

# CV

## Personal Data

Name Pietro Caputo  
Address Dip. Matematica, Università di Roma Tre  
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Date and place of birth January 14, 1972  
Milano, Italy  
Nationality Italian

## Education

1991–1996 Physics studies at the University of Rome, “La Sapienza”  
*Laurea* degree in Physics.  
1997–1999 PhD studies at the Technical University, Berlin (Germany)  
within the DFG–Graduiertenkolleg Stochastic Processes  
and Probabilistic Analysis.

## Academic positions

Jan. 2000 – July 2000 Postdoctoral fellowship at Technion,  
Israel institute of technology, Haifa, Israel.  
Sept. 2000 – Dec. 2003 Research fellowship at Roma Tre University, Rome, Italy.  
Jan. 2004 – Jan. 2011 Ricercatore (tenured position), Roma Tre University,  
Aug. 2005 – Dec. 2005 Visiting Assistant Professor  
at the Georgia Institute of Technology, Atlanta, GA – USA.  
July 2008 – July 2009 Visiting Associate Professor  
at the University of California, Los Angeles (UCLA), CA – USA.  
Jan. 2011 – August 2016 Associate Professor of Mathematics, Roma Tre University.  
Sept. 2016 – today Full Professor of Mathematics, Roma Tre University.  
Aug. 2022 – Dec. 2022 Miller visiting Professor at UC Berkeley, CA – USA.

## Research Interests

*Probability Theory, Statistical physics.* Main topics include:  
Spin systems: Gibbs measures, large deviations.  
Interface models: Equilibrium fluctuations and stochastic dynamics.  
Random media: Random graphs, random walks in random environment, random matrices.  
Mixing time for Markov chain Monte Carlo algorithms. Functional inequalities.

## Languages

Italian (mother tongue), French (fluent),  
English (fluent), German (good)

## Teaching

1997–1999 2005	Undergraduate lower division teaching at the TU–Berlin Graduate and undergraduate Probability and Statistics at the Georgia Institute of Technology.
2008-09	Graduate and undergraduate Probability classes at UCLA.
2022-present	Master level teaching programs at AIMS, Ghana.
2000–present	Undergraduate courses at Università Roma Tre: <ul style="list-style-type: none"><li>- Multivariate calculus</li><li>- Probability Theory</li><li>- Introduction to Stochastic Simulation</li></ul> Graduate courses at Università Roma Tre: <ul style="list-style-type: none"><li>- Brownian motion and stochastic differential equations.</li><li>- Markov chains and mixing times</li></ul>

## Main conferences

Oct. 1997	Workshop on large deviations, Bielefeld, Germany
Oct. 2001	Hydrodynamic Limits. Institut Henri Poincaré, Paris, France
July 2002	Stochastic Analysis on Large Interacting Systems, Tokyo, Japan
Sept. 2002	Dynamical Systems: classical, quantum, stochastic Otranto, Italy
Jan. 2003	Inhomogeneous Random Systems, Cergy–Pontoise, Paris, France
Aug. 2004	Large scale structures, Oberwolfach, Germany
Jan. 2005	Probability, Algorithms and Statistical Physics, MSRI Berkeley, CA, USA
July 2006	Asymptotic Geometric Analysis and Applications, Institut Henri Poincaré, Paris, France
July 2006	Stochastic Processes and Applications, SPA 2006, Paris, France
June 2007	Percolation, random fields and evolution of stochastic interacting systems, Bologna, Italy
Sept. 2007	Large scale stochastic interacting systems, Oberwolfach, Germany
Nov. 2007	Particle systems, nonlinear diffusions, and equilibration. Hausdorff Institute, Bonn, Germany
Dec. 2008	Southern California Probability Symposium, UCLA, Los Angeles, USA
July 2009	Stochastic Processes and Applications, SPA 2009, Berlin, Germany
April 2010	Hypathie conference. Marseille, France
May 2010	Random walks in random environment. CIRM, Marseille, France
Jan. 2011	Functional inequalities and discrete spaces. Paris, France
June 2011	La Pietra Probability week. Firenze, Italy
Oct. 2011	FOCS 2011. Palm Springs, CA - USA
March 2012	PDE and Probability at ICOR 2012. Havana, Cuba
June 2012	Phenomena in high dimensions. Roscoff, France
August 2012	Interacting particle systems. Firenze, Italy
Sept 2013	Real analysis in computer science. Simons Institute, Berkeley, CA - USA.
March 2014	Talking across fields. Conference in honour of P. Diaconis. Toulouse, France

Sept 2014: Statistical Mechanics, Quantum Physics and PDEs, La Spezia, Italy

Dec 2014: When Dominique Bakry is sixty, Toulouse, France

Jan 2015: Random Matrices and Their Applications Workshop, Hong Kong

March 2015: Kolmogorov meets Turing I, a workshop on probabilistic methods, Roma, Italy

Apr. 2015: PhD school IMPA, Rio de Janeiro, Brasil.

