Carlo Orrieri

Curriculum Vitae

Department of Mathematics
Via Ferrata 5, 27100, Pavia, Italy
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Positions

1 nov 2023-now **Associate professor**, *University of Pavia*

1 nov 2020-31 oct 2023 **Assistant professor (RTD-b)**, *University of Pavia*

10 dec 2018-31 oct 2020 **Assistant professor (RTD-a)**, *University of Trento*

1 Sep 2018- 9 dec 2018 **Postdoctoral fellow**, *University of Pavia*
Supervisor: Prof. Elisabetta Rocca.

1 Sep 2016-31 Aug 2018 **Postdoctoral fellow**, *Sapienza University of Roma*

1 Dec 2015-31 Aug 2016 **Postdoctoral fellow**, *University of Pavia*
Supervisor: Prof. Giuseppe Savaré.

Education

Gen 2022–Gen. 2031 **National Scientific Habilitation - Associate Professor**
Abilitazione Scientifica Nazionale: seconda fascia.
Settore Concorsuale 01–A3: analisi matematica, probabilità e statistica matematica

Dec. 2012–Nov. 2015 **PhD student in Mathematics**, *University of Pavia*
Thesis title: *Maximum principle for optimal control of stochastic dissipative systems*.
Advisor: Prof. Marco Fuhrman.

2011–2012 **Executive Course**, *MIP, Politecnico di Milano*
Advanced training course in Quantitative Finance.
Scholarship provided by Unicredit Group.

2009–2011 **M.Sc. in Mathematics**, *University of Milano*,
Grade: *summa cum laude*
Thesis title: *Caratterizzazioni di Varietà di Fano di coindice dato in termini di invarianti numerici*.
Advisor: Prof. Antonio Lanteri.

2006–2009 **Bc. in Mathematics**, *University of Milano-Bicocca*,
Grade: *summa cum laude*
Thesis title: *Teoria di Morse*.
Advisor: Dott. Alessandro Ghigi.

2001–2006 **Scientific high school diploma**, *ISIS Giulio Natta*,
Grade: 100/100

Other Experience

Feb–July 2012 **Quantitative Analyst**, *Unicredit Global Information Services*, Milano
Training Period.

Sep–Dec. 2011 **Mathematics Teacher**, *Secondary School G. Donizzetti*, Bergamo

Research Interests

- Interacting Particle Systems.
- Large Deviations.
- Stochastic PDEs
- (Stochastic) Optimal Control

Talks and Seminars

1-5 Jul 2024 Invited seminar: "TBA" *SPDE below sea level*, to be held in Delft.

12-16 Feb 2024 Invited seminar: "Uniqueness by noise for some singular SPDEs" *Stochastic Partial Differential Equations*, to be held in ESI, Vienna.

06 Oct 2023 Invited seminar: "Uniqueness by noise for (some) singular SPDEs" *Three talks on weak and strong uniqueness for SPDEs*, Como.

19 May 2023 Invited seminar: "Wasserstein stability of porous medium equation on Riemannian manifolds" *Variational and PDE problems in Geometric Analysis, IV*, Bologna.

23 May 2022 Invited seminar: "Random separation property for a class of stochastic Allen-Cahn equations" *Phase-field methods in applied science*, Rome.

16 Nov 2021 Invited seminar: "Lagrangian, Eulerian and Kantorovich formulations of controlled interacting particles" *Schrödinger Problem and Mean-field PDE Systems*, CIRM, Luminy.

6 Jul 2021 Invited seminar: "Gamma-convergence and Large Deviations for some interacting particle systems" *Seminars of Applied Mathematics, University of Pavia, (online)*

16 Jun 2021 Invited seminar: "Large Deviations for some interacting particle systems" *Oberseminar of Applied Mathematics, University of Münster, (online)*

19 Jun 2020 Invited seminar: "Gamma-convergence and Large Deviations for some interacting particle systems" *Oberseminar Stochastics, University of Bonn, (online)*

4 Jun 2020 Invited seminar: "Topics in PDEs: a probability point of view" *Math bites Trento, (online)*

25 Nov 2019 Invited short course: "Optimal Transport. A (very) short intro" Hacking day of math for data science, *Trento.*

