential integrators for mean-field selective optimal control problems](#), G. Albi, M. Caliori, E. Calzola, F. Cassini, Journal of Approximation Software, 1 (2), 1-21, 2024. WEB: ojs.unito.it/index.php/JAS/article/view/10973
- 29 [Kinetic Description of Swarming Dynamics with Topological Interaction and Transient Leaders](#), G. Albi, F. Ferrarese, Multiscale Modeling & Simulation, 22(3), 1169-1195, 2024. DOI: 10.1137/23M1588615
- 28 [A data-driven kinetic model for opinion dynamics with social network contacts](#), G. Albi, E. Calzola, G. Dimarco, European Journal of Applied Mathematics, 1-27, 2024. DOI: 10.1017/S0956792524000068
- 27 [Robust feedback stabilization of interacting multi-agent systems under uncertainty](#), G. Albi, M. Herty, C. Segala. Applied Mathematics & Optimization, 89(1), 16, 2024. DOI:10.1007/s00245-023-10078-2
- 26 [Kinetic based optimization enhanced by genetic dynamics](#), G. Albi, F. Ferrarese, C. Totzeck, Math. Models Methods Appl. Sci., 33(14), 2905–2933, 2023. DOI: 10.1142/S0218202523500641
- 25 [Efficient stochastic algorithms for agent-based models with predator-prey dynamics](#), G. Albi, R. Chignola, F. Ferrarese, Mathematics and Computers in Simulation, 199, 317–340 DOI: 10.1016/j.matcom.2022.03.019
- 24 [Moment-driven predictive control of mean-field collective dynamics](#), G. Albi, M. Herty, D. Kalise, C. Segala, SIAM journal on Control and Optimization, 60(2), 814–841, 2022. DOI: 10.1137/21M1391559
- 23 [Mean-field selective optimal control via transient leadership](#), G. Albi, S. Almi, M. Morandotti, F. Solombrino, Applied Mathematics & Optimization, 85 (9), 1-44, 2022. DOI: 10.1007/s00245-022-09837-4.
- 22 [Gradient-augmented Supervised Learning of Optimal Feedback Laws Using State-dependent Riccati Equations](#), G. Albi, S. Bicego, D. Kalise, IEEE Control Systems Letters, 6 pp. 836–841, 2022. DOI: 10.1109/LCSYS.2021.3086697.
- 21 [Modelling lockdown measures in epidemic outbreaks using selective socio-economic containment with uncertainty](#), G. Albi, L. Pareschi, M. Zanella. Mathematical Biosciences and Engineering, Volume 18, Issue 6, Pages 7161 - 7190. 2021.
- 20 [Control with uncertain data of socially structured compartmental epidemic models](#), G. Albi, L. Pareschi, M. Zanella, Journal of Mathematical Biology 82.7 1-41. 2021. DOI: 10.1007/s00285-021-01617-y
- 19 [High order semi-implicit multistep methods for time dependent partial differential equations](#), G. Albi, L. Pareschi, Communications on Applied Mathematics and Computation 1-18, 2021. DOI: 10.1007/s42967-020-00110-5
- 18 [Implicit-Explicit multistep methods for hyperbolic systems with multiscale relaxation](#), G. Albi, G. Dimarco, L. Pareschi, SIAM Journal on Scientific Computing 42.4, A2402-A243, 2020. DOI: 10.1137/19M1303290.
- 17 [Linear multistep methods for optimal control problems and applications to hyperbolic relaxation systems](#) G. Albi, M. Herty, L. Pareschi, App. Math. & Comp. 354, pp. 460-477, 2019. DOI: 10.1016/j.amc.2019.02.021.

- 16 [Boltzmann Games in Heterogeneous Consensus Dynamics](#) G. Albi, L. Pareschi, M. Zanella, J. of Stat. Phys. 175(1), pp. 97-125, 2019. DOI: 10.1007/s10955-019-02246-y.
- 15 [Vehicular traffic, crowds, and swarms. From kinetic theory and multiscale methods to applications and research perspectives.](#), G. Albi, N. Bellomo, L. Fermo, S.-Y. Ha, J. Kim, L. Pareschi, D. Poyato and J. Soler, Math. Models Methods Appl. Sci., Vol. 29, No. 10, pp. 1901-2005, 2019. DOI: 10.1142/S0218202519500374.
- 14 [Leader formation with mean-field birth and death models](#), G. Albi, F. Rossi, F. Solombrino, Math. Models Methods Appl. Sci., 29(4), pp. 633-679, 2019. DOI: 10.1142/S0218202519400025.
- 13 [Selective model-predictive control for flocking systems](#), G. Albi, L. Pareschi, Comm. in App. and Ind. Math. 9(2), pp. 4-21, 2018. DOI: 10.2478/caim-2018-0009.
- 12 [Pressureless Euler alignment with control](#), G. Albi, Y-P. Choi., A-S. Häck, Math. Models Methods Appl. Sci., 28 (09), pp. 1635-1664, 2018. DOI: 10.1142/S0218202518400018.
- 11 [Mean field control hierarchy](#), G. Albi, Y-P. Choi, M. Fornasier, D. Kalise, App. Math. Optim., 76(1):93-135, 2017. DOI: 10.1007/s00245-017-9429-x
- 10 [Opinion dynamics over complex networks: kinetic modeling and numerical methods](#), G. Albi, L. Pareschi, M. Zanella, Kin. Rel. Med., 10(1): 1-32, 2017. DOI: 10.3934/krm.2017001.
- 9 [Biological transportation network: modeling and simulation](#), G. Albi, M. Artina, M. Fornasier, P. A. Markovich, Analysis and Applications, 14(01), pp. 185-206, 2016. DOI: 10.1142/S0219530515400059.
- 8 [Invisible control of self-organizing agents leaving unknown environments](#), G. Albi, M. Bongini, E. Cristiani, D. Kalise, SIAM J. Appl. Math., 76(4), 1683 - 1710, 2016. DOI: 10.1137/15M1017016.
- 7 [Uncertainty quantification in control problems for flocking models](#), G. Albi, L. Pareschi, M. Zanella, Mathematical Problems in Engineer, 2015. DOI: 10.1155/2015/850124.
- 6 [Kinetic description of optimal control problems and applications to opinion consensus](#), G. Albi, M. Herty, L. Pareschi, Comm. Math. Scien., 13(6), pp. 1407-1429, 2015. DOI: 10.4310/CMS.2015.v13.n6.a3
- 5 [Boltzmann type control of opinion consensus through leaders](#), G. Albi, L. Pareschi, M. Zanella, Proc. of the Roy. Soc. A., 372(2028), 2014. DOI: 10.1098/rsta.2014.0138.
- 4 [Stability analysis of flock and mill rings for 2nd order models in swarming](#), G. Albi, D. Balagué, J. A. Carrillo, J. von Brecht, SIAM J. Appl. Math., 74(3), pp. 794-818, 2014. DOI: 10.1137/13091779X.
- 3 [Asymptotic Preserving time-discretization of optimal control problems for the Goldstein–Taylor model](#), G. Albi, M. Herty, C. Jörres, L. Pareschi, Numer. Meth. Partial Diff. Equations, 30(6), 1770-1784, 2014. DOI: 10.1002/num.21877.
- 2 [Binary interaction algorithms for the simulation of flocking and swarming dynamics](#). G. Albi, L. Pareschi. SIAM Multiscale Model. Simul., 11(1), pp. 1-29, 2013. DOI: 10.1137/120868748.