Aug. 2015: Mostly Markov Mixing, PhD school and workshop at the Technion, Haifa - Israel.

Jan 2016: Inhomogeneous Random Systems, Institut H. Poincaré , Paris.

Feb 2016: Approximate Counting, Markov chains and Phase Transitions, Simons Institute, Berkeley, CA - USA

May 2016: Kolmogorov meets Turing III, Roma, Italy

June 2016: School and Workshop on Random Interacting Systems, Bath, UK

July 2016: Universality, Scaling Limits and Effective Theories, Rome, Italy

Sept. 2016: Interactions between PDE and functional inequalities, Mittag-Leffler Institute, Stockholm, Sweden

Nov. 2016: Large scale structures, Oberwolfach, Germany

Dec. 2016: XIV Latin American Congress of Probability and Mathematical Statistics (CLAPEM). San Jose, Costa Rica

Apr. 2017: PDEs and Probability, C.I.R.M. Marseille, France

May 2017: One-day workshop on Large scale random structures Roma Tre, Roma, Italy.

June 5-9, 2017: Statistical Mechanics, random planar geometry, and interacting random walks. Lyon, France.

July 23-28 2017: SPA conference, Moscow, Russia.  
Random Graphs and Random Matrices session organizer.

Aug. 1-10 2017: Escola Brasileira de Probabilidade, IMPA Rio de Janeiro, Brasil.

Sept. 4-8 2017: Eurandom PhD school YEP, Eindhoven, The Netherlands.

Dec. 2017: Kolmogorov meets Turing IV  
Workshop at Roma Tre University, Italy

Jan. 28-Feb. 3 2018: Strongly correlated systems, Oberwolfach, Germany.

Apr 17, 2018: Random graphs workshop at King's College, London, UK.

May 4, 2018: Mark Kac seminar, Utrecht, NL.

May 14-17, 2018: Markov mixing and algorithms, Georgia Tech, Atlanta, USA.

Sept. 2018: Large scale random structures, Oberwolfach, Germany.

March 6-9, 2019: Interacting particle systems conference in honour of Tom Liggett, IPAM-UCLA, Los Angeles, CA - USA.

July 2019: Large scale random structures, PRIN meeting, Milano Bicocca, Italy.

Sept. 2019: Large scale stochastic dynamics, Oberwolfach, Germany.

Jan. 2020: Random matrices and graphs, CIRM meeting, Marseille, France.

Sept. 2020: Random polymers and networks, Porquerolles, France.

June 2021: The Networks 2021 Conference, Amsterdam (online).

Jan 2022: AIMS, Ghana.

August 2022. Summer school, UC Santa Barbara, CA - USA.

Sept. 2022: Large scale random structures, Oberwolfach, Germany

Jan. 2023: AIMS, Ghana.  
April 2023: British Mathematical Colloquium, Bath, UK.  
June 2023: Probability Encounters Toulouse, FR.  
February 2024: AIMS Ghana

### Editorial activity

*Associate editor* of the Journal of Functional Analysis (2020–today), Probability Theory and Related Fields (2021–today) Annales de l’Institut Henri Poincaré (2012–2021), Annales Mathématiques Blaise Pascal (2013–today), ALEA, Latin American Probability Journal (2018–today).

*Referee reviewer* for several journals including: Duke Math. Journal, Probability theory and related fields, Annals of probability, Annales de l’Institut Henri Poincaré, Communications in mathematical physics, Annals of applied probability, Journal of theoretical probability, Stochastic processes and applications, Journal of statistical physics.