20 Nov 2019 Invited seminar: "A variational approach to the planning problem" *University of Vienna.*

Sep 2019 Contributed talk: "Lagrangian, Eulerian and Kantorovich formulations of multi-agents systems" *Mean Field Games and Related Topics, Levico Terme.*

17 June 2019 Invited seminar: "Some optimal control problems for non-local random systems" *Second Italian Meeting on Probability and Statistics, Vietri.*

10 May 2019 invited Seminar: "Optimal control of a stochastic tumor growth model" *Recent advances in Phase-Field modeling, Pavia.*

27 Mar 2019 invited Seminar: "Random phase field models" *MACH Indam, Roma.*

4 mar 2019 invited Seminar: "Entropic optimal transport and mean field planning " *Università di Padova.*

6 Feb 2019 invited Seminar: "Entropic optimal transport and mean field planning " *ICMC summer meeting on differential equations, São Carlos, Brasil.*

16 Jan 2019 invited Seminar: "Entropic optimal transport and mean field planning " *Stochastic PDEs and Mean-Field Games, Bologna.*

4 Nov 2018 Invited Seminar: "Optimal control of interacting agents" *LUISS, Roma.*

4 July 2018 Seminar: "Optimal control and large deviations for interacting particle systems" *Two days workshop on Large scale random structures (PRIN), Padova.*

20 may 2018 Invited Seminar: "Singular stochastic Allen-Cahn equations with dynamic boundary conditions" *Special Materials and Complex Systems, Gargnano.*

10 Apr 2018 Invited Seminar: "Controlled interacting particle systems" *Università di Trento.*

15 Feb 2018 Contributed talk: "Mean field planning problem: a variational approach" *XXVIII Convegno Nazionale di Calcolo delle Variazioni*, Levico Terme.

30 Gen 2018 Invited Seminar: "A variational approach to the mean field planning problem" *Università di Pisa.*

21 Nov 2017 Invited Seminar: "A variational approach to the mean field planning problem" *Politecnico di Milano.*

7 Sept 2017 Contributed talk: "Variational mean field planning problem" *XVII italian meeting on Hyperbolic Equations*, Pavia.

18 May 2017 Invited Seminar: "Limit theory for controlled Vlasov-type dynamic" *Insubria University*, Como.

7 April 2017 Invited Seminar: "Mean field limit for controlled Vlasov dynamic" *Optimal transport and PDEs in applied sciences*, GSSI, L'aquila.

22 Nov 2016 Invited Seminar: "Controlled Vlasov-type dynamics", Sapienza Università di Roma.

21 Nov 2016 Invited Seminar: "A variational approach to mean field games", Sapienza università di Roma.

1 June 2016 Invited short seminar: "Stochastic maximum principle for SPDEs with delay" *Stochastic Partial Differential Equations and Applications*, Levico Terme.

26 Oct 2015 Invited Seminar: "Ergodic maximum principle for infinite dimensional stochastic systems" *Academy of sciences of Czech Republic*, Prague.

19 Oct 2015 Invited Seminar: "Necessary conditions for stochastic optimal control" *Insubria University*, Como.

28 Sept 2015 Contributed talk: "Necessary conditions for optimal ergodic stochastic control problems" *Stochastic Analysis with applications*, Levico Terme.

6 July 2015 Contributed talk: "Some results in stochastic control for dissipative systems" *45ème école d'été de probabilités* , Saint-Flour.

4 May 2015 Invited Seminar: "Stochastic maximum principle for dissipative systems on infinite horizon" *University of Milano-Bicocca*, Milano.

13 Apr 2015 Invited Seminar: "Necessary conditions for optimal control of Stochastic PDEs with dissipative drift" *Lions-Magenes Days*, Pavia.

7-11 July 2014 Contributed talk: "Stochastic maximum principle for a class of non-linear SPDEs in Banach spaces" *2nd Barcelona summer school on stochastic analysis*, Barcelona.

