

CURRICULUM VITAE OF PAOLO DAI PRA

Personal data

Born 1 November 1962 in Venezia, Italy. Citizenship: Italian.

Affiliation: Università di Verona, Dipartimento di Informatica

email: paolo.daipra@univr.it

Tel.: +390458027093

webpage: <http://www.di.univr.it/?ent=persona&id=11481>

Education and Training

- Master Degree in Mathematics cum laude, Università di Padova (1986)
- CNR scholarship at LADSEB Padova, advisor M. Pavon (1987-1988)
- Ph.D. in Mathematics, Rutgers University, advisor Prof. J.L. Lebowitz (1988-1992)

Academic Positions

- Full Professor of Mathematics, Università di Verona (2019-present)
- Full Professor of Mathematics, Università di Padova (2000-2019)
- Associate Professor of Mathematics, Politecnico di Milano (1998-2000)
- Assistant Professor of Mathematics, Università di Padova (1992-1998)

Visiting Positions

- Université de Poitiers (2015, 1 month)
- UST Lille (1998, 1 month)
- Rutgers University (1996, 6 months)

Grants

- PRIN 2015 “Research Projects of National Interest”, Italian Ministry of University. Project “ Large scale random structures”, responsible for the unit of Padova (2016-2019, 29100 Euros)
- Principal Investigators of the Grant ‘New challenges in reciprocal processes, Schroedinger bridges, optimal transport and their respective geometries with applications to control engineering problems for classical and quantum systems’, University of Padova (2015-16, 20742 Euros)
- PRIN “Research Projects of National Interest”, Italian Ministry of University (2003-09, 115,000 Euros total)

Main Recent Invited Talks and Courses

- Invited speaker at the “Stochastics Meeting Lunteren 2019”.
- Invited speaker at the Workshop “Phase Transitions and Particle Systems”, Berlin, 2019.
- Invited speaker at the Conference “Population Dynamics and Statistical Physics in Synergy II”, Pisa, 2019.
- Invited speaker at the “Institutskolloquium”, Institut für Mathematik, Universität Potsdam, 2018.
- Invited speaker at the seminar series “Kac Seminars”, Utrecht, 2018.

- Invited speaker at the “Workshop on Random Walks, Folding Transitions and related topics”, Firenze 2017.
- Invited speaker at the workshop “Self interacting processes”, Melbourne 2017.
- Invited lecturer of a mini course at the CIRM School “Stochastic Dynamics out of Equilibrium”, Marseille-Paris 2017
- Invited speaker at the seminar series “Hypatie”, Marseille 2015.
- Invited speaker at the meeting “Inhomogeneous random systems”, Paris 2014.
- Invited speaker at the workshop “Probabilistic Cellular Automata”, Eindhoven 2013.
- Invited speaker at the SIAM Annual Meeting, Minneapolis 2012.
- Invited speaker at the workshop “Discrete harmonic analysis”, Cambridge 2011.
- Invited lecturer of a mini course at the Spring School “Stochastic Models of Complex Processes”, Potsdam 2007.

Recent Scientific Organization Activity

- Co-organizer of the workshop “Random Polymers and Networks”, Porquerolles, 2020.
- Co-organizer of the Second Italian Meeting on Probability and Mathematical Statistics, Vietri sul Mare, 2019.
- Organizer of the workshop “Large Scale Random Structures”, Padova, 2018.
- Co-organizer of the workshop “Stochastic models in ecology and evolutionary biology”, Venezia, 2018.
- Co-organizer of the First Italian Meeting on Probability and Mathematical Statistics, Torino 2017.
- Co-organizer of the Summer School RTG1845 Berlin-Potsdam “Stochastic Analysis with applications to Biology, Finance and Physics”, Levico Terme 2015
- Co-organizer of the International Conference “Interacting Particle Systems”, Villa Finally, Firenze 2012
- Co-organizer of the XII Workshop on quantitative finance, Padova 2011

Editorial Activity

Member of the editorial board of

- Electronic Journal of Probability and Electronic Communications in Probability (2018-)
- Mathematics of Control, Signal and Systems (2003-2014)
- ISRN Probability and Statistics (2012-2014)
- La Matematica nella Società e nella Cultura (Journal of the Unione Matematica Italiana) (2007-2012)

Journal Refereeing

Annals of Probability, Annals of Applied Probability, Probability Theory and Related Fields, Annales de l’Institut Henri Poincaré, Journal of Statistical Physics, Stochastic Processes and their Applications.