- 1 [Modeling self-organized systems interacting with few individuals: from microscopic to macroscopic dynamics](#). G. Albi, L. Pareschi, App. Math. Lett., 26, pp. 397-401, 2013. DOI: 10.1016/j.aml.2012.10.011.

Capitoli in libri

- 5 [Kinetic modelling of epidemic dynamics: social contacts, control with uncertain data, and multiscale spatial dynamics.](#), G. Albi, G. Bertaglia, W. Boscheri, G. Dimarco, L. Pareschi, G. Toscani, M. Zanella, In: Predicting Pandemics in a Globally Connected World, Volume 1: Toward a Multiscale, Multidisciplinary Framework through Modeling and Simulation. Cham: Springer International Publishing, p. 43-108, 2022. DOI: 10.1007/978-3-030-96562-4_3
- 4 [Optimized leaders strategies for crowd evacuation in unknown environments with multiple exits.](#), G. Albi, F. Ferrarese, C. Segala, in L. Gibelli, editor, Crowd Dynamics Volume 3 - Theory, Models, and Applications. Birkhauser-Springer, pp. 97-131, 2022, DOI: https://doi.org/10.1007/978-3-030-91646-6_5
- 3 [Mathematical models and methods for crowd dynamics control.](#), G. Albi, E. Cristiani, L. Pareschi, D. Peri, in L. Gibelli, editor, Crowd Dynamics Volume 2 - Theory, Models, and Applications. Birkhauser-Springer, 2020. DOI: https://doi.org/10.1007/978-3-030-50450-2_8
- 2 [Recent advances in opinion modeling: control and social influence.](#), G. Albi, L. Pareschi, G. Toscani, M. Zanella, in N. Bellomo, P. Degond, and E. Tadmor, editors, Active Particles Volume 1, Theory, Methods, and Applications. Birkhauser-Springer, 2016. DOI: 10.1007/978-3-319-49996-3_2.
- 1 [Continuum Modeling of Biological Network Formation.](#), G. Albi, M. Burger, J. Haskovec, P. A. Markowich, M. Schlottbom, in N. Bellomo, P. Degond, and E. Tadmor, editors, Active Particles Volume 1, Theory, Methods, and Applications. Birkhauser-Springer, 2016. DOI: 10.1007/978-3-319-49996-3_1.

Atti di convegno

- 5 [Supervised learning for kinetic consensus control](#), G. Albi, S. Bicego, D. Kalise, IFAC-PapersOnLine 55(30), pp. 103-108, 2022. DOI: 10.1016/j.ifacol.2022.11.036.
- 4 [Relaxation approximation of optimal control problems and applications to traffic flow models](#), G. Albi, M. Herty, L. Pareschi, AIP Conference Proceedings 1975, 020001, 2018. DOI: 10.1063/1.5042169.
- 3 [\(Sub\)Optimal feedback control of mean-field multi-population dynamics: a Boltzmann-Bellman approach](#), G. Albi, D. Kalise, IFAC-PapersOnLine 51(3), pp. 86-91, 2018. DOI: 10.1016/j.ifacol.2018.06.020.
- 2 [A Boltzmann approach to mean-field sparse feedback control](#), G. Albi, M. Fornasier, D. Kalise, IFAC-PapersOnLine 50(1), pp. 2898-2903, 2017. DOI: 10.1016/j.ifacol.2017.08.646.
- 1 [On the optimal control of opinion dynamics on evolving networks](#), G. Albi, L. Pareschi, M. Zanella, in IFIP TC7 2015 proceedings. DOI:10.1007/978-3-319-55795-3_4.