Short invited visits

'19 - '23 **Sapienza università di Roma.** Profs. L. Bertini and G. Basile (often)

Nov '19 & Feb '20 **University of Vienna**. Prof. U. Stefanelli and L. Scarpa

'18-'19 **Università di Pavia.** Prof. Giuseppe Savaré (often)

Mar '18 **National Research University HSE**, Moscow. Prof. M. Mariani

Mar '17 **TUM**, Monaco. Prof. M. Fornasier

July '16 **IST Austria**, Vienna. Prof. J. Maas

Oct '15 **Charles University**, Prague. Prof. B. Maslowski

Fellowships and Grants

2024 GNAMPA 2024 research project *"Fluidodinamica stocastica"*, P.I. M. Coghi

2023 GNAMPA 2023 research project *"Equazioni differenziali stocastiche e operatori di Kolmogorov in dimensione infinita"*, P.I. D.A. Bignamini

2023 PRIN 2022 project *"Noise in fluid dynamics and related models"*, P.I. F. Flandoli

2022 GNAMPA 2022 research project *"Analisi qualitativa PDE stocastiche: ergodicità ed equazioni Kolmogorov"*, P.I. L. Scarpa

2020 GNAMPA 2019 research project *"Sistemi con interazione spaziale: convergenza, controllo e applicazion"*, P.I. G. Zanco

2019 Principal Investigator of GNAMPA 2018 research project *"Trasporto ottimo per dinamiche con interazione"*

Sep. '18 A 1 year postdoc fellowship at Università degli studi di Pavia, Italy.

2017 GNAMPA 2017 research project *"Equazioni di evoluzione con diffusione e interazione"*, P.I. S. Lisini

2016-2018 PRIN 2015 project *"Large scale random structure"*, P.I. F. Martinelli

Sept. '16 A 2 year postdoc fellowship at Sapienza Università di Roma, Italy.

2016 PRIN 2010-2011 project *"Calculus of variations"*, P.I. G. Dal Maso

Dec. '15 A 1 year postdoc fellowship at Università degli studi di Pavia, Italy.

2013-2015 PRIN 2010-2011 project *"Evolution differential problems: deterministic and stochastic approaches and their interactions"*, P.I. M. Fuhrman

2015- 2016 GNAMPA 2015 research project *"Processi markoviani in spazi non commutativi"*, P.I. R. Carbone

2014- 2015 GNAMPA 2014 research project *"Semigruppi markoviani su algebre non commutative"*, P.I. R. Carbone

2013- 2014 GNAMPA 2013 research project *"Evoluzioni quantistiche markoviane"*, P.I. R. Carbone

2011 Scholarship from *Unicredit Group* to attend the Executive course on Quantitative Finance, MIP.

Organization activity

From Apr. '21 Seminar series: *Pavia-Milano Seminar on Probability & Mathematical Statistics* - $(PMS)^2$,
joint with M. Maurelli, M. Rossi and M. Zanella,
`https://paviamilanoseminars.wordpress.com`

5–7 Sep '22 Workshop: *Interacting Particle systems and Applications*
joint with M. Coghi, M. Maurelli, G. Zanco,
To be held in the University of Trento.
`https://sites.google.com/view/ipsa2022/home`

13-16 Jun '22 Session: *Regularisation by noise and Kolmogorov equations*
joint with L. Scarpa,
Third Italian Meeting on Probability and Mathematical Statistics, to be held in Bologna.
`https://site.unibo.it/probstat/en`

12-14 Febr. '20	School: *Primer on data science* joint with C. Agostinelli and S. Bonaccorsi, University of Trento. `http://datascience.maths.unitn.it/events/pds2020/index.html`
17-20 Jun '19	Session: *Stochastic systems with interaction* joint with L. Scarpa, Second Italian Meeting on Probability and Mathematical Statistics, Vietri sul mare. `http://www.salerno2019.dipmat.unisa.it/`
19-21 Sep '18	Workshop: *Optimal control and Mean Field Games* joint with G. Cavagnari, S.Lisini, G. Savaré, University of Pavia `https://sites.google.com/view/controlpv2018.`

