Giacomo Albi

Curriculum Vitae

Ufficio: Strada Le Grazie 14, Ca Vignal 2
Verona, Italy 37134
✉ *giacomo.albi@univr.it*
www.giacomoalbi.com

Dati personali

Nato il	22/02/1985
Luogo	Zevio (VR), Italia
Cittadinanza	Italiana
Stato	Libero

Posizione attuale

March 2017-now — Ricercatore di Tipo A in MAT/08 at Department of Computer Science, University of Verona

Posizioni precedenti

May 2014-March 2017 — Postdoc presso la Technische Universität München, Fakultät für Mathematik

Education

2014 **Ph.D. in Matematica e Informatica**, *03/03/2014*, Universitá di Ferrara,
Tesi: Kinetic approximation, stability and control of collective behavior in self-organized systems.
Relatore: Prof. Lorenzo Pareschi.

2010 **Laurea specialistica in Matematica**, *18/02/2010*, Universitá di Padova,
Tesi: Law of large numbers and fluctuations for the random Curie-Weiss model, (Legge dei grandi numeri e fluttuazioni per il modello random Curie-Weiss).
Relatore: Prof. Paolo Dai Pra.

2007 **Laurea triennial in Matematica**, *19/09/2007*, Universitá di Trento,
Tesi: Finite-Difference method for pay-off options with discontinuous barrier, (Metodo alle differenze finite per opzioni pay-off a barriera discontinue).
Relatore: Prof. Aldo Tagliani.

2004 **Diploma di maturitá scientifica**, *Giugno 2004*, Liceo Scientifico A. Messedaglia, Verona.

Premi e riconoscimenti

2015 Premio per la *miglior tesi di dottorato per il XXVI ciclo* Universitá di Ferrara.

2014 Riconoscimento *Nicolò Copernico* per tesi di dottorato in scienze e tecnologia.

Interessi di ricerca

Il mio interesse di ricerca consiste principlamente nello sviluppo di metodi numerici per equazioni cinentiche e modelli iperbolici, in particolare per le applicazioni di controllo ottimo in modelli multi agente ad alta dimensionalitá e per sistemi iperbolici con rilassamento.

Un'altra linea di ricerca consiste nella modellizzazione e simulazione di modelli per la formazione di reti biologiche, descritti da un sistema accoppiato di due EDP di tipo ellittico e di reazione-diffusione. Nello specifico sono interessato nello studio di metodi numerici capaci di preservare la decrescita del energia del sistema.

Keywords Numerical analysis, Boltzmann equation, multi-agent systems, optimal control, Monte-Carlo methods, uncertainty quantification, mathematical modeling, hyperbolic systems, Asymptotic Preserving schemes, IMEX schemes.

Affiliazioni American Mathematical Society (AMS); Gruppo Nazionale Calcolo Scientifico, (GNCS-INdAM); Complex System group, (SisCo-SIMAI).

Pubblicazioni

Articoli in riviste con referaggio internazionale

Opinion dynamics over complex networks: kinetic modeling and numerical methods, G. Albi, L. Pareschi, M. Zanella, accepted in Kin. Rel. Med., pp. 31, 2016.

Biological transportation network: modeling and simulation, G. Albi, M. Artina, M. Fornasier, P. A. Markovich, Analysis and Applications, 14(01), pp. 185-206, 2016.

Invisible control of self-organizing agents leaving unknown environments, G. Albi, M. Bongini, E. Cristiani, D. Kalise, accepted in SIAM J. Appl. Math., pp. 25, 2015.

Uncertainty quantification in control problems for flocking models, G. Albi, L. Pareschi, M. Zanella, Mathematical Problems in Engineer, 2015.

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.

Boltzmann type control of opinion consensus through leaders, G. Albi, L. Pareschi, M. Zanella, Proc. of the Roy. Soc. A., 372(2028), 2014.

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.

