

# Marco Formentin, Curriculum Vitæ

## Contact Information:

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## Additional Information:

- *Language skills:* Italian (mother tongue), English (good)
- *Computer skills:* Fortran, L<sup>A</sup>T<sub>E</sub>X, Mathematica

## Academic Positions:

- **Present position:** Researcher (Ricercatore a tempo determinato tipo b) at the Dept. of Mathematics, University of Padova (Italy)
- **Past positions:**
- (June 2015 – Feb 2017) Senior Grant at the Dept. of Mathematics, University of Padova (Italy)
- (Oct 2014 – June 2015) Postdoc at the Czech Academy of Sciences (Czech Republic)
- (Feb 2014 – Sep 2014) Postdoc position at the Dept. of Physics, University of Padova (Italy)
- (Sep 2013 – Dec 2013) Postdoc position at the Czech Academy of Sciences (Czech Republic)
- (Jun 2011 – May 2013) Postdoc position at the Dept. of Physics, University of Padova (Italy)
- (Oct 2009 – May 2011) Postdoc position at the Faculty of Mathematics, University of Bochum (Germany)

## Education:

- (12 Nov 2009) Ph.D. in Mathematics – University of Padova. Advisors: Prof. Paolo Dai Pra and Prof. Dr. Christof Külske
- (16 Dec 2004) Laurea (Master’s degree) in Theoretical Physics – University of Padova. Advisor: Prof. Gianfranco Sartori

## Grants:

- (Feb 2017) Principal Investigator of the Indam – GNAMPA project *Collective behavior in interacting particle systems*
- (June 2015) *Senior grant awarded by the Dept. of Mathematics of the University of Padova (Italy):* a grant dedicated to the support of innovative and excellent research proposed by young scientists. Title of my project: “Mathematics of the living systems: criticality, network dynamics and optimization”
- (September 2013) Awarded the *ERCIM – Alain Bensoussan Fellowship* (renounced for family reasons)

## Others:

- (Venice 2018) Co-organizer of the Workshop *Stochastic Models in Ecology and Evolutionary Biology*
- (Amsterdam 2016) Co-organizer of the Conference in Complex Systems '16 satellite *Robustness, Adaptability and Critical Transition in Living Systems # 2*
- (Lucca 2014) Co-organizer of the European Conference in Complex Systems '14 satellite *Robustness, Adaptability and Critical Transition in Living Systems*
- Reviewer for *Entropy, Journal of Statistical Mechanics: Theory and Applications, Journal of Statistical Physics, PlosOne, Journal of Fixed Point Theory and Applications, Theoretical Population Biology, Journal of Applied Statistics, Acta Biotheoretica, ALEA – Latin American Journal of Probability and Mathematical Statistics, Scientific Reports*
- (2010 – 2011) *Scientific collaborator in the project Fluctuations and large deviations in non-equilibrium stochastic dynamics (German national project)*
- (2010 – 2011) *Scientific collaborator in the project Single particle operators with disorder of short range structure (German national project)*
- (2010 – 2013) *Research team member in the PRIN project Statistical Physics of Active Matter: Disentangling Complexity Patterns in Biological Systems (Italian national project)*
- (2014 – 2015) *Research team member in the project Threshold phenomena in stochastic systems (Czech Science Foundation)*
- (2017-present) *Member of the faculty board of the PhD school in Neurosciences, University of Padova*
- *Member of the GNAMPA*

**Research Interests and Publications:** My primary research topic is the understanding of systems made up of a large number of interacting agents and possible applications in complex systems ranging from ecology to human dynamics. Recent interests are 1) mechanisms for the emergence of collective periodic behavior 2) how the topology of the interaction network may influence the dynamics of such systems in the large volume limit 3) the role of disorder and noise in the stability of the equilibria 4) mathematical ecology: in particular mechanisms that enhance biodiversity 5) modeling and statistics for complex human dynamics.