Master thesis supervision

A.Y. '22-'23	M. M. Ghisolfi; S. N. Paicu.
A.Y. '21-'22	L.M. Strambini.
A.Y. '20-'21	A. Mannolini (joint with L.A. Bianchi, University of Trento); L. Roveri (joint with M. Coghi, TU Berlin); F. Mascari (joint with G. Conforti, CMAP École Polytechnique).
A.Y. '19-'20	F. Bertacco (joint with L. Scarpa, University of Wien) ["Premio Con.Scienze" award for the MSc thesis]; L. Galvagni (joint with L. Scarpa, University of Wien); A. Marcon, (joint with M. Coghi, TU Berlin).
A.Y. '16-'17	F. Marrone (joint with I. Birindelli, Sapienza University of Roma)

Bachelor thesis supervision

A.Y. '22-'23	L. Rolando, M. I. Cagnola, co-supervision (supervisor: D. Simon, Sorbonne Université, Paris)
A.Y. '21-'22	G. Adobati, S. Pinciroli.

Service

A.Y. '19 – '20	Member of PhD board, faculty of mathematics, University of Trento (ciclo di dottorato XXXV).
Referee for	Electron. J. Probab.; SIAM J. Control Optim.; SIAM J. Math. Anal.; J. Differential Equations; Annali SNS; ESAIM Control Optim. Calc. Var.; Stoch. Partial Differ. Equ.: Anal. Comput.; Nonlinear Analysis; Potential Analysis; Appl. Math. Optim.; Discrete Contin. Dyn. Syst. (S); J. Math. Ana.l Appl.; Math. Methods Appl. Sci.; J. Dyn. Control Syst.;

Teaching

A.Y. '23-'24	Master course: *Processi stocastici*, faculty of Mathematics, Pavia.
A.Y. '23-'24	Bachelor course: *Statistica*, faculty of Biotechnology, Pavia.
A.Y. '23-'24	Bachelor course: *Elementi di probabilità* (with E. Dolera), faculty of Mathematics, Pavia.
A.Y. '22-'23	Bachelor course: *Statistica*, faculty of Biotechnology, Pavia.
A.Y. '22-'23	Bachelor course: *Elementi di probabilità* (with E. Dolera), faculty of Mathematics, Pavia.
A.Y. '21-'22	Bachelor course: *Statistica*, faculty of Biotechnology, Pavia.
A.Y. '21-'22	Bachelor course: *Elementi di probabilità* (with E. Dolera), faculty of Mathematics, Pavia.
A.Y. '20-'21	Master course: *Processi stocastici*, faculty of Mathematics, Pavia.

A.Y. '20-'21	Bachelor course: *Elementi di probabilità* (with E. Dolera), faculty of Mathematics, Pavia.
A.Y. '19-'20	PhD and Master course: *Stochastic differential equations*, faculty of Mathematics, Trento.
A.Y. '19-'20	Master course: *Stochastic processes* (with S. Mazzucchi), faculty of Mathematics, Trento.
A.Y. '19-'20	Seminar: *Passeggiate aleatorie e l'equazione del calore*, faculty of Mathematics (percorso eccellenza), Trento.
A.Y. '18-'19	Master course: *Stochastic differential equations*, faculty of Mathematics, Trento.
A.Y. '18-'19	Exercises lectures: *Advanced Mathematical Methods for Engineers*, Faculty of Engineering, Pavia.
A.Y. '18-'19	Exercises lectures: *Analisi 1*, Faculty of Engineering, Pavia.
A.Y. '17-'18	Exercises lectures: *Advanced Mathematical Methods for Engineers*, Faculty of Engineering, Pavia.
A.Y. '16-'17	Exercises lectures: *Advanced Mathematical Methods for Engineers*, Faculty of Engineering, Pavia
A.Y. '15-'16	Exercises lectures: *Matematica 3*, Faculty of Materials science, University of Milano-Bicocca
A.Y. '14-'15	Exercises lectures: *Complementi di Analisi Matematica e Statistica*, Faculty of Engineering, Pavia
A.Y. '13-'14	Exercises lectures: *Complementi di Analisi Matematica e Statistica*, Faculty of Engineering, Pavia