Main Academic Organization Activities

- Presidente CCS Laurea Magistrale in “Data Science”, Università di Padova, 2019.

- Presidente Comitato Ordinatore Laurea Magistrale in “Data Science”, Università di Padova, 2017-2019.
- Presidente della Commissione Didattica dei Corsi di laurea in Matematica, Università di Padova, 2017-.
- Coordinatore della Scuola di Dottorato in Scienze Matematiche dell'Università di Padova, 2009-2014.
- Presidente della Commissione Risorse dell'Area Matematica nella Facoltà di Scienze MM FF NN, e rappresentante di Area nella Commissione Risorse e Programmazione della Facoltà di Scienze MM FF NN, 2003-2007.

Teaching activity

In my career I have been teaching a wide variety of courses, from basic probability to stochastic processes, mathematical statistics, mathematical analysis and mathematical physics. Here is the list of the courses I taught in the last five years:

- 2019/20:
 - Statistical learning (LM Mathematics)
 - Sistemi stocastici (LT Matematica Applicata)
 - Probabilità (LT Matematica Applicata)
- 2018/19:
 - Stochastic methods (LM Data Science)
 - Probabilità e statistica (LT Matematica)
 - Analytic and stochastic mathematical methods for engineering (LM Mathematical Engineering)
- 2017/18:
 - Stochastic methods (LM Data Science)
 - Calcolo delle Probabilità (LM Scienze Statistiche)
 - Statistica Matematica (LT Matematica)
 - Basics in stochastic simulations (Ph.D. Mathematical Sciences)
- 2016/17
 - Istituzioni di Probabilità (LT Statistica per l'Economia e le Scienze)
 - Analisi Stocastica (LM Matematica)
- 2015/16
 - Istituzioni di Probabilità (LT Statistica per l'Economia e le Scienze)
 - Analisi Stocastica (LM Matematica)
 - Mean field models, propagation of chaos and applications (Ph.D. in Mathematical Sciences)
- 2014/15
 - Istituzioni di Probabilità (LT Statistica per l'Economia e le Scienze)
 - Calcolo delle Probabilità (LT Matematica)

Former Ph.D. Students (with academic positions)

- Marco Formentin (Associate Professor, University of Padova)
- Francesca Collet (Assistant Professor, University of Padova)
- Elena Sartori (Assistant Professor, University of Padova)
- Giovanni Conforti (Assistant Professor, École Polytechnique, Paris)

- Pierre-Yves Louis (Associate Professor, AgroSup Dijon)
- Ida Minelli (Assistant Professor, University of L'Aquila)
- Marco Tolotti (Associate Professor, University of Venezia)

Research Interests

I have coauthored more than 60 papers on international journal, as Ann. of Probability, Prob. Theory and Related Fields, Comm. Pure Appl. Math., J. Funct. Analysis, SIAM J. Control Optimiz., Ann. Inst. H. Poincaré, Stoch. Processes and Appl., Electron. J. Probab., J. of Statistical Physics.

My research focuses on probability theory and its applications. My main research topics are:

1. Complex systems in Biological and social sciences.
2. Geometric and scaling properties of stochastic processes.
3. Convergence to equilibrium and functional inequalities for interacting particle systems.

Some of my key results include:

- A large deviation principle for disordered mean-field models
- A duality theorem connecting stochastic control problems and dynamic games
- First proof of the diffusive scaling of the spectral gap in zero-range processes
- A partial extension to jump process of the Bakry-Emery theory for diffusions
- Introduction of new families of dissipative mean field dynamics, and proof of their collective periodic behavior in some special cases.