Asymptotic Preserving time-discretization of optimal control problems for the Goldstein–Taylor model, G. Albi, M. Herty, C. Jörres, L. Pareschi, Num. Meth. for PDE, 30(6), 1770-1784, 2014.

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.

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.

Contributi su libri

Recent advances in opinion modeling: control and social influence., G. Albi, L. Pareschi, G. Toscani, M. Zanella, accepted in N. Bellomo, P. Degond, and E. Tadmor, editors, Active Particles Volume 1, Theory, Methods, and Applications. Birkhauser-Springer, 2016.

Discrete and Continuum Modeling of Biological Network Formation., G. Albi, M. Burger, J. Haskovec, P. A. Markowich, M. Schlottbom, accepted in N. Bellomo, P. Degond, and E. Tadmor, editors, Active Particles Volume 1, Theory, Methods, and Applications. Birkhauser-Springer, 2016.

Proceeding di conferenze internazionali

On the optimal control of opinion dynamics on evolving networks, G. Albi, L. Pareschi, M. Zanella, in IFIP TC7 2015 proceedings.

A Boltzmann approach to mean-field sparse feedback control, G. Albi, M. Fornasier, D. Kalise, accepted in proceedings of IFAC WC 2017.

Preprints

Mean field control hierarchy, G. Albi, Y-P. Choi, M. Fornasier, D. Kalise, preprint arXiv:1608.01728 (accepted), 2016.

Selective model-predictive control for flocking systems, G. Albi, L. Pareschi, preprint arXiv:1603.05012v2 (accepted), 2016.

Competenze tecnologiche

Standard C, C++, Python, Fortran, Freefem++, R, Html, Excel, Office.

Avanzato MATLAB, Mathematica, Maple, LaTeX.

Competenze linguistiche

Italiano **Madrelingua**

Inglese **Avanzato**

Tedesco **Intermedio**

Comunicazioni

Presentazioni su invito

2017 *Boltzmann-type control for consensus dynamics*, Inha University, 18/10/2017, Incheon, Corea del Sud.

Mean-field control hierarchy, LSIS, 12-15/03, Marsiglia, Francia.

2016 *Kinetic approximation and control of multi-agent systems*, 01/02, WWM Münster, Germania.

2015 *Kinetic approximation and control of multi-agent systems*, Numerical aspects of hyperbolic balance laws and related problems, 17-19/12, Ferrara, Italia.

Kinetic modeling and control of self-organizing systems, 02/12, KAUST, Thuwal, KSA.

Multi-scale modeling and control of self-organizing systems, IperGSSI, 16th Italian Meeting on Hyperbolic Equations, 22-25/10, L'Aquila, Italia.

AP and IMEX RK schemes for optimal control hyperbolic problems with relaxation, Numerics for Nonlinear PDEs, in Roma 3, 29-30/01, Roma, Italy.

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, Francia.

Modeling self-organized systems numerical methods and control dynamics, 29/01, KU Leuven, Belgio.

2013 *Modeling self-organized systems numerical methods and interaction with few individuals*, 10/09, 2013, RTWH, Aachen, Germania.

2012 *Modeling self-organized systems interacting with few individuals: from microscopic to macroscopic dynamics*, 12/12, 2012, CASA colloquium TU Eindhoven, Eindhoven, NL.

Presentazioni e poster

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, Italia.

Binary interaction approximation for mean-field optimal control problems, CMAM-7 2016, 01-05/08, Jyväskyla, Finlandia.

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, Cile.

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, Italia.

Binary algorithm for the simulation of self-organized systems, 07/07, 2014, SIMAI Conference, Taormina, Italia.

Kinetic description of optimal control problems in consensus modeling, 08/07, 2014, SIMAI Conference, Taormina, Italia.

Asymptotic Preserving schemes for optimal control problem for hyperbolic relaxation system, 08/07, 2014, SIMAI Conference, Taormina, Italia.