*Keywords:* Complex Systems, Probability on Graphs, Random Dynamical Systems, Mathematical Models in Ecology, Complex Human Dynamics

Here, it is a list of my publications and preprints:

## Publications:

- 17 A. Tovo, S. Suweis, M. Formentin, M. Favretti, J. R. Banavar, S. Azaele, A. Maritan, *Upscaling Species Richness and Abundances in Tropical Forests*, Science Advances, Vol. 3, No.10, October 2017; DOI: 10.1126/sciadv.1701438
- 16 F. Collet, M. Formentin, D. Tovazzi, *Rhythmic behavior in a two-population mean field Ising model*, Physical Review E, Vol.94, No.4, 2016
- 15 A. Tovo, M. Formentin, M. Favretti, A. Maritan, *Application of optimal data-based binning method to spatial analysis of ecological datasets*, Spatial Statistics, Vol.16, Pages 137–151, May 2016
- 14 M. Formentin, J. M. Swart, *The limiting shape of a full mailbox*, ALEA, Lat. Am. J. Probab. Math. Stat. 13, 1151–1164, 2016

- 13 L. Andreis, D. Barbato, F. Collet, M. Formentin, L. Provenzano, *Strong existence and uniqueness of the stationary distribution for a stochastic inviscid dyadic model*, Nonlinearity, Vol.29, No.3, 2016
- 12 D. A. Kessler, S. Suweis, M. Formentin, N. M. Shnerb, *Neutral dynamics with environmental noise: age-size statistics and species lifetimes*, Physical Review E, Vol.92, No.2, 2015
- 11 M. Formentin, A. Lovison, A. Maritan, G. Zanzotto, *New activity patterns in human interactive dynamics*, Journal of Statistical Mechanics: Theory and Experiment, Vol.2015, No.9, 2015
- 10 F. Collet, P. Dai Pra, M. Formentin, *Collective periodicity in mean-field models of cooperative behavior*, Nonlinear Differential Equations and Applications (NoDEA) 06/2015; DOI:10.1007/s00030-015-0331-4, 2015
- 9 S. Zaoli, A. Giometto, M. Formentin, S. Azaele, A. Rinaldo, A. Maritan, *Phenomenological modeling of the motility of self-propelled microorganisms*, 2014. Available at <http://arxiv.org/abs/1407.1762>
- 8 A. Giometto, M. Formentin, A. Rinaldo, E. J. Cohen, A. Maritan, *Sample and population exponents of generalized Taylor's law*, PNAS June 23, 2015 Vol.112, No.25, pag. 7755-7760
- 7 M. Fischer, M. Formentin, C. Borile, P. Dai Pra, A. Maritan, *Time to absorption for a heterogeneous neutral competition model*, Journal of Statistical Physics, Vol.156, No.1, 2014
- 6 M. Formentin, A. Lovison, A. Maritan, G. Zanzotto, *Hidden scaling and universality in written human communication*, Physical Review E, Vol.90, No.1, 2014
- 5 M. Formentin, C. Külske, A. Reichenbachs, *Metastates in mean-field models with random external fields generated by Markov chains*, Journal of Statistical Physics, Vol. 46, No. 2, 2012
- 4 S.R. Fleurke, M. Formentin, C. Külske, *Dependent particle deposition on a graph: concentration properties of the height profile*, Markov Processes and Related Fields, Vol.17, No. 2, 187–208, 2011
- 3 M. Formentin, C. Külske, *A symmetric entropy bound on the non-reconstruction regime of Markov chains on Galton-Watson trees*, Electronic Communication in Probability, No.14, 587-596, 2009
- 2 M. Formentin, C. Külske, *On the Purity of the free boundary condition Potts measure on random trees*, Stochastic Processes and their Applications, Vol.119, No.9, 2992-3005, 2009
- 1 M. Formentin, *Two problems concerning interacting systems: 1. On the purity of the free boundary condition Potts measure on Galtson-Watson trees 2. Uniform propagation of chaos and fluctuation theorems in some spin-flip models*, Ph.D. Thesis, University of Padova, 2009

### Preprints:

- 2 R. Cerf, P. Dai Pra, M. Formentin, D. Tovazzi, *Collective periodic behavior in an Ising model with dissipation*, preprint, 2017
- 1 M. Formentin, S. Suweis, C. Tu, J. Grilli, A. Maritan, *Cooperative Voter model: a simple model for the role of symbiotic species interactions in biodiversity patterns*, preprint, 2017

### Research Visits:

- (May 2017) One-week stay at IHP Paris, within the activities of the trimester “Stochastics dynamics out of equilibrium”
- (Nov 2015) One-week stay at UTIA Prague, guest at the invitation of Prof. Jan Swart
- (Sep 2014) One-month visit at UTIA Prague, guest at the invitation of Prof. Jan Swart
- (Jun 2013) One-month visit at UTIA Prague, guest at the invitation of Prof. Jan Swart
- (Nov 2012) One-week stay at University of Paris-Diderot (France), guest of the Laboratoire de Probabilités et Modèles Aléatoires at the invitation of Prof. Giambattista Giacomin
- (Mar 2012) One-week stay at University of Bochum (Germany), guest of the Statistical Mechanics/Probability group at the invitation of Prof. Dr. Christof Külske