Bibliometric Data (30-01-2020)

From Google Scholar:

- Citations 1333 (677 since 2015)
- h-index 20 (16 since 2015)
- i10-index 33 (23 since 2015)

From Scopus:

- N. papers last 10 years: 34
- N. citations last 15 years: 230
- h-index 15 years: 9

Published articles

- 1) Dai Pra, P., Formentin, M., & Pelino, G. (2020). Oscillatory behavior in a model of non-Markovian mean field interacting spins. *Journal of Statistical Physics*, 179(3), 690-712.
- 2) Dai Pra, P., Sartori, E., Tolotti, M.

Climb on the bandwagon: consensus and periodicity in a lifetime utility model with strategic interactions.

(2019) *Dyn. Games Appl.* 9, no. 4, pp. 1061–1075.

3) Dai Pra, P.

Stochastic mean-field dynamics and applications to life sciences.

(2019) *Stochastic dynamics out of equilibrium*, Springer Proc. Math. Stat., 282, Springer, Cham, pp. 3-27

4) Cecchin, A., Dai Pra, P., Fischer, M., Pelino, G.,

On the convergence problem in mean field games: a two state model without uniqueness

(2019) *SIAM J. Control Optim.* 57, no. 4, pp. 2443–2466

5) Dai Pra, P., Tovazzi, D

The dynamics of critical fluctuations in asymmetric Curie–Weiss models

(2019) *Stochastic Processes and their Applications*, 129 (3), pp. 1060-1095.

2) Crimaldi, I., Dai Pra, P., Louis, P.-Y., Minelli, I.G.

Synchronization and functional central limit theorems for interacting reinforced random walks

(2019) *Stochastic Processes and their Applications*, 129 (1), pp. 70-101.

3) Andreis, L., Asselah, A., Dai Pra, P.,

Ergodicity of a system of interacting random walks with asymmetric interaction

(2019) *Annales de l'institut Henri Poincaré (B) Probability and Statistics*, 55 (1), pp. 590-606.

4) Dai Pra, P., Sartori, E., Tolotti, M.,

Strategic interaction in interacting particle systems

(2018) *Probabilistic Cellular Automata*, *Emerg. Complex. Comput.*, 27, Springer, Cham, pp. 53-67.

5) Andreis, L., Dai Pra, P., Fischer, M.

McKean–Vlasov limit for interacting systems with simultaneous jumps

(2018) *Stochastic Analysis and Applications*, published online.

6) Conforti, G., Dai Pra, P., Røelly, S.

Reciprocal Class of Jump Processes

(2017) *Journal of Theoretical Probability*, 30 (2), pp. 551-580.

7) Andreis, L., Dai Pra, P., Fischer, M.

Simultaneous jumps in interacting particle systems: From neuronal networks to a general framework

(2017) *Springer INdAM Series*, 24, pp. 99-110.

- 8) Crimaldi, I., Dai Pra, P., Minelli, I.G.
Fluctuation theorems for synchronization of interacting Pólya's urns
(2016) Stochastic Processes and their Applications, 126 (3), pp. 930-947.
- 9) Collet, F., Dai Pra, P., Formentin, M.
Collective periodicity in mean-field models of cooperative behavior
(2015) Nonlinear Differential Equations and Applications, 22 (5), pp. 1461-1482.
- 10) Dai Pra, P., Pigato, P.
Multi-scaling of moments in stochastic volatility models
(2015) Stochastic Processes and their Applications, 125 (10), pp. 3725-3747.
- 11) Dai Pra, P., Scoppola, B., Scoppola, E.
Fast Mixing for the Low Temperature 2D Ising Model Through Irreversible Parallel Dynamics
(2015) Journal of Statistical Physics, 159 (1), pp. 1-20.
- 12) Dai Pra, P., Louis, P.-Y., Minelli, I.G.
Synchronization via interacting reinforcement
(2014) Journal of Applied Probability, 51 (2), pp. 556-568.
- 13) Borile, C., Dai Pra, P., Fischer, M., Formentin, M., Maritan, A.
Time to Absorption for a Heterogeneous Neutral Competition Model
(2014) Journal of Statistical Physics, 156 (1), pp. 119-130.
- 14) Dai Pra, P., Giacomini, G., Regoli, D.,
Noise-induced periodicity: some stochastic models for complex biological systems.
(2014) Mathematical models and methods for planet Earth, Springer INdAM Ser., 6, Springer, Cham, pp. 25-35.
- 15) Dai Pra, P., Pavon, M., Sahasrabudhe, N.
A Note on the Geometric Interpretation of Bell's Inequalities
(2013) Letters in Mathematical Physics, 103 (11), pp. 1165-1170.
- 16) Dai Pra, P., Sartori, E., Tolotti, M.
Strategic Interaction in Trend-Driven Dynamics
(2013) Journal of Statistical Physics, 152 (4), pp. 724-741.
- 17) Dai Pra, P., Fischer, M., Regoli, D.
A Curie-Weiss Model with Dissipation
(2013) Journal of Statistical Physics, 152 (1), pp. 37-53.
- 18) Dai Pra, P., Pavon, M., Sahasrabudhe, N.
A maximum entropy approach to the realizability of Spin correlation matrices
(2013) Entropy, 15 (6), pp. 2448-2463.