### Published papers

1. **PC**, J.D. Deuschel, *Large deviations and variational principle for harmonic crystals*, Commun. Math. Phys. **209**, 595–632, 2000
2. **PC**, Y. Velenik, *A note on wetting transition for gradient fields*, Stoch. Proc. Appl. **87**, 107–113, 2000
3. **PC**, J.D. Deuschel, *Critical large deviations in harmonic crystals with long range interactions*, Ann. Probab. **29**, 242–287, 2001
4. **PC**, F. Martinelli, *Asymmetric diffusion and the energy gap above the 111 ground state of the quantum XXZ models*, Commun. Math. Phys. **226**, 323–375, 2002
5. **PC**, D. Ioffe, *Finite volume approximations of the effective diffusion matrix: The case of independent bond disorder*, Ann. Inst. Henri Poincaré (Probab. & Stat.) **39**, No. 3, 505–525, 2003
6. **PC**, F. Martinelli, *Relaxation time of anisotropic simple exclusion processes and quantum Heisenberg models*, Ann. Appl. Probab. **13**, No. 2, 691–721, 2003
7. **PC**, *Uniform Poincaré inequalities for unbounded conservative spin systems: The non-interacting case*, Stoch. Proc. Appl. **106**, No. 2, 223–244, 2003
8. **PC**, *Spectral gap inequalities in product spaces with conservation laws*, in: T. Funaki and H. Osada (eds.) Adv. Studies in Pure Math. Japan 2004
9. **PC**, *Energy gap estimates in XXZ ferromagnets and stochastic particle systems*, Markov Processes and Related Fields **11**, 189–210, 2005
10. A.S. Boudou, **PC**, P. Dai Pra, G. Posta, *Spectral gap inequalities for interacting particle systems via a Bochner type inequality*, Journal of Funct. Analysis **232**, 222–258, 2006
11. **PC**, F. Martinelli, *Phase ordering after a deep quench: The stochastic Ising and hard-core gas models on a tree*, Probability Theory and Related Fields **136**, 37–80, 2006

12. N. Cancrini, **PC**, F. Martinelli, *Relaxation time for  $L$ -reversal processes and other chromosome shuffles*, Annals of Applied Probab. **16**, 1506-1527, 2006
13. **PC**, G. Posta, *Entropy dissipation estimates in a zero-range dynamics*, Probability Theory and Related Fields, **139**, 65-87, 2007
14. N. Bhatnagar, **PC**, P. Tetali, E. Vigoda, *Analysis of Top-Swap Shuffling for Genome Rearrangements*, Annals of Applied Probability, **17**, 1424-1445, 2007
15. **PC**, A. Faggionato, *Isoperimetric inequalities and mixing time for a random walk on a random point process*, Annals of Applied Probability, **17**, 1707-1744, 2007
16. **PC**, F. Martinelli and F.L. Toninelli, *On the approach to equilibrium for a polymer with adsorption and repulsion*, Electronic Journal of Probability **13**, 213-258, 2008
17. **PC**, *On the spectral gap of the Kac walk and other binary collision processes*, ALEA - Latin American Journal of Probability and Mathematical Statistics **6**, 2008.
18. **PC**, P. Dai Pra, G. Posta, *Convex entropy decay via the Bochner–Bakry–Emery approach*, Ann. Inst. Henri Poincaré, Probab. & Stat. **45**, 734-753, 2009.
19. **PC**, A. Faggionato, *Diffusivity in one-dimensional generalized Mott variable-range hopping models*, Annals of Applied Probability **10**, 1459-1494, 2009.
20. **PC**, A. Faggionato, A. Gaudilliere, *Recurrence and transience for long-range reversible random walks on a random point process*. Electronic Journal of Probability **14**, 2580-2616, 2009.
21. **PC**, F. Martinelli and F.L. Toninelli, *Convergence to equilibrium of biased plane partitions*, Random Structures & Algorithms **39**, 831-851, 2011
22. C. Bordenave, **PC**, D. Chafai, *Spectrum of large random reversible Markov chains: two examples*, ALEA – Latin American Journal of Probability and Math. Stat. **6**, 2010
23. **PC**, T.M. Liggett and T. Richthammer, *Proof of Aldous’ spectral gap conjecture*, Journal of the American Mathematical Society **23**, 831-851, 2010
24. C. Bordenave, **PC**, D. Chafai, *Spectrum of large random reversible Markov chains: Heavy-tailed weights on the complete graph*, Annals of Probability **39**, 1544-1590, 2011
25. **PC**, F. Martinelli, F. Simenhaus, and F.L. Toninelli, *“Zero” temperature stochastic 3D Ising model and dimer covering fluctuations: a first step towards interface mean curvature motion*, Communications in Pure and Applied Math. **64**, 778-831, 2011
26. C. Bordenave, **PC**, D. Chafai, *Circular law theorem for random Markov matrices*, Probability Theory and Related Fields **152**, 751-779, 2012
27. **PC**, H. Lacoin, F. Martinelli, F. Simenhaus, F.L. Toninelli, *Polymer dynamics in the depinned phase: metastability with logarithmic barriers*, Probability Theory and Related Fields **153**, 587-641, 2012
28. C. Bordenave, **PC**, D. Chafai, *Spectrum of non-Hermitian heavy tailed random matrices*, Communications in Mathematical Physics **307**, 513-560, 2011
29. **PC**, F. Martinelli, and F.L. Toninelli, *Mixing times of monotone surfaces and SOS interfaces: a mean curvature approach*, Communications in Mathematical Physics **311**,

