

Coordinatore GEV-02

Riccardo Zecchina



Curriculum vitae of Riccardo Zecchina

Born: May 6 1963, married, four children in the family

Professional address:

Professor Theoretical Physics,
Politecnico di Torino
Corso Duca Degli Abruzzi 24, 10129 Torino, Italy
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Education:

- Politecnico di Torino University, 1988 doctoral degree
- University of Torino, 1993 PhD in Theoretical Physics

Appointments:

2007- present, Full Professor in Theoretical Physics, Politecnico di Torino, Italy
2001-2007 Research Scientist, International Centre for Theoretical Physics (ICTP), Head of the Statistical Mechanics and Interdisciplinary Applications group
1999-2001 Assistant Research Scientist, ICTP
1997-1999, Tenure track, Condensed Matter Group, ICTP

Visiting positions:

2010-2011-2015 Visiting Researcher, Microsoft Research New England,
2007 Visiting Researcher, Microsoft Research Redmond, Theory Group
2001-02/ 2003-04, CNRS Visiting Researcher, Université Paris Sud, Lab. de Physique Theorique e Modeles Statistiques

Professional Activities:

- 2013 - ... European Research Council, Panel member for Advanced Grants
- 2013 - ... Member of Scientific Council of LENS Florence
- 2010 AERES (French evaluation agency for research and higher education), Evaluation Committee for the ENS, Paris
- 2011 - ... Head of Unit of Statistical Inference, Human Genetics Foundation
- 2011- 2013 coordinator of the international master's program in Physics of Complex Systems (Politecnico di Torino, SISSA, ICTP, Un. Paris VI, VII, XI and ENS Cachan)
- 2011 - ... Area Scientific Director, Journal of Statistical Mechanics JSTA
- 2010 - ... Fellow Collegio Carlo Alberto
- 2001-2005, Director of the joint ICTP/SISSA International Master's Program "Modeling and Simulations"

Distinctions: European Research Council (ERC) Advanced grantee, "*Optimization and inference algorithms from the theory of disordered systems*" 2011-2016; E. Kramer Prize, 2015, *for contributions in biophysics and biomathematics*, Academy of Science Milan.

Main Research Grants:

OPTINF, European Research Council Advanced Investigator Grant (2011-2016), Microsoft Research External Activities Research Grant, Principal Investigator, (2007-09), STIPCO European Training Network (2002-2005, INFN SISSA), EVERGROW European Community Integrated Project (03-06 ICTP), STAMINA European Community FET-grant STREP (2010-2013), NETADIS Marie Curie European Training Network (2012-2015), PRIN 2010, (Italian grant, Ministry for research), FIRB 2005, (Italian grant, Ministry for research)

Main collaborators: M. Mezard (ENS, Paris), N. Brunel (Un. Chicago), T. Regge (Turin), R. Monasson (ENS Paris), M. Marsili (ICTP Trieste), A. Braunstein (Turin), J. Chayes (MSR, New England), C. Borgs (MSR, New England), M. Weigt (Paris), F. Ricci-Tersenghi (Rome), G. Parisi (Rome), A. Ramezanzpour (Iran), C. Sander (MSKCC), P.P. Pandolfi (Harvard), E. Fraenkel (MIT), A. Pagnani (Turin), S. Franz (Paris), C. Baldassi (Turin)

PhD supervised: A. Braunstein, C. Baldassi, M. Leone, D. Battaglia, A. Ingrosso, L. Saglietti, F. Gerace, M. Kolar, S. Bradde, V. Napolano, J. Realpe-Gomez, O. Zagordi

Post-docs: F. Ricci-Tersenghi, P. Zhang, J. Berg, A. Barrat, C. Lucibello, C. Bosia, M. Bailly-Bechet, F. Altarelli, T. Gueudre, A. Ramezanzpour,

Research activity:

The research interests of Riccardo Zecchina (RZ) lie at the interface between statistical physics, computer science and computational biology. His current research activity is primarily focused on the understanding and the design of probabilistic sampling techniques, namely message passing algorithms (MPA), of different degree of complexity, with applications to inverse problems that arise in computational biology and computational neuroscience.

The work of RZ has been of both theoretical and algorithmic nature, ranging from exact solutions and rigorous proofs in statistical mechanics, to advanced analytical methods for random systems and to new algorithms for hard combinatorial and inference problems. RZ has authored more than 120 publications in international refereed journals, several book chapters and two patents.

Invited Lectures: RZ has been invited speakers at more than 70 international conferences, seminars and colloquia since 2001 (including statphys22 and three plenary talks). He has lectured in several international Schools (e.g. Les Houches (FR), Scuola Normale Superiore Pisa & SISSA (IT), Kings College and Oxford (UK)).

Editorial activity: Scientific Area Director of the Journal of Statistical Mechanics-Theory and Experiments (2011-); Member of the editorial board of Journal of Statistical Mechanics (2004-2011); Guest Editor, Theoretical Computer Science (2003).