Binary algorithm for the simulation of self-organized systems, 07/04, MCQMC14, KU Leuven, Belgio

2013 *Modeling self-organized systems numerical methods and interaction with few individuals*, 10/09, 2013, School on Mathematical Physics, INdAM, Ravello, SA, Italia

AP schemes for optimal control problem for hyperbolic relaxation system, 10/09, 2013, HyperBAlls, Indam GNCS Workshop, Milano, Italia

2012 *Modeling self-organized systems interacting with few individuals: from microscopic to macroscopic dynamics*, poster session, 4/09, 2012, CRM, UAB, Barcelona, Spagna

Binary interaction algorithm for the simulations of swarming and flocking dynamics, 2^{nd} Young researcher meeting, BIOMAT 2012 Granada, Spagna.

2011 *Monte Carlo algorithms for the Boltzmann equation*, 26/10, 2011 Young Researcher Seminars, ICERM, Brown University, Providence RI, US.

Conferenze, Workshops e Scuole

2017 IperPV 2017, 06-09/09, Pavia, Italia.

AMMCS 2017, 20-25/08, Waterloo, Ontario, Canada.

Mean-field games and related topics, 21-23/06, Roma, Italy.

School on uncertainty quantification for kinetic equations, GSSI, 10-12/04, L'Aquila, Italy.

54th British Applied Mathematical Conference, University of Surrey, 10-12/04, Guildford, UK.

Mean-Field Days, LSIS, 12-15/03, Marseilles, France.

SIAM Conference on Computational Science and Engineering, 27/02-03/03, Atlanta, GA, US.

2016 Transport phenomena in collective dynamics: from micro to social hydrodynamics, 01-04/09, ETH Zurich, Swiss.

SIMAI Conference 2016, 07-09/09, Milano, Italy.

Computational Methods in Applied Mathematics (CMAM-7), 01-05/08, Jyväskyla, Finlandia.

HIM program: Mathematics of Signal Processing, 05/02-20/03, Hausdorff Research Institute, Bonn, Germania.

KTMP 2016, Kinetic Theory and Multiscale Phenomena: Modelling, Analysis, Computation and New Applications, 22 - 25/01, Stellenbosch, Cape Town, South Africa.

WONAPDE 2016 Fifth Chilean Workshop on Numerical Analysis of Partial Differential Equations, 11 - 15/01 Universidad de Concepción, Concepción, Chile. (Minisymposium organizer: *Recent developments in numerical methods for HJB and Multi-agent systems.)*

2015 Numerical aspects of hyperbolic balance laws and related problems, 17-19/12, Ferrara, Italia.

IperGSSI, 16th Italian Meeting on Hyperbolic Equations, 22-25/10, L'Aquila, Italia.

27th IFIP Conference on System Modelling and Optimization, 29/06-03/07, Sophia Antipolis, Francia.

26th Biennial Numerical Analysis Conference, 23-26/06, University of Strathclyde, Glasgow, UK.

Complex networks: theory, methods and applications, 18-22/05, Lake Como School of Advanced Studies, Como, Italia.

13th Viennese Workshop on Optimal Control and Games, 13-16/05,Vienna, Austria. (Minisymposium organizer: *Mean-field modeling and control of multi-agents systems.)*

Numerics for Nonlinear PDEs, 29-30/01,Roma 3, Roma, Italia.

2014 NETGCOOP2014, International conference on Network Games, Control and Optimization, 29-31/10, Trento, Italia.

Multiscale kinetic and fluid problems: asymptotic analysis, modelling and numerical simulation, 28/09-4/10, Cargèse (IESC), Corsica, Francia.

SIMAI Conference 2014, 07-12/07, Taormina, Italia.

Collective Behavior: Macroscopic versus Kinetic Descriptions, 19-23/05, Imperial College London, UK.

Monte Carlo & Quasi Monte Carlo methods, 2014, 07-11, KU Leuven, Belgio.

2013 XXXVII Summer School on Mathematical Physics, 14-28/09, Ravello, SA, Italia.

IperMiB, 15th Italian Meeting on Hyperbolic Equations, 10-13/09, Milano, Italia.