157-189, 2012

30. **PC**, A. Faggionato and T. Prescott, *Invariance principle for Mott variable range hopping and other walks on point processes*, Ann. Inst. Henri Poincaré Probab. & Stat. **49**, no. 3, 654-697, 2013

31. **PC**, F. Martinelli, and F.L. Toninelli, *Sharp mixing times for sampling random surfaces*, Proceedings of IEEE FOCS 2011.

32. **PC**, E. Lubetzky, F. Martinelli, A. Sly, and F.L. Toninelli, *The shape of the  $(2+1)D$  SOS surface above a wall*. C. R. Math. Acad. Sci. Paris **350**, no. 13-14, 703-706, 2012

33. **PC**, E. Lubetzky, F. Martinelli, A. Sly, and F.L. Toninelli, *Dynamics of  $2+1$  dimensional SOS surfaces above a wall: slow mixing induced by entropic repulsion*, Annals of Probability **42**, no. 4, 1516-1589, 2014

34. **PC**, Fabio Martinelli, Alistair Sinclair, Alexandre Stauffer, *Random Lattice Triangulations: Structure and Algorithms* (conference version), Proceedings of the 45th Annual ACM Symposium on Theory of Computing STOC 2013.

35. Charles Bordenave, **PC** and Djalil Chafai, *Spectrum of Markov generators on sparse random graphs*, Communications in Pure and Applied Math. **67**, 621-669, 2014

36. Charles Bordenave, **PC**, *Large deviation principle for Wigner matrices without gaussian tails*, Annals of Probability **42**, no. 6, 2454-2496, 2014

37. **PC**, E. Lubetzky, F. Martinelli, A. Sly, and F.L. Toninelli, *Scaling limit and cube-root fluctuations in SOS surfaces above a wall*, Journal of the European Mathematical Society (JEMS) **18**, 931-995, 2016

38. **PC**, Fabio Martinelli, Alistair Sinclair, Alexandre Stauffer, *Random Lattice Triangulations: Structure and Algorithms*, Annals of Applied Probability **25**, 1650-1685, 2015

39. Charles Bordenave, **PC**, *Large deviations of empirical neighborhood distribution in sparse random graphs*, Probability Theory and Related Fields **163**, 149-222, 2015

40. **PC**, Georg Menz, Prasad Tetali, *Approximate tensorization of entropy at high temperature*, Ann. Fac. Sci. Toulouse **24**, 691-716, 2015

41. **PC**, F. Martinelli, and F.L. Toninelli, *Multi-level pinning problems for random walks and self-avoiding lattice paths*, Electronic journal of probability **20**, 29 pp, 2015

42. **PC**, F. Martinelli, and F.L. Toninelli, *On the probability of staying above a wall for the  $(2+1)$ -dimensional SOS model at low temperature*, Probability Theory and Related Fields **163**, 803-331, 2015

43. **PC**, J. Sohier, *Convergence to equilibrium for a directed  $(1+d)$ -dimensional polymer*. Ann. Fac. Sci. Toulouse **26**, 289-318, 2017

44. **PC**, Fabio Martinelli, Alistair Sinclair, Alexandre Stauffer, *Dynamics of Lattice Triangulations on Thin Rectangles*, Electronic journal of probability **21**, 22 pp, 2016

45. Charles Bordenave, **PC**, and Djalil Chafai, Daniele Piras, *Spectrum of large random Markov chains: Heavy-tailed weights on the oriented complete graph*. Random Matrices Theory and Applications **6**, no. 2, 2017.