Libri

- 2 [Advances in Numerical Methods for Hyperbolic Balance Laws and Related Problems](#) , G. Albi, W. Boscheri and M. Zanella editors, SEMA-SEMAI, 2023. DOI: 10.1007/978-3-031-29875-2
- 1 [Trails in Kinetic Theory Foundational Aspects and Numerical Methods](#) , G. Albi, S. Merino, A. Nota and M. Zanella editors, SEMA-SEMAI, 2021. DOI: 10.1007/978-3-030-67104-4

Preprint

- 2 [Control of high-dimensional collective dynamics by deep neural feedback laws and kinetic modelling](#) , G. Albi, S. Bicego, D. Kalise, 2024, preprint arXiv:2404.02825
- 1 [Data/moment-driven approaches for fast predictive control of collective dynamics](#) , G. Albi, S. Bicego, M. Herty, Y. Huang, D. Kalise, C. Segala, 2024, preprint arXiv:2402.15611.

Total: 46 Documents (2 Preprints, 32 Articles, 5 Chapters, 5 Proceedings, 2 Books).

Indici bibliometrici (01/02/2025)

	Publications	h-index	Citations
Mathschinet	30	15	667
Scopus	41	17	1166
GScholar	44	23	1768

Disseminazione & outreach

- 4 *Manuale per un leader: Strategie matematiche di controllo dell'opinione pubblica*. Gli Stati Generali, May 2015.
- 3 *L'effetto gregge esisite*. Le Scienze. May 2015.
- 2 *Effetto gregge e controllo di folle*. MaddMaths, June 2015.
- 1 *Laboratorio di dinamiche socio-economiche* , activities for high-school students within "Progetto Lauree Scientifiche" (PLS) [web], since 2012.

Progetti di ricerca

Coordinamento

- 2023 - Project PRIN PNRR 2022: *Data-driven discovery and control of multi-scale interacting artificial agent systems*, (total: 224775 €, Verona unit: 97125 €) (role: [PI](#)).
- Project PRIN 2022: *Efficient numerical schemes and optimal control methods for time-dependent partial differential equations*. (total: 214683 €, Verona unit: total: 66923 €) (role: [local coordinator](#), [co-PI](#)), Responsabile: Prof. Walter Boscheri.

- 2019 - Project PRIN 2017: *Innovative numerical methods for evolutionary partial differential equations and applications*. (total: 533540 €, Verona Unit: 76500 €) (role: [local coordinator](#)), Responsible: Prof. Giovanni Russo.
- 2018 - Project GNCS-INDAM 2018: *Metodi Numerici per problemi di controllo multiscala*. (total: 5000 €) (role: [PI](#))
- 2012 - Young Researchers Grant University of Ferrara: *Differential equations and collective behavior with applications to social, economics and natural sciences*. (total: 3500 €) .

Partecipazione

- 2020 RIBA University of Verona: *Geometric evolution of multi-agent system*. Responsible: Prof. Marco Caliarì.
- 2019 Project GNCS-INDAM 2019: *Approssimazione numerica di problemi di natura iperbolica e applicazioni*.
Responsible: Prof. Elisabetta Carlini.
- 2014-2017 ERC-Starting Grant: *High-Dimensional Sparse Optimal Control*.
Responsible: Prof. Massimo Fornasier.
- 2013 Project GNCS-INDAM: *Hyperbolic dominated multi-scale problems: numerical methods and applications*.
Responsible: Dr. Matteo Semplice.
- 2010-2012 Bilateral project Italy–Germany Vigoni: *Adjoint IMEX methods for the numerical solution to optimization problems*.
Responsables: Prof. Lorenzo Pareschi and Prof. Michael Herty.
- 2011-2013 PRIN: *High-order numerical methods for systems of balance laws with sources in fluid-dynamics*.
Responsible: Prof. Lorenzo Pareschi.

Organizzazione di eventi scientifici

- 2024 - Conference: "Numerical aspects of hyperbolic balance laws and related problems" - Young Researcher Conference, 17-19/12, Ferrara, Italy, ([Organizer](#)).
- Kick-off meeting: "Data-driven discovery and control of multi-scale interacting artificial agent systems", 4-5 April, Verona, Italy, ([Organizer](#)).
- Workshop: "Modeling, analysis, and control of multi-agent systems across scales"- 21-26/01, Centro De Giorgi, Pisa, Italy, ([Organizer](#)).
- 2023 - Workshop "Geometric Evolution of Multi Agent Systems" 20/12, Verona, Italy, ([Organizer](#)).
- 2022 - 35th ECMI Modelling Week - 03-09/07, Verona, Italy, ([Organizer](#)).
- One day– Young Researchers Seminars, Maths Applications & Models" 8/07, Verona, Italy. ([Organizer](#)).
- 2021 - Conference: "Numerical aspects of hyperbolic balance laws and related problems" - Young Researcher Conference, 15-17/12, Verona, Italy, ([Organizer](#)).

- 2020 - Electronic Workshop: "Collective Models, Control and Uncertainty Quantification for Infectious Diseases and Related Problems", 04/04 - Online ([Organizer](#)).
- 2019 - Minisymposium: "Novel Concepts in Model-driven Optimization and Control of Agent-based Systems", 15-19/07 ICIAM 2019 Valencia, Spain, ([MS Organizer](#)).
 - Summer School: "Trails in Kinetic Theory: theoretical aspects and numerical methods", 20-25/05, HIM Bonn, Germany, ([Organizer](#)).
- 2018 - Winter School: "From Interacting Particle Systems to Kinetic equations", 26-30/11, Verona, Italy, ([Organizer](#)).
 - Conference: "Numerical aspects of hyperbolic balance laws and related problems", 26-30/04, Ferrara, Italy, ([Organizer](#)).
- 2016 - Minisymposium: "Recent developments in numerical methods for HJB and Multi-agent systems", WONAPDE 2016, Fifth Chilean Workshop on Numerical Analysis of Partial Differential Equations, 11 - 15/01 Universidad de Concepcion, Concepcion, Chile. ([MS Organizer](#)).
- 2015 - Minisymposium: "Mean-field modeling and control of multi-agents systems", 13th Viennese Workshop on Optimal Control and Games, 13-16/05, Vienna, Austria. ([MS Organizer](#))
- 2012 - Conference: "Numerical aspects of hyperbolic balance laws and related problems", 3-4/04, Ferrara, Italy. ([Organizer](#)).