Organization of International Conferences:

- Statistical Physics, Inference and Optimization, School & Workshop, Les Houches, 2012
- Statistical Physics and Computational Biology, International Workshops, Bardonecchia, 2011 and 2015

- DIMACS 08, Working group on message-passing algorithms, 2008
- Computational Aspects of Biological Information, Int. Conference, Seattle (2007)
- Programme Chair of the European Conference on Complex System 2008, Jerusalem
- Asian-Pacific School on Statistical Physics and Interdisciplinary Applications, Beijing 2006
- Latin-American School and Conference on: Statistical Physics and Interdisciplinary Applications, 2005 & 2015
- ICTP International Conferences and Schools: - Summer School on Statistical Physics and Probabilistic Methods in Computer Science, 1999 - Conference, NP-hardness and Phase transitions, 1999 - School on Neural Information Processing, 1999 - Workshop, Graph Theory and Statistical Physics, 2001 - School on Statistical Physics, Probability Theory and Computational Complexity, 2002 - Conference "Typical case complexity, randomness and analysis of search algorithms", 2002 - Conference on "Kolmogorov's Legacy in Physics: One Century of Chaos, Turbulence and Complexity", 2003 - School and Conference on Fundamental Aspects of Complexity, 2004 - School and Workshop on Structure and Function of Complex Networks, 2005 - School and Workshop on Theory and Technology in Quantum Information, Communication, Computation and Cryptography, 2006 - Conference and School on Modeling Elastic Manifolds: from Soft Condensed Matter to Biomolecules, 2006

Grant Reviewing: ERC, National Science Foundation (US), National Science Foundation (Israel), Agence Nationale de la Recherche (France).

Selected publications:

- *Weight space structure and internal representations: a direct approach to learning and generalization in multilayer neural networks*, R Monasson, R Zecchina, Physical review letters 75 (12), 2432 (1995)
- *Exact solution of the Ising model on group lattices of genus $g > 1$* , T Regge, R Zecchina, Journal of Mathematical Physics 37 (6), 2796-2814 (1996)
- *Entropy of the K-satisfiability problem*, R Monasson, R Zecchina, Physical Review Letters 76 (21), 3881 (1996)
- *Statistical mechanics of the random K-satisfiability model*, R Monasson, R Zecchina, Physical Review E 56 (2), 1357 (1997)
- *Determining computational complexity from characteristic 'phase transitions'*, R. Monasson, R. Zecchina, S. Kirkpatrick, B. Selman, L. Troyansky, Nature 400, 133 (1999)
- *Combinatorial and topological approach to the 3D Ising model*, T Regge, R Zecchina, Journal of Physics A: Mathematical and General 33 (4), 741 (2000)
- *Statistical Mechanics of systems with heterogeneous agents: Minority Games*, D. Challet, M. Marsili, R. Zecchina, Phys. Rev. Lett. 84, 1824 (2000)
- *Simplest random k-satisfiability problem*, F Ricci-Tersenghi, M Weigt, R Zecchina, Physical Review E 63 (2), 026702 (2001)
- *Exact solutions for diluted spin glasses and optimization problems*, S Franz, M Leone, F Ricci-Tersenghi, R Zecchina, Physical review letters 87 (12), 127209 (2001)
- *Random K-satisfiability: from an analytic solution to a new efficient algorithm*, M. Mezard, R. Zecchina, Phys.Rev. E 66, 056126 (2002)
- *Analytic and Algorithmic Solution of Random Satisfiability Problems*, M. Mezard, G. Parisi and R.

- Zecchina, Science 297, 812 (2002)
- *Coloring random graphs*, R Mulet, A Pagnani, M Weigt, R Zecchina, Physical review letters 89 (26), 268701 (2002)
 - *Survey Propagation: an algorithm for satisfiability*, A. Braunstein, M. Mezard and R. Zecchina, Random Structures and Algorithms 27, 201-226 (2005)
 - *Clustering of solutions in the random satisfiability problem*, M. Mézard, T. Mora, R. Zecchina, Phys.Rev.Lett. 94 (2005) 197205
 - *Two solutions to diluted p-spin models and XORSAT problems*, M Mézard, F Ricci-Tersenghi, R Zecchina, Journal of Statistical Physics 111 (3-4), 505-533 (2003)
 - *Learning by message passing in networks of discrete synapses*, Braunstein, A; Zecchina, R Physical Review Letters, 96, 030201 (2006)
 - *On the exactness of the cavity method for weighted b-matchings on arbitrary graphs and its relation to linear programs*, M Bayati, C Borgs, J Chayes, R Zecchina, Journal of Statistical Mechanics: Theory and Experiment 2008 (06), L06001 (2008)
 - *Protein 3D structure computed from evolutionary sequence variation*, DS Marks, LJ Colwell, R Sheridan, TA Hopf, A Pagnani, R Zecchina, C. Sander PloS one 6 (12), e28766 (2011)
 - *Subdominant dense clusters allow for simple learning and high computational performance in neural networks with discrete synapses*, C. Baldassi, A. Ingrosso, C. Lucibello, L. Saglietti, R. Zecchina, Phys. Rev. Lett. 2015