46. Charles Bordenave, **PC**, Justin Salez, *Random walk on sparse random digraphs*. Probability Theory and Related Fields **170**, 933-960, 2018.
47. **PC**, Alistair Sinclair, *Entropy production in nonlinear recombination models*. Bernoulli **24**, 3246-3282, 2018.
48. **PC**, F. Martinelli, and F.L. Toninelli, *Entropic repulsion in  $|\nabla\phi|^p$  surfaces: a large deviation bound for all  $p \geq 1$* . Boll. Unione Mat. Ital. **10**, no. 3, 451466, 2017.
49. Charles Bordenave, **PC**, Djalil Chafai, Konstantin Tikhomirov, *On the spectral radius of a random matrix: an upper bound without fourth moment*. Annals of Probability **46**, no. 4, 2268-2286, 2018
50. Antonio Blanca, **PC**, Alistair Sinclair, Eric Vigoda, *Spatial mixing and non-local Markov chains* (Conference version). Proceedings SODA 2017
51. Charles Bordenave, **PC**, Justin Salez, *Cutoff at the “entropic time” for sparse Markov chains*. Probability Theory and Related Fields **173**, 2019
52. Antonio Blanca, **PC**, Alistair Sinclair, Eric Vigoda, *Spatial mixing and non-local Markov chains*. Random Structures and Algorithms **55**, 2019.
53. **PC**, Dima Ioffe, Vitali Wachtel, *Confinement of Brownian Polymers under Geometric Area Tilts*. Electronic Journal of Probability **24**, 2019
54. **PC**, Dima Ioffe, Vitali Wachtel, *Tightness and line ensembles for brownian polymers under geometric area tilts*. In: Statistical Mechanics of Classical and Disordered Systems. Springer 2019 (eds: Gayrard, Arguin, Kistler, Kourkova)
55. **PC**, Cyril Labbé, Hubert Lacoïn, *Mixing time of the adjacent walk on the simplex*. Annals of Probability **48**, 2020
56. **PC**, Matteo Quattropiani, *Stationary distribution and cover time of sparse directed configuration models*. Probability Theory and Related Fields **178**, 2020
57. **PC**, Matteo Quattropiani, *Mixing time trichotomy in regenerating dynamic digraphs*. Stochastic Processes and Applications **137**, 2021.
58. David Aldous, **PC**, Rick Durrett, Alexander E. Holroyd, Paul Jung, Amber L. Puha, *The Life and Mathematical Legacy of Thomas M. Liggett*. Notices of the AMS **68**, 2021.
59. Antonio Blanca, **PC**, Daniel Parisi, Alistair Sinclair, Eric Vigoda, *Entropy decay in the Swendsen-Wang dynamics*. Annals of Applied Probability **32**, 2022. (conference version: STOC 2021).
60. **PC**, Matteo Quattropiani, *Mixing time trichotomy in regenerating dynamic digraphs*. Stochastic Processes and Applications **137**, 2021.
61. **PC**, Cyril Labbé, Hubert Lacoïn, *Spectral gap and cutoff phenomenon for the Gibbs sampler of  $\nabla\varphi$  interfaces with convex potential*. Annales de l’Institut Henri Poincaré Probab. Stat. **58**, 2022.
62. **PC**, Daniel Parisi, *Block factorization of the relative entropy via spatial mixing*. Communications in Mathematical Physics **388**, 2021.

63. Alexandre Bristiel, **PC**, *Entropy inequalities for random walks and permutations*. *Annales de l'Institut Henri Poincaré* **60**, 2024.
64. Xing Shi Cai, **PC**, Guillem Perarnau, Matteo Quattropiani, *Rankings in directed configuration models with heavy tailed in-degrees*. *Annals of Applied Probability* **33**, 2023.
65. Antonio Blanca, **PC**, Zongchen Chen, Daniel Parisi, Daniel Stefankovic, Eric Vigoda, *On Mixing of Markov Chains: Coupling, Spectral Independence, and Entropy Factorization*. *Electronic Journal of Probability* **27**, 1-42, 2022. (conference version: SODA 2022)
66. **PC**, Matteo Quattropiani, Federico Sau, *Cutoff for the Averaging process on the hypercube and complete bipartite graphs*. *Electronic Journal of Probability* **28**, 1-31, 2023.

### Preprints

67. **PC**, Daniel Parisi, *Nonlinear recombinations and generalized random transpositions*. arXiv:2207.04775
68. **PC**, Alistair Sinclair, *Nonlinear dynamics for the Ising model*. arXiv:2305.18788
69. **PC**, Shirshendu Ganguly, *Uniqueness, mixing, and optimal tails for Brownian line ensembles with geometric area tilt*. arXiv:2305.18280
70. Mriganka Basu Roy Chowdhury, **PC**, Shirshendu Ganguly, *Characterizing Gibbs states for area-tilted Brownian lines*. arXiv:2310.06817
71. **PC**, Cyril Labbe', Hubert Lacoïn, *Cutoff phenomenon in nonlinear recombinations*. arXiv:2402.11396
72. **PC**, Florentin Mnch, Justin Salez, *Entropy and curvature: beyond the Peres-Tetali conjecture*. arXiv:2401.17148

*Last update:* March 2024

*For more information:* <http://www.mat.uniroma3.it/users/caputo/>