Comunicazioni su invito

- 2025 - [Robust control strategies in magnetic confined fusion plasma](#), "3C Conference: Challenges in Computational methods for Complex environmental applications", 21-23 /05, Chambéry, France (Invited speaker).
 - [Multiscale linear multistep methods for transport and control problem](#), "Efficient high-order time discretization methods for PDEs", 12-17 /05, Capri, Italy (Invited speaker).
 - [Controlling high-dimensional particle systems with supervised machine learning](#), "Mathematics for Machine Learning: Applications to PDEs and Related Fields", 23-26 /03, Ferrara, Italy (Invited speaker).
- 2024 - [Controlling high-dimensional particle systems in magnetically confined fusion plasma](#), "Mini-Workshop: High-Dimensional Control Problems and Mean-Field Equations with Applications in Machine Learning", 9-13 /12, Oberwolfach, Germany (Invited speaker).
 - [Impact of opinion formation phenomena in epidemic dynamics: kinetic modeling on networks](#), "Novel perspectives on continuous opinion formation models & related topics, 11-12/11, Pavia, Italy (Invited speaker).
 - [High order multi-step methods for time dependent partial differential equations](#), "Innovations in the Numerical Treatment of Stiff Differential Equations", 19-22/02, Roma, Italy. (Invited speaker).

- [*Instantaneous control of Vlasov-Poisson system via magnetic confinement*](#), "New Trends in Optimal Control", 15-17 /05, Venice, Italy. (Invited speaker).
- [*High order multi-step methods for time dependent partial differential equations*](#), "Innovations in the Numerical Treatment of Stiff Differential Equations", 19-22/02, Roma, Italy. (Invited speaker).
- 2023 - [*Supervised learning for high-dimensional mean-field optimal control problems*](#), "Control Methods in Hyperbolic Partial Differential Equations", 5-10/09, Oberwolfach, Germany. (Invited speaker).
- [*Supervised learning for high-dimensional mean-field optimal control problems*](#), "Numerical aspects of hyperbolic balance laws and related problems", 19-23/06, Cortona, Italy. (Invited speaker).
- [*Data-driven kinetic model for opinion dynamics and contacts*](#), "Mathematical Challenges in Social Systems and Applications to Public Health", 9-12/05, Buenos Aires, Argentina. (Invited speaker).
- [*Machine learning for mean-field optimal control problems*](#), "Innovative Numerical Methods for Evolutionary Partial Differential Equations and Application", 18-22/02, Catania, Italy. (Invited speaker).
- 2022 - [*Control and optimization of interacting multi-agent systems across scales*](#), "Mathematical Models in Social Innovation Blended Intensive Program", September 5 - 10, 2022 L'Aquila, Italy. (Invited speaker).
- [*Kinetic approximation for mean-field control problems*](#), "Theoretical and Numerical Trends in Inverse Problems and Control for PDEs, and Hamilton-Jacobi Equation: a French-Italian-Japanese Conference", CIRM, Luminy - Marseille, France June 13-17, 2022. (Invited speaker).
- [*Multistep methods for hyperbolic systems with relaxation and optimal control problems*](#) "Frontiers in numerical analysis of kinetic equations", May 22-27, 2022, INI Institute, Cambridge University, UK (Invited speaker).
- 2021 - [*Kinetic approximation for optimal control of collective behavior*](#), Workshop and Summer School on Kinetic Theory and Related Applications, Computational Science Research Center, Beijing, China, June 28-July 10, 2021. (Invited speaker).
- [*Kinetic approximation for optimal control of collective behavior*](#), Control Methods in Hyperbolic Differential Equations 19-23/08. (Invited speaker).
- 2019 - [*Kinetic control of emergent behavior*](#), Recent Advances in Nonlocal Kinetic, Fluid and Diffusive PDEs, Jeju, South Korea 19-23/08. (Invited speaker).
- [*Boltzmann-type control in multi-agent systems*](#), Workshop in Control Theory and applications, GSSI L'Aquila, Italy 28-29/03. (Invited speaker).
- [*Boltzmann-type optimal control problems*](#), Sussex University, 24-26/03 (Invited seminar).
- 2018 - [*Boltzmann game in heterogeneous consensus dynamics*](#), Recent Trends in Kinetic Modelling and Related Fields, 25-26/10, Torino, Italy. (Invited speaker).
- [*Multistep methods in hyperbolic systems with relaxation*](#), Interactive workshop on hyperbolic equations (WIDEI), Ferrara, 10-12/09, 2018. (Invited speaker).