- (Jul 2008-Aug 2008) One-month stay at University of Groningen (The Netherlands), guest of the Statistical Mechanics/Probability group at the invitation of Prof. Dr. Christof Külske
- (Dec 2007-Mar 2008) Three-month stay at University of Groningen (The Netherlands), guest of the Statistical Mechanics/Probability group at the invitation of Prof. Dr. Christof Külske

### Presentations:

- (Jan 2018) **Invited** Talk at the conference “*Transformations and phase transitions*”, Ruhr-Universität, Bochum, Germany
- (April 2017) Poster at the conference “*Stochastic dynamics out of equilibrium*”, CIRM, Marseille, France
- (Nov 2016) **Invited** Talk at Dept. of Applied Mathematics, Delft University of Technology
- (Feb 2016) **Invited** Seminar in the “RoDeO” series, Department of Management, Ca’ Foscari, University of Venice
- (Jan 2015) Poster at the conference “*Statistical Physics Methods in Social and Economic Systems*”, Institut Henri Poincaré, Paris
- (Oct 2013) Talk at the UTIA, Prague
- (Feb 2013) Talk at the The Institute of Science and Technology, Wien
- (Nov 2012) **Invited** Seminar in the “*Modélisation Stochastique (Stochastic Modelling) series*”, Department of Mathematics, University of Paris 7
- (Aug 2012) Poster at the conference “*Interacting Particle Systems and Related Topics*”, Villa Finaly, Florence
- (Sep 2010) **Invited** Seminar at the SFB 12 meeting, Oggebbio
- (Jul 2009) **Invited** Talk at the “*International Summer School in Probability*”, University of Bologna
- (Jun 2009) **Invited** Talk at the University of Rome 3
- (Jan 2009) Talk at the workshop “*Stochastic models with many degrees of freedom: theory and Applications*”, University of Verona
- (Oct 2008) Seminar in the “*Seminario Dottorato (Graduate Seminar) series*”, Department of Mathematics, University of Padova (I). A brief note of this talk is available at [http://dottorato.math.unipd.it/sites/default/files/SemDott0809\\_note.pdf](http://dottorato.math.unipd.it/sites/default/files/SemDott0809_note.pdf)
- (Dec 2006) Talk in the “*Dynamical Seminars Series*”, University of Groningen

### Conferences and Schools:

- (Jan 2018) “*Transformations and phase transitions*”, (Bochum)
- (May 2017) “*A spring day in Probability and Statistical Mechanics*”, (Florence)
- (April 2017) “*Stochastic dynamics out of equilibrium*”, (Marseille)
- (Dec 2016) “*A guided tour through random media*”, (Eindhoven)
- (Sept 2016) “*Conference in Complex Systems '16*”, (Amsterdam)
- (May 2016) “*International Conference on Mathematical Neuroscience*”, (Antibes)
- (Oct 2015) “*Summer School in Stochastic Analysis with applications in Biology, Finance and Physics*”, (Levico Terme)
- (Sep 2015) “*Workshop: Living systems, from interaction patterns to critical behavior*”, (Venice)
- (Jan 2015) “*Statistical Physics Methods in Social and Economic Systems*”, (Institut Henri Poincaré, Paris)

- (Jan 2014) *"Inhomogeneous Random Systems"*, (Institut Henri Poincaré, Paris)
- (Aug 2012) *"Interacting Particle Systems and Related Topics"*, (Villa Finaly, Firenze)
- (Jun 2012) *"Disorder in Probability and Statistical Mechanics"*, (Complesso San Geminiano, Modena, Italy)
- (Dec 2010) ESF Research Conference: *"Combinatorics and Analysis in Spatial Probability"*, (EURANDOM, Eindhoven)
- (Mar 2010) YEP VII 2010 (Young European Probabilists): *"Probability, random trees and algorithms"*, (EURANDOM, Eindhoven)
- (Jul 2009) International Summer School in Probability, (University of Bologna)
- (Sep 2008) Fall School of the Institut Henri Poincaré: *"Random Media, Phase Transition and Information Theory"*, (Institut Poincaré, Paris)
- (Jun 2008) 3rd La Pietra Week in Probability: *"Stochastic Models in Physics"*, (Villa La Pietra, Florence)
- (Sep 2007) GNAMPA Summer School *"De Ludo Aleae"* on Probability, (University "La Sapienza", Rome)
- (Aug 2007) SMI Cortona Summer Course: *"Probability"*, ("il Palazzone", Scuola Normale Superiore, Cortona)
- (Jul 2007) *"Stochastic Processes: Theory and Applications"*, a conference in honor of the 65th birthday of Wolfgang J. Runggaldier, (Accademia Cusanus, Bressanone)
- (Jun 2007) Annual Meeting of the PRIN project: *"Percolation, Random Fields and Evolution of Stochastic Interacting Systems"*, (Dept. of Mathematics, University of Bologna)
- (Mar 2007) Spring School: *"Stochastic Models of Complex Processes"*, (University of Potsdam)