HyperBAlls, Indam GNCS Workshop, 09-10/09, Milano, Italia.

12th Summer School on Scientific Visualization,10-14/06, CINECA, Milano, Italia.

Mathematics for Planet Earth, Workshop INdAM, 27-29/05, Roma, Italia.

2012 15-16/11, 2012, Dagli individui alla collettività: folle e sciami, CNR Roma, Italia.

Applied Differential Equations in Physics, Biology and Social Sciences: Classical and Modern Perspectives, ESF Conference, CRM, UAB, 3 - 7/09, Barcelona, Spagna.

Analysis, Modeling and Simulation of Collective Dynamics from Bacteria to Crowds, CISM, 9-13/07, Udine, Italia.

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.

Workshop on Numerical aspects of hyperbolic balance laws and related problems, 3-4/04, Ferrara, Italia. Organizzatore locale.

Spring School on Mathematical Fluid Dynamics, TU Darmstadt, 28/02 - 3/03, Germania.

Partecipazione in progetti di ricerca

2014-2017 ERC-Starting Grant: *High-Dimensional Sparse Optimal Control*.
Responsabile: Prof. Massimo Fronasier.

2013 progetto GNCS:*Hyperbolic dominated multi-scale problems: numerical methods and applications*.
Responsabile: Dott. Matteo Semplice.

2012 5x1000 Young Researchers Grant, University of Ferrara:*Differential equations and collective behavior with applications to social, economics and natural sciences*.
Responsabile: Dott. Giacomo Albi.

2010-2012 progetto bilaterale Italia-Germania Vigoni: *Adjoint IMEX methods for the numerical solution to optimization problems*.
Responsabili: Prof. Michael Herty, Prof. Lorenzo Pareschi.

2011-2013 PRIN: *High-order numerical methods for systems of balance laws with sources in fluid-dynamics*.
Responsabile: Prof. Lorenzo Pareschi.

2011 FAR: *Metodi numerici e statistici avanzati per le applicazioni*.
Responsabile: Prof. Lorenzo Pareschi.

Attivitá didattica

2017 Docente per: "Calcolo Numerico I con Laboratorio", Università di Verona.
Totale: 56 ore.

2016 Relatore e mentore per: Traffic flow on networks, Haupt-Seminar per studenti di master, TU München, web: `www-m15.ma.tum.de/Allgemeines/TrafficFlow`.
Totale ore: 20 ore

2013 Tutor per: "Geometria", nel corso trienniale laurea in ingegneria, Universitá di Ferrara. Responsabile: Prof. Paltin Ionescu. web: `www.giacomoalbi.com/teaching/geometria/`.
Totale ore: 20 ore

2011-2013 Tutor per: "Matematica Applicata", nel corso trienniale laurea in Architettura, Universitá di Ferrara. Responsabile: Prof. Lorenzo Pareschi.
Totale ore: 60 ore

2011-2013 Tutor per: "Analisi II", nel corso trienniale laurea, Universitá di Ferrara. Responsabile: Prof. Michele Miranda. web: `www.giacomoalbi.com/teaching/analisi-ii/`.
Totale ore: 60 ore

2011-2012 Esercitatore (supporto alla didattica), laboratorio e esercizi per: "Metodi e Modelli Numerici", nel corso magistrale in Matematica, Universitá di Ferrara. Responsablie: Prof. Lorenzo Pareschi. web: www.giacomoalbi.com/teaching/metodi-e-modelli-numerici/.
Totale ore: 30 ore

2011-2013 Insegnamento per "Laboratorio sulle dinamiche socio-economiche", corso per il progetto lauree scientifiche, PLS project. web: https://laboratoriopls.wordpress.com/.
Totale ore: 80

Supervisione studenti

2016 Tesi magistrale: Optimal planning for a traffic model on networks, at TU Munchen, studente: Markus Stachl, status: ongoing.

2015-2017 Mentore di Juliane Sigl, presso International Research Training Group IGDK, web:http://igdk.eu/IGDK1754/Mentors