- [Boltzmann-type optimal control problems](#), Workshop on Kinetic Theory for Control, Games and Uncertainty, Aachen, 15-16/05, 2018. (Invited speaker).
- [Numerical methods for optimal control in multiscale differential problems](#), Conference on Frontiers in Industry and Applied Mathematics 2018, 26-27/04 Hamirpur, Himchal-Pradesh, India. (Plenary speaker).
- 2017 - [Boltzmann-type control for consensus dynamics](#), Inha University, 18/10, Incheon-Seoul, South Korea. (Invited seminar).
- [Mean-field control hierarchy](#), LSIS, 12-15/03, Marseilles, France. (Invited speaker).
- 2016 - [Kinetic approximation and control of multi-agent systems](#), 01/02, WWM Münster, Germany. (Invited seminar).
- 2015 - [Kinetic approximation and control of multi-agent systems](#), Numerical aspects of hyperbolic balance laws and related problems, 17-19/12, Ferrara, Italy. (Invited speaker).
- [Kinetic modeling and control of self-organizing systems](#), 02/12, KAUST, Thuwal, KSA. (Invited seminar).
- [Multi-scale modeling and control of self-organizing systems](#), IperGSSI, 16th Italian Meeting on Hyperbolic Equations, 22-25/10, L'Aquila, Italy. (Invited speaker).
- [AP and IMEX RK schemes for optimal control hyperbolic problems with relaxation](#), Numerics for Nonlinear PDEs, in Roma 3, 29-30/01, Roma, Italy. (Invited speaker).
- 2014 - [Kinetic description of optimal control problems in consensus modeling](#), Multiscale kinetic and fluid problems: asymptotic analysis, modelling and numerical simulation, in Cargèse (IESC), 28/09-4/10, Corsica, France. (Invited speaker).
- [Modeling self-organized systems numerical methods and control dynamics](#), 29/01, KU Leuven, Belgium. (Invited seminar).
- 2013 - [Modeling self-organized systems numerical methods and interaction with few individuals](#), 10/09, 2013, RTWH, Aachen, Germany. (Invited seminar)
- 2012 - [Modeling self-organized systems interacting with few individuals: from microscopic to macroscopic dynamics](#), 12/12, 2012, CASA colloquium TU Eindhoven, Eindhoven, NL. (Invited seminar)

Seminari

- 2024 - [A Data-Driven Kinetic Model for Opinion Dynamics with Social Network Contacts](#), Minisimposia: "Dynamics of Socially- and Behaviorally-structured Multi-population and Multiagent Systems", SIAM Conference on the Life Sciences, 5-9/06, Portland, Oregon, US.
- 2023 - [Kinetic description of swarming dynamics with topological interaction and emergent leaders](#), Minisimposia: "Matematica per le scienze della vita", XXII Congresso Nazionale UMI, 6-7/09, Pisa, Italy.
- [Kinetic description of swarming dynamics with topological interaction and emergent leaders](#), Minisimposia: "Many-agent systems and mean-field models for socio-economic and life sciences dynamics", ICIAM 2023, 18-26/08, Tokyo, Japan.

- 2022 - [*Kinetic approximation of mean-field optimal control*](#), Minisimposia: "Inverse Problems, PDE-Constrained Optimization, and Applications" , SCICADE 2022, 24-29/07, Reykjavik, Iceland.
- 2021 - [*Mean-field selective optimal control with transient leadership*](#), Minisimposia: "Recent Results in Kinetic Theory and Applications" , SIMAI 2020, Parma.
 - [*Moment-driven predictive control of collective dynamics*](#), Minisimposia: "Innovative numerical methods for evolutionary PDEs" , SIMAI 2020, Parma, Italy.
 - [*IMEX Linear Multistep Methods for hyperbolic problems with relaxation*](#), NumHyp Trento, 21-29/07, Trento, Italy.
- 2019 - [*IMEX Linear Multistep Methods for hyperbolic problems with relaxation*](#), Invited Minisymposium " Asymptotic preserving methods for kinetic equations", sciCADE 2019, 20-25/07, Innsbruck, Austria.
 - [*Boltzmann control strategies for multi-agent systems*](#), Minisymposium: "Novel Concepts in Model-driven Optimization and Control of Agent-based Systems", ICIAM 2019, 15-19/07, Valencia, Spain.
 - [*Linear multistep methods for optimal control problems and applications to hyperbolic relaxation systems*](#), "Efficient high-order time discretization methods for PDEs", 8-10/05, Villa Orlandi, Anacapri, Italy.
 - [*Boltzmann-type optimal control problems*](#), Minisymposium: "Recent advances in PDE models describing emergent behaviour and collective dynamics", BAMC 2019, 24-26/04, Bath, UK.
- 2018 - [*Boltzmann-type optimal control problems*](#), "Advances in Kinetic Theory", UMI-SIMAI-PTM, 17-20/09, Wrocław, Poland.
 - [*Boltzmann game in heterogeneous consensus dynamics*](#), Special Session: "Advances in kinetic theory", AIMS Conference, Taipei, Taiwan, 05-09/07.
 - [*Boltzmann-type optimal control problems*](#), Special Session: "Kinetic and related equations: collisions, mean field, and organized motion", AIMS Conference, Taipei, Taiwan, 05-09/07.
- 2017 - [*Boltzmann-type optimal control*](#), IperPV 2017, 06-09/09, Pavia, Italy.
 - [*Mean-field control hierarchy for opinion dynamics*](#), AMMCS 2017, 20-25/08, Waterloo, Ontario, Canada.
 - [*Mean-field control hierarchy*](#), BAMC 2017, 10-12/04, Guildford, UK.
 - [*Mean-field control hierarchy in consensus models*](#), SIAM CSE, 27/02-03/03, Atlanta, GA, US.
- 2016 - [*Binary interaction approximation for mean-field optimal control problems*](#), SIMAI 2016, 13-16/09, Milano, Italy.
 - [*Binary interaction approximation for mean-field optimal control problems*](#), CMAM-7 2016, 01-05/08, Jyväskylä, Finland.
 - [*Kinetic modeling and control of self-organizing systems*](#), KTMP 2016, 22-25/01, Stellenbosch, South Afrika.
 - [*Kinetic modeling and control of self-organizing systems*](#), WONAPDE 2016, 11-15/01, Concepcion, Chile.