Participation to schools/workshops

18-19 May '23	Workshop "*Variational and PDE problems in Geometric Analysis, IV*", Bologna.
27-31 Mar '23	Workshop "*Scaling limits and generalized hydrodynamics*", GSSI, online partecipation.
11-12 July '22	Workshop "*Contemporary Trends in Kinetic Theory & PDEs*", Pavia.
13-16 June '22	Workshop "*Third Italian Meeting on Probability and Mathematical Statistics*", Bologna.
23-27 May '22	INdAM Workshop "*Phase field methods in applied sciences*", Roma.
15-19 Nov '21	CIRM Workshop "*Schrödinger Problem and Mean-field PDE Systems*", Luminy, Marseille.
3-7 Feb '20	Workshop "*XXX Convegno Nazionale di Calcolo delle Variazioni*", Levico Terme.
9-13 Sept '19	Workshop "*Mean Field Games and Related Topics*", Levico Terme.
17-20 June '19	Workshop "*Second Italian Meeting on Probability and Mathematical Statistics*", Vietri.
10-14 June '19	CIME school on "*Mean field games*", Cetraro.
8-10 May '19	Workshop "*Recent advances in Phase-Field modeling: from Engineering to Biology*", Roma.
25-29 Feb '19	Workshop "*Indam MACH 2019*", Roma.
4-6 Feb '19	Conference "*ICMC summer meeting on differential equations*", São Carlos, Brasil.
14-16 Jan '19	Winter school on "*Stochastic PDEs and Mean Field Games*", Bologna.
23-27 Jul '18	RISM school on "*Developments in Stochastic Partial Differential Equations, in honour of G. Da Prato*", Varese.
4-5 July '18	PRIN workshop "*Two days workshop on Large scale random structures*", Padova.
18-22 May '18	Conference "*Special Materials and Complex Systems*", Gargnano.
12-16 Feb '18	Workshop "*XXVIII Convegno Nazionale di Calcolo delle Variazioni*", Levico Terme.
6-8 Sept '17	XVII italian meeting on "*Hyperbolic Equations*", Pavia.
26-30 June '17	CIME-CIRM School "*New trends on analysis and geometry in metric spaces*", Levico Terme.
14-16 June '17	Conference "*Mean field games and related topics*", to be held in Roma.
6-7 Apr '17	Mini Workshop "*Optimal transport and PDEs in applied sciences*", GSSI L'Aquila.
3-5 Apr '17	CIRM School "*Stochastic Dynamics out of Equilibrium*", Lumini.
6-10 Feb '17	Workshop "*XXVII Convegno Nazionale di Calcolo delle Variazioni*", Levico Terme.
29-4 Feb '17	MFO Workshop '*Applications of Optimal Transportation in the Natural Sciences*", Oberwolfach.
28-02 Dic '16	Indam Workshop "*PDE models for multi-agent phenomena*", Roma.
7-11 Nov '16	Workshop "*Optimal Transport and Applications*", SNS, Pisa.
5-9 Sept '16	INdAM Workshop "*Trends on Applications of Mathematics to Mechanics* ", Roma.
22-26 Aug '16	CIME-EMS Summer school in applied mathematics "*Singular Random Dynamics*", Cetraro.
29-3 June '16	10^{th} International Meeting on "*Stochastic Partial Differential Equations and Applications*", Levico Terme.
17-19 Feb '16	Winter school on "*Stochastic Homogenization*", Augsburg.
9-11 Dec '15	Course on "*Martingale optimal transport*", Università di Pisa.
28-2 Oct '15	Summer school "*Stochastic Analysis with applications*", Levico Terme.
6-17 July '15	Summer school "*45ème école d'été de probabilités*" Saint-Flour.
2-6 Jan '15	Bicocca winter school "*Recent Breakthroughs in Singular Stochastic PDEs*" University of Milano-Bicocca, Milano.
15-19 Dec '14	MFO Workshop "*Variational methods for evolution*" Oberwolfach.
27-31 Oct '14	ERC Workshop "*Optimal transportation and applications*" Scuola Normale Superiore, Pisa.

6-10 Oct '14 IHP minicourse "*Rough Paths*". Geometry, Analysis and Dynamics on Sub-Riemannian Manifolds, Trimester Institut Henri Poincaré, Paris.

22-25 Sept '14 CRM School "*Singular Stochastic PDEs*", Scuola Normale Superiore, Pisa.