- 19) Dai Pra, P., Posta, G.
Entropy decay for interacting systems via the Bochner-Bakry-Émery approach
(2013) Electronic Journal of Probability, 18, (52), pp. 1-21.
- 20) Andreoli, A., Caravenna, F., Dai Pra, P., Posta, G.
Scaling and multiscaling in financial series: A simple model
(2012) Advances in Applied Probability, 44 (4), pp. 1018-1051.
- 21) Dai Pra, P., Scoppola, B., Scoppola, E.
Sampling from a Gibbs Measure with Pair Interaction by Means of PCA
(2012) Journal of Statistical Physics, 149 (4), pp. 722-737.
- 22) Collet, F., Dai Pra, P.
The role of disorder in the dynamics of critical fluctuations of mean field models
(2012) Electronic Journal of Probability, 17, (26), pp. 1-40.
- 23) Collet, F., Dai Pra, P., Sartori, E.
A simple mean field model for social interactions: Dynamics, fluctuations, criticality
(2010) Journal of Statistical Physics, 139 (5), pp. 820-858.
- 24) Dai Pra, P., Louis, P.-Y., Minelli, I.G.
Realizable monotonicity for continuous-time Markov processes
(2010) Stochastic Processes and their Applications, 120 (6), pp. 959-982.
- 25) Dai Pra, P., Tolotti, M.
Heterogeneous credit portfolios and the dynamics of the aggregate losses
(2009) Stochastic Processes and their Applications, 119 (9), pp. 2913-2944.
- 26) Caputo, P., Dai Pra, P., Posta, G.
Convex entropy decay via the Bochner-Bakry-Emery approach
(2009) Annales de l'institut Henri Poincaré (B) Probability and Statistics, 45 (3), pp. 734-753.
- 27) Dai Pra, P., Runggaldier, W.J., Sartori, E., Tolotti, M.
Large portfolio losses: A dynamic contagion model
(2009) Annals of Applied Probability, 19 (1), pp. 347-394.
- 28) Cattiaux, P., Dai Pra, P., Røelly, S.
A constructive approach to a class of ergodic hjb equations with unbounded and nonsmooth cost
(2008) SIAM Journal on Control and Optimization, 47 (5), pp. 2598-2615.
- 29) Chignola, R., Dai Pra, P., Morato, L.M., Siri, P.
Proliferation and death in a binary environment: A stochastic model of cellular ecosystems
(2006) Bulletin of Mathematical Biology, 68 (7), pp. 1661-1680.