- 2015 - *Invisible control of self-organizing agents leaving unknown environments*, 27th IFIP Conference on System Modelling and Optimization, 29/06-3/07, Sophia Antipolis, France.
 - *Uncertainty quantification in control problems for flocking models*, 26th Biennial Numerical Analysis Conference, 23-26/06, University of Strathclyde, Glasgow, UK.
- 2014 - *Boltzmann type control for consensus dynamic with leaders*, 13/09, 2014, CNR, Roma, Italy.
 - *Binary algorithm for the simulation of self-organized systems*, 07/07, 2014, SIMAI Conference, Taormina, Italy.
 - *Kinetic description of optimal control problems in consensus modeling*, 08/07, 2014, SIMAI Conference, Taormina, Italy.
 - *Asymptotic Preserving schemes for optimal control problem for hyperbolic relaxation system*, 08/07, 2014, SIMAI Conference, Taormina, Italy.
 - *Binary algorithm for the simulation of self-organized systems*, 07/04, MCQMC14, KU Leuven, Belgium
- 2013 - *Modeling self-organized systems numerical methods and interaction with few individuals*, 10/09, 2013, School on Mathematical Physics, INdAM, Ravello, SA, Italy
 - *AP schemes for optimal control problem for hyperbolic relaxation system*, 10/09, 2013, HyperBALLs, Indam GNCS Workshop, Milano, Italy
- 2012 - *Modeling self-organized systems interacting with few individuals: from microscopic to macroscopic dynamics*, poster session, 4/09, 2012, CRM, UAB, Barcelona, Spain
 - *Binary interaction algorithm for the simulations of swarming and flocking dynamics*, 2nd Young researcher meeting, BIOMAT 2012 Granada, Spain.
- 2011 - *Monte Carlo algorithms for the Boltzmann equation*, 26/10, 2011 Young Researcher Seminars, ICERM, Brown University, Providence RI, US.

--- Visiting presso istituti di ricerca

Long stays and affiliations at research institutes and universities

- 2022 Semester on “ Frontiers in kinetic theory: connecting microscopic to macroscopic scales - KineCon 2022”, INI for Mathematical Sciences - Cambridge, UK, (1 month)
- 2019 HIM Junior Trimester program: Kinetic Theory, 20/05-27/06, Hausdorff Research Institute Bonn, Germany. (1,25 months)
- 2018 Trimester on “Mathematical Biology” at Institut Mittag-Leffler, 10-28/10, Djursholm, Sweden. (15 days)
- 2016 HIM Trimester program: Mathematics of Signal Processing, 05/02-20/03, Hausdorff Research Institute, Bonn, Germany. (1 month)
- 2015 KAUST, 15/11-01/12, Jeddah, Saudi Arabia, contact person: Prof. P. A. Markowich, (17 days)
- 2014 Visiting researcher at IAC-CNR Roma, 01-15/09, Roma, Italy, person: Dr. E. Cristiani (15 days)

- 2011-2013 Visiting PhD student at RTWH Aachen, tutor: Prof. M. Herty (total: 3 months)
- 2012-2013 Visiting PhD student at Universitat Autònoma de Barcelona, tutor: Prof. J. A. Carrillo (total: 3 months)
- 2011 - Trimester on "Kinetic Theory and Computation", ICERM, Brown University, Providence, Rhode Island, US, Sep 7 - Dec 9, 2011 (1,25 months)

Supported participation in scientific events

- 2017 - School on Uncertainty Quantification for kinetic equations, GSSI, 10-12/04, L'Aquila, Italy.
- 2016 - Conference: Transport phenomena in collective dynamics: from micro to social hydrodynamics, 01-04/09, ETH Zurich, Swiss.
- Summer school: Complex networks: theory, methods and applications, 18-22/05, Lake Como School of Advanced Studies, Como, Italy.
- 2014 - Conference: NETGCOOP2014, International conference on Network Games, Control and Optimization, 29-31/10, Trento, Italy.
- Conference: "Collective Behavior: Macroscopic versus Kinetic Descriptions", 19-23/05, Imperial College London, UK.
- 2013 - XXXVII Summer School on Mathematical Physics, 14-28/09, Ravello, SA, Italy. (14 days)
- 12th Summer School on Scientific Visualization, 10-14/06, CINECA, Milano, Italy.
 - Mathematics for Planet Earth, Workshop INdAM, 27-29/05, Roma, Italy.
- 2012 - 15-16/11, "Dagli individui alla collettività: folle e sciame", CNR Roma, Italy.
- Applied Differential Equations in Physics, Biology and Social Sciences: Classical and Modern Perspectives, ESF Conference, CRM, UAB, 3 - 7/09, Barcelona, Spain.
 - School: Analysis, Modeling and Simulation of Collective Dynamics from Bacteria to Crowds, CISM, 9-13/07, Udine, Italy.
 - School: BIOMAT 2012, 2-6/07, Granada, Spain.
- 2011 - Workshop on Boltzmann Models in Kinetic Theory, ICERM, Brown University, 7 - 11/11, Providence RI, US.
- Workshop on Novel Applications of Kinetic Theory and Computations, ICERM, Brown University, Providence RI, US.
 - Spring School on Mathematical Fluid Dynamics, TU Darmstadt, 28/02 - 3/03, Germany.

Supervisione studenti, attività didattiche e ruoli amministrativi

Supervisione studenti

Dottorato

- 11/2020- Federica Ferrarese, University of Trento, PhD Thesis: '*Particles methods for kinetic equations in plasma physics, collective behaviors and optimization*.' 07/03/2024.
- 11/2018- Chiara Segala, University of Trento. PhD Thesis: '*Robust numerical control methods for mean-field collective dynamics*.' 30/06/2022.