1-5 Sept '14 CIRM School "*Sub-Riemannian manifolds: from geodesics to hypoelliptic diffusion*", Luminy, Marseille.

7-11 July '14 CRM School "*2nd Barcelona summer school on stochastic analysis*", Barcelona.

9-13 June '14 ERC School "*Analysis and Geometry on Singular Spaces*" Scuola Normale Superiore, Pisa.

12-16 May '14 CIMI Course "*Stochastic Differential Geometry*", Tolouse.

6-11 Jan '14 9^{th} International Meeting on "*Stochastic Partial Differential Equations and Applications*", Levico Terme.

22-24 May '13 Workshop "*Backward Stochastic Differential Equations*" Centre Henri Lebesgue, Rennes.

Languages

Italian Native language, **English** Fluent, **French** Basic

Preprints

1. F. Bertacco, C. Orrieri and L. Scarpa
Weak uniqueness by noise for singular stochastic PDEs.
Submitted. url: https://arxiv.org/abs/2308.01642

Published papers

16. C. Orrieri and L. Scarpa
A note on regularity and separation for the stochastic Allen-Cahn equation with logarithmic potential.
Discrete Contin. Dyn. Syst. (S), 16(12) (2023) 3837-3851.

15. N. De Ponti, M. Muratori and C. Orrieri
Wasserstein stability of porous medium-type equations on manifolds with Ricci curvature bounded below.
Journal of Functional Analysis. 283(9) (2022) 109661

14. F. Bertacco, C. Orrieri and L. Scarpa
Random separation property for stochastic Allen-Cahn-type equations.
Electron. J. of Probab. 27 (2022), 95, 1-32

13. G. Cavagnari, S. Lisini, C. Orrieri and G. Savaré
Lagrangian, Eulerian and Kantorovich formulations of multi-agent optimal control problems: equivalence and Gamma-convergence.
Journal of Differential Equations, 322 (2022) 268-364.

12. G. Basile, D. Benedetto, L. Bertini and C. Orrieri
Large deviations for Kac-like walks.
Journal of Statistical Physics, 184 10 (2021).

11. F. Masiero, C. Orrieri, G. Tessitore and G. Zanco
Semilinear Kolmogorov equations on the space of continuous functions via BSDEs.
Stochastic Processes and their Applications 136 (2021) 1-56.

10. C. Orrieri
Large deviations for interacting particle systems: joint mean-field and small-noise limit.
Electron. J. Probab. 25 (2020), 111, 44 pp.

9. C. Orrieri, E. Rocca and L. Scarpa
Optimal control of stochastic phase-field models related to tumor growth.
ESAIM: Control Optim. Calc. Var. 26 (2020) 104, 46pp.

8. C. Orrieri, A. Porretta and G. Savaré
A variational approach to the mean field planning problem.
Journal of Functional Analysis. 277 (2019) 1868-1957.

7. M. Fornasier, S. Lisini, C. Orrieri and G. Savaré
Mean-field optimal control as Gamma-limit of finite agent controls.
European Journal of Applied Mathematics. 30 (2019) 1153-1186.

6. C. Orrieri and L. Scarpa
Singular Stochastic Allen-Cahn equations with dynamic boundary conditions.
Journal of Differential Equations. 266 (2019) 4624-4667.

5. C. Orrieri, G. Tessitore and P. Veverka
Ergodic maximum principle for stochastic systems.
Applied Mathematics and Optimization. 79 (2019) 567-591.

4. G. Guatteri, F. Masiero and C. Orrieri
Stochastic maximum principle for SPDEs with delay.
Stochastic Processes and their Applications, 127 (2017) 2396-2427.
3. C. Orrieri and P. Veverka
Necessary stochastic maximum principle for dissipative systems on infinite time horizon.
ESAIM: Control Optim. Calc. Var., 23 (2017) 337-371.
2. M. Fuhrman and C. Orrieri
Stochastic maximum principle for optimal control of a class of non-linear SPDEs with dissipative drift.
SIAM Journal on Control and Optimization, 54 (2016) 341-371.
1. C. Orrieri
A stochastic maximum principle with dissipativity conditions.
Discrete Contin. Dyn. Syst (A), 35 (2015) 5499-5519.