- 30) Dai Pra, P., Minelli, I.
Stochastic attractors for non-ergodic Markov processes: Some examples
(2006) Stochastics and Dynamics, 6 (3), pp. 395-421.
- 31) Dai Pra, P., Louis, P.-Y., Minelli, I.
Monotonicity and complete monotonicity for continuous-time Markov chains
(2006) Comptes Rendus Mathematique, 342 (12), pp. 965-970.
- 32) Boudou, A.-S., Caputo, P., Dai Pra, P., Posta, G.
Spectral gap estimates for interacting particle systems via a Bochner-type identity
(2006) Journal of Functional Analysis, 232 (1), pp. 222-258.
- 33) Dai Pra, P., Posta, G.
Logarithmic Sobolev inequality for zero-range dynamics
(2005) Annals of Probability, 33 (6), pp. 2355-2401.
- 34) Dai Pra, P., Posta, G.
Logarithmic Sobolev inequality for zero-range dynamics: independence of the number of particles
(2005) Electronic Journal of Probability, 10, (15), pp. 525-576.
- 35) Asselah, A., Dai Pra, P.
Hitting times for special patterns in the symmetric exclusion process on $\mathbb{Z}^d$
(2004) Annals of Probability, 32 (4), pp. 3301-3323.
- 36) Dai Pra, P., Roelly, S.
An existence result for infinite-dimensional Brownian diffusions with non-regular and non-Markovian drift
(2004) Markov Processes and Related Fields, 10, (1), pp. 113-136.
- 37) Dai Pra, P., Runggaldier, W.J., Tolotti, M.
Pathwise Optimality for Benchmark Tracking
(2004) IEEE Transactions on Automatic Control, 49 (3), pp. 386-395.
- 38) Colombo, G., Dai Pra, P., Krivan, V., Vrkoč, I.
Stochastic processes for bounded noise
(2003) Mathematics of Control, Signals, and Systems, 16 (2-3), pp. 95-119.
- 39) Dai Pra, P., Paganoni, A.M., Posta, G.
Entropy inequalities for unbounded spin systems
(2002) Annals of Probability, 30 (4), pp. 1959-1976.
- 40) Dai Pra, P., Louis, P.-Y., Roelly, S.
Stationary measures and phase transition for a class of probabilistic cellular automata
(2002) ESAIM - Probability and Statistics, 6, pp. 89-104.

- 41) Dai Pra, P., Roelly, S., Zessin, H.
A Gibbs variational principle in space-time for infinite-dimensional diffusions
(2002) Probability Theory and Related Fields, 122 (2), pp. 289-315.
- 42) Dai Pra, P., Di Masi, G.B., Trivellato, B.
Pathwise optimality in stochastic control
(2001) SIAM Journal on Control and Optimization, 39 (5), pp. 1540-1557.
- 43) Asselah, A., Dai Pra, P.
Quasi-stationary measures for conservative dynamics in the infinite lattice
(2001) Annals of Probability, 29 (4), pp. 1733-1754.
- 44) Asselah, A., Dai Pra, P., Lebowitz, J.L., Mounaix, Ph.
Diffusion effects on the breakdown of a linear amplifier model driven by the square of a Gaussian field
(2001) Journal of Statistical Physics, 104 (5-6), pp. 1299-1315.
- 45) Colombo, G., Dai Pra, P.
A class of piecewise deterministic Markov processes
(2001) Markov Processes and Related Fields, 7, (2), pp. 251-287.
- 46) Albertini, F., Dai Pra, P., Prior, C.
Small parameter limit for ergodic, discrete-time, partially observed, risk-sensitive control problems
(2001) Mathematics of Control, Signals, and Systems, 14 (1), pp. 1-28.
- 47) Asselah, A., Dai Pra, P.
First occurrence time of a large density fluctuation for a system of independent random walks
(2000) Annales de l'institut Henri Poincaré (B) Probability and Statistics, 36 (3), pp. 367-393.
- 48) Albertini, F., Dai Pra, P.
Small parameter limit for discrete-time partially observed risk-sensitive control problems
(1999) SIAM Journal on Control and Optimization, 37 (1), pp. 1-32.
- 49) Dai Pra, P., Di Masi, G.B., Trivellato, B.
Almost sure optimality and optimality in probability for stochastic control problems over an infinite time horizon
(1999) Annals of Operations Research, 88, pp. 161-171.
- 50) Dai Pra, P., Meneghini, L., Runggaldier, W.J.
Explicit solutions for multivariate, discrete-time control problems under uncertainty
(1998) Systems and Control Letters, 34 (4), pp. 169-176.