Postdoc

- from 8/2024 Matteo Piu, University of Verona. Project: "*Efficient numerical schemes and optimal control methods for time-dependent partial differential equations*". PRIN 2022
- from 3/2024 Elisa Calzola, University of Verona. Project: "*Data-driven discovery and control of multi-scale interacting artificial agent systems*". PRIN PNRR 2022
- 11/2021- Elisa Calzola, University of Verona. Project: "*Innovative numerical methods for evolutionary partial differential equations and applications*". PRIN2017
- 4/2023
- 06/2020- Franco Zivcovich, University of Verona. Project: "*Innovative numerical methods for evolutionary partial differential equations and applications*". PRIN2017
- 06/2021

Tesi magistrali e triennali

- 2024 - Master thesis (LM-40), University of Verona: Kinetic modelling of opinion dynamics over social-network, student: A. Ambrosi.
- Master thesis (LM-40), University of Verona: Data-driven age-structure kinetic model for breast tumor, student: A. Bontempi.
- 2023 - Master thesis (LM-40), University of Verona: Kinetic Description of Neural Differential Equations, student: V. Flora.
- Master thesis (LM-40): Data-driven mean-field modeling for opinion dynamics in Twitter sentiment analysis, student: D. Prezioso.
 - Bachelor thesis (L-35), University of Verona: Dinamiche collettive in modelli predatore-predatore, student: F. Poma.
 - Bachelor thesis (L-35), University of Verona: Modelli epidemiologici con struttura di età per pandemia covid-19, student: V. Piccoli.
- 2022 - Master thesis (LM-40), University of Verona: Numerical schemes for time-delay models and applications to self-organizing systems, student: M. A. Savu.
- Bachelor thesis (L-35), University of Verona: Controllo e calibrazione di modelli epidemiologici per la trasmissione del virus SARA-Cov-2, student: S. Arcari.
 - Bachelor thesis (L-35), University of Verona: Modelli matematici per epidemie da bostrico in ecosistemi forestali, student: F. Marini.
- 2021 - Master thesis (LM-40), University of Verona: Supervised learning feedback laws for nonlinear large-scale dynamics, student: S. Bicego, Co-supervision: D. Kalise (Imperial College London).
- Master thesis (LM-40), University of Verona: Regularization Methods in Deep Learning: an Optimal Control Perspective, student: G. Tabarelli.
 - Master thesis (LM-40), University of Verona: Tracking the evolution of cancer cell populations through the mathematical lens of phenotype-structured equations, student: A. Sfilio. Co-supervision: T. Lorenzi (Politecnico di Torino).

- Master thesis (LM-40), University of Verona: Optimization methods in Machine Learning and applications to facial detection problems, student: R. Vencato.
- Master thesis (LM-40), University of Verona: Random Batch Methods for interacting particle systems and modern applications, student: M. Ambrosi
- Bachelor thesis (L-35), University of Verona: Modelli matematici per dinamiche socio-epidemiologiche, student: A. Marcazzan.
- 2020 - Master thesis (LM-40), University of Verona: Optimized leaders strategies in crowd dynamics, student: F. Corsini.
- Master thesis (LM-40), University of Verona: Stochastic algorithms for populations biology, student: F. Ferrarese.
- Bachelor thesis (L-35), University of Verona: Strategie di controllo e stima dei parametri per modelli epidemiologici applicati al COVID19, student: A. Mortaro.
- Bachelor thesis (L-35), University of Verona: Dinamiche di sincronizzazione in modelli Kuramoto: soglie critiche e metodi Runge-Kutta stocastici, student: P. Brunetto.
- 2019 - Master thesis (LM-40), University of Verona: Kinetic approximation of particle swarming optimization, student: F. Rubes.
- Master thesis (LM-40), University of Verona: On a system of nonlocal parabolic equations modelling evolutionary dynamics of healthy and cancer cell populations, student: C. Langella, Co-supervision: T. Lorenzi (Politecnico di Torino)
- Bachelor thesis (L-35), University of Verona: Schemi Chang-Cooper per equazioni Fokker-Planck non locali e applicazioni, student: G. Campagnari.
- Bachelor thesis (L-35), University of Verona: Modelli cinetici e problemi di controllo ottimo per le disuguaglianze economiche, student: M. Framba.
- Bachelor thesis (L-35), University of Verona: Metodi IMEX per problemi stiff e applicazioni, student: M. Ambrosi.
- Bachelor thesis (L-35), University of Verona: Dinamiche a due popolazioni per sistemi multi-agente e applicazioni alle scienze sociali e biologiche, student: S. Baltieri.
- 2018 - Master thesis (LM-40), University of Verona: Control and learning of interaction kernel in multi-agent systems, student: E. Frison.
- Bachelor thesis (L-35), University of Verona: Modelli matematici per lo studio delle mutazioni di Luria - Delbrück, student: A. Sfilio.
- Bachelor thesis (L-35), University of Verona: Metodi di shooting e applicazioni alla fisica, student: F. Ferrarese
- 2017 - Master thesis at TU München: Optimal planning for a traffic model on networks, student: M. Stachl.

Total: 14 Master thesis, 13 Bachelor thesis.