### Supervised Theses:

#### Bachelor Theses:

- (1) (*Bachelor*) Stefano Garlaschi (2016), *Ranked based Markov chains, self-organized criticality and applications* (in English)
- (2) (*Bachelor*) Philipp Schriever (2011), *Gibbs Measures and Phase Transitions on Trees* (in English)
- (3) (*Bachelor*) Katharina Günter (2011), *Electrical Networks and Recurrence/Transience of Symmetric Random Walk on Graphs* (in German)

#### Master Theses:

- (1) (*Master*) Paolo Longhin (2016), *Importance sampling for some ecological models* (in English)
- (2) (*Master*) Anna Tovo (2014), *Spatial aggregation in ecology: models and data analysis* (in English)

- (3) (*Master*) Silvia Zaoli (2014), *Phenomenological Modeling of the Motility of Self-Propelled Microorganisms* (in English) [jointly with Amos Maritan]

PhD Theses:

Currently supervising Samuele Stivanello, XXXIII ciclo.

Teaching:

- **Ph.D. Courses:**

- (1) (2017/2018) “*Basics in stochastic simulation*”, Department of Mathematics, University of Padova [in collaboration with P. Dai Pra]
- (2) (2017/2018) “*Stochastic processes*”, Department of Statistics, University of Padova
- (3) (Spring 2016) “*Complex systems through basic examples*”, Department of Physics, University of Padova [in collaboration with J. Hidalgo and S. Suweis]
- (4) (Spring 2014) “*Introduction to Probability on Graphs*”, Department of Physics, University of Padova [in collaboration with S. Suweis]

- **Courses and Recitations::**

- (1) (2017/2018) *Interaction Networks in Living Systems*, Corso interno della Scuola Galileiana, Università di Padova
- (2) (Winter Semester 2017/2018) *Statistica Matematica* per il Corso di Laurea in Matematica, Università di Padova
- (3) (Summer Semester 2017) *Probabilità e Statistica* per il Corso di Laurea in Informatica, Università di Padova
- (4) (Summer Semester 2010) *Interacting Stochastic Particle Systems*, Ruhr-Universität Bochum, Fakultät für Mathematik [jointly with Christof Külske]
- (5) (Winter Semester 2009) *Interacting Stochastic Particle Systems* Ruhr-Universität Bochum, Fakultät für Mathematik [jointly with Christof Külske]
- (6) (Summer Semester 2011) Recitations in *Mathematical Statistics I*, Ruhr-Universität Bochum, Fakultät für Mathematik
- (7) (Winter Semester 2010) Recitations in *Introduction to Probability and Mathematical Statistics*, Ruhr-Universität Bochum, Fakultät für Mathematik
- (8) (Summer Semester 2010) Recitations in *Algebra II*, Ruhr-Universität Bochum, Fakultät für Mathematik
- (9) (Winter Semester 2009) Recitations in *Introduction to Probability and Mathematical Statistics*, Ruhr-Universität Bochum, Fakultät für Mathematik [in collaboration with Christof Külske]

- (10) (Spring Trimester 2007) Recitations in *Probability and Statistics*, Department of Mathematics, University of Padova
- (11) (Spring Trimester 2006) Recitations in *Calculus 2*, Department of Physics, University of Padova

Academic Referees:

- Prof. Paolo Dai Pra,  
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🌐 <http://www.math.unipd.it/~daipra>
  
- Prof. Amos Maritan,  
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✉ [maritan@pd.infn.it](mailto:maritan@pd.infn.it),  
🌐 <http://www.padova.infm.it/sezioneb/peoplemaritan.htm>
  
- Prof. Dr. Christof Külske,  
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🌐 <http://www.ruhr-uni-bochum.de/ffm/Lehrstuehle/Kuelske>