- 51) Asselah, A., Dai Pra, P.
Sharp estimates for the occurrence time of rare events for symmetric simple exclusion
(1997) Stochastic Processes and their Applications, 71 (2), pp. 259-273.
- 52) Dai Pra, P., Rudari, C.
Large deviation limit for discrete-time, totally observed stochastic control problems with multiplicative cost
(1997) Applied Mathematics and Optimization, 35 (2), pp. 221-235.
- 53) Asselah, A., Dai Pra, P.
Occurrence of rare events in ergodic interacting spin systems
(1997) Annales de l'institut Henri Poincaré (B) Probability and Statistics, 33 (6), pp. 727-751.
- 54) Dai Pra, P., Runggaldier, W. J., Rudari, C.
On dynamic programming for sequential decision problems under a general form of uncertainty
(1997) ZOR. Zeitschrift für Operations-Research, 45 (1), pp. 81-107.
- 55) Dai Pra, P., Rudari, C.,
Risk sensitive control and dynamic games: the discrete-time case.
(1996) System modelling and optimization (Prague, 1995), Chapman & Hall, London, pp. 163-170.
- 56) Dai Pra, P., Den Hollander, F.
McKean-Vlasov limit for interacting random processes in random media
(1996) Journal of Statistical Physics, 84 (3-4), pp. 735-772.
- 57) Albertini, F., Dai Pra, P.
Recurrent neural networks coupled with linear systems: Observability in continuous and discrete time
(1996) Systems and Control Letters, 27 (2), pp. 109-116.
- 58) Dai Pra, P., Meneghini, L., Runggaldier, W.J.,
Connections between stochastic control and dynamic games
(1996) Mathematics of Control, Signals, and Systems, 9 (4), pp. 303-326.
- 59) Albertini, F., Dai Pra, P.
Forward accessibility for recurrent neural networks
(1995) IEEE Trans. Automat. Control, 40, (11), pp. 1962-1968.
- 60) Dai Pra, P.
A minimum entropy problem for stationary reversible stochastic spin systems on the infinite lattice
(1994) Rend. Sem. Mat. Univ. Padova, 92, pp. 179-194.

- 61) Dai Pra, P.
Detecting nonergodicity in continuous-time spin systems
(1994) Journal of Statistical Physics, 76 (5-6), pp. 1247-1265.
- 62) Dai Pra, P.
Large deviations and stationary measures for interacting particle systems
(1993) Stochastic Processes and their Applications, 48 (1), pp. 9-30.
- 63) Dai Pra, P.
Space-time Large Deviations for interacting particle systems.
(1993) Comm. Pure Appl. Math., 46 (3), pp. 387-422
- 64) Dai Pra, P.
A stochastic control approach to reciprocal diffusion processes
(1991) Applied Mathematics & Optimization, 23 (1), pp. 313-329.
- 65) Dai Pra, P., Pavon, M.
On the Markov Processes of Schrodinger, the Feynman-Kac formula and stochastic control.
(1990) Realization and modelling in system theory (Amsterdam 1989), Progr. Systems Control Theory, 3, Birkhauser Boston, Boston, pp. 497-504
- 66) Dai Pra, P., Pavon, M.
A rigorous Onsager-Machlup formulation of nonequilibrium thermodynamics.
(1989) Applications of mathematics in industry and technology (Siena, 1988), Teubner, Stuttgart, pp. 219-228
- 67) Dai Pra, P., Pavon, M.
Variational path-integral representations for the density of a diffusion process
(1989) Stochastics Stochastics Rep., 26, (4), pp. 205-226.
- 68) Dai Pra, P.
A general approximation method for discrete-time nonlinear filtering problems
(1988) Boll. Un. Mat. Ital. B (7) 2, (4), pp. 831-858.

Book

Caravenna, F., Dai Pra, P.,
Probabilità: un'introduzione attraverso modelli e applicazioni
(2013) Springer Unitext, Springer-Verlag, Milano.

September 4, 2020

Paolo Dai Pra