Attività didattica

- a.a. 24/25 - "Logistic Optimization" (SSD MATH-06/A) 12 hours/year in LM-77R (Supply Chain Management).
- "Calcolo Numerico I con laboratorio" (SSD MATH-05/A) 32 hours/year in L-35 (Matematica Applicata). ([coordinator](#))
 - "Foundation of Data Analysis", (SSD MATH-05/A) 52 hours/year in LM-40 (Mathematics), in LM-91 (Data Science), in LM-18 (Artificial Intelligence). ([coordinator](#))
 - "Metodi Matematici e Statistici in la Biologia", (SSD BIO/13) 24 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
 - "Advances in Numerical Analysis and Mathematical Modelling: Multi-agent interaction models, from control to learning across scales." (SSD MATH-05/A) 10 hours/year *PhD course at University of Trento*.
- Total** : 5 modules, 130 hours/year
- a.a. 23/24 - "Numerical methods for partial differential equations" (SSD MAT/08) 16 hours/year in LM-40 (Mathematics).
- "Calcolo Numerico I con laboratorio" (SSD MAT/08) 32 hours/year in L-35 (Matematica Applicata). ([coordinator](#))
 - "Numerical Modelling and Optimization", (SSD MAT/07) 28 hours/year in LM-40 (Mathematics). ([coordinator](#))
 - "Foundation of Data Analysis", (SSD MAT/08) 52 hours/year in LM-40 (Mathematics), in LM-91 (Data Science), in LM-18 (Artificial Intelligence). ([coordinator](#))
 - "Metodi Matematici e Statistici in la Biologia", (SSD BIO/13) 24 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
 - "Advances in Numerical Analysis and Mathematical Modelling: Multi-agent interaction models, from control to learning across scales." (SSD MAT/08) 15 hours/year *PhD course at University of Trento*.
- Total** : 6 modules, 167 hours/year
- a.a. 22/23 - "Numerical methods for partial differential equations" (SSD MAT/08) 12 hours/year in LM-40 (Mathematics).
- "Numerical Modelling and Optimization", (SSD MAT/07) 44 hours/year in in LM-40 (Mathematics). ([coordinator](#))
 - "Foundation of Data Analysis", (SSD MAT/08) 52 hours/year in LM-40 (Mathematics), in LM-91 (Data Science), in LM-18 (Artificial Intelligence). ([coordinator](#))
 - "Metodi Matematici e Statistici in la Biologia", (SSD BIO/13) 24 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
 - "Advances in Numerical Analysis and Mathematical Modelling: Multi-agent interaction models, from control to learning across scales." (SSD MAT/08) 15 hours/year *PhD course at University of Trento*.
- Total** : 5 modules, 147 hours/year
- a.a. 21/22 - "Numerical methods for partial differential equations" (SSD MAT/08) 12 hours/year in LM-40 (Mathematics).

- "Numerical Modelling and Optimization", (SSD MAT/07) 28 hours/year in LM-40 (Mathematics). ([coordinator](#))
- "Foundation of Data Analysis", (SSD MAT/08) 52 hours/year in LM-40 (Mathematics), in LM-91 (Data Science). ([coordinator](#))
- "Metodi Matematici e Statistici in la Biologia", (SSD BIO/13) 24 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
- Total** : 4 modules, 116 hours/year
- a.a. 20/21 - "Foundation of Data Analysis", (SSD MAT/08) 56 hours/year in LM-40 (Mathematics), in LM-91 (Data Science). ([coordinator](#))
- "Numerical Modelling and Optimization", (SSD MAT/07) 28 hours/year in LM-40 (Mathematics). ([coordinator](#))
- "Metodi Matematici e Statistici in la Biologia", (SSD BIO/13) 24 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
- Total** : 3 modules, 108 hours/year
- a.a. 19/20 - "Foundation of Data Analysis", (SSD MAT/08) 56 hours/year in LM-40 (Mathematics), in LM-91 (Data Science). ([coordinator](#))
- "Numerical Modelling and Optimization", (SSD MAT/07) 28 hours/year in LM-40 (Mathematics). ([coordinator](#))
- "Metodi Matematici e Statistici in la Biologia", (SSD BIO/13) 24 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
- Total** : 3 modules, 108 hours/year
- a.a. 18/19 - "Advanced Numerical Analysis II", (SSD MAT/08) 28 hours/year in LM-40 (Mathematics).
- "Metodi Matematici e Statistici in la Biologia", (SSD BIO/13) 24 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
- Responsible for: "Research Modelling Seminar", (SSD MAT/07) 8 hours/year in LM-40 (Mathematics). ([coordinator](#))
- Total** : 3 modules, 60 hours/year
- a.a. 17/18 - "Advanced Numerical Analysis II", (SSD MAT/08) 28 hours/year in LM-40 (Mathematics).
- "Calcolo Numerico I con laboratorio", (SSD MAT/08) 24 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
- Responsible for: "Research Modelling Seminar", (SSD MAT/07) 8 hours/year in LM-40 (Mathematics). ([coordinator](#))
- Total** : 3 modules, 60 hours/year
- a.a. 16/17 - "Calcolo Numerico I con laboratorio", (SSD MAT/08) 56 hours/year in L-M35 (Matematica Applicata). ([coordinator](#))
- Total** : 1 module, 56 hours/year

[Altre esperienze didattiche](#)

- 2015/16 Mentor and Assistant for: Traffic flow on networks, Haupt-Seminar for master students, TU München, web: www-m15.ma.tum.de/Allgemeines/TrafficFlow. Total: 20 hours.
- 2012/13 Assistant for: "Geometria", Engineer bachelor degree course, University of Ferrara. Responsible: Prof. Paltin Ionescu. Total: 20 hours.
- 2012/13 Assistant for: "Matematica Applicata", Architecture bachelor degree course, University of Ferrara. Teacher: Prof. Lorenzo Pareschi. Total: 60 hours.
- 2012/13 Assistant for: "Analisi II", Engineer bachelor degree course, University of Ferrara. Total: 30 hours.
- 2011/12 Assistant for: "Analisi II", Engineer bachelor degree course, University of Ferrara. Total: 30 hours.
- 2011/12 Assistant for: "Metodi e Modelli Numerici", Mathematics master degree course, University of Ferrara. Responsible: Prof. Lorenzo Pareschi. Total: 30 hours.
- 2011/13 Responsible for PLS project "Laboratorio sulle dinamiche socio-economiche", web: <https://laboratoriopls.wordpress.com/>. Total: 80 hours.

Ruoli istituzionali

- since 11/2021 "Delegato all'internazionalizzazione" for the Computer Science department.
- since 10/2021 Deputy Coordinator of the International Mobility for the Area of Science and Engineering, and member of the Erasmus+ selection committee.