Elena Bandini

Curriculum vitae

Università di Bologna
Dipartimento di Matematica
Via Filopanti 5,
40126 Bologna, Italy
✉ *elena.bandini7@unibo.it*

Present position

09/2021–Present **Assistant professor** (RTD-B) at Dipartimento di Matematica, Università di Bologna, Bologna.

Awards and qualifications

2020 **Abilitazione Scientifica Nazionale** a Professore di II fascia, settore 01/A3 (Analisi Matematica, Probabilità e Statistica Matematica).

2018 GNAMPA Project 2018 (PI): "*Controllo ottimo stocastico con osservazione parziale: metodo di randomizzazione ed equazioni di Hamilton-Jacobi-Bellman sullo spazio di Wasserstein*".

Past positions

11/2017–08/2021 **Assistant professor** (RTD-A) at Dipartimento di Matematica e Applicazioni, Università degli Studi di Milano-Bicocca, Milano.

01/2016–10/2017 **Post-doc** at Dipartimento di Economia e Finanza, LUISS Guido Carli, Roma. Supervisor: Prof. F. Gozzi.

Education

2013–2015 **PhD in Mathematical Models and Methods in Engineering** at Politecnico di Milano and ENSTA ParisTech - École Nationale Supérieure de Techniques Avancées. Advisors: Prof. M. Fuhrman and Prof. F. Russo.

2010–2012 **Master of Science in Mathematical Engineering** at Politecnico di Milano. Advisor: Prof. M. Fuhrman.

09/2011–01/2012 Graduate Exchange Program at Université Pierre et Marie Curie - Paris 6.

2007–2010 **Bachelor of Science in Mathematical Engineering** at Politecnico di Milano. Advisor: Prof. M. Fuhrman.

2002–2007 **Scientific high school diploma**. Liceo Scientifico "G. Marconi", Parma.

Research Interests

- Stochastic control and stochastic analysis
- Stochastic calculus for discontinuous processes and random measures
- Backward stochastic differential equations
- Hamilton-Jacobi-Bellman equations

Visiting Positions

2016-2017 (3 weeks) **Université Pierre et Marie Curie, Paris**, Prof. M. Thieullen.

2014-2015 (6 months) **ENSTA ParisTech, École Nationale Supérieure de Techniques Avancées**, Prof. F. Russo.

Research Projects

- 2024: Member of the **research project** *"Problemi di controllo ottimo in dimensione infinita"* supported by GNAMPA - Gruppo Nazionale per l'Analisi Matematica e la Probabilità. Head: A. Calvia.
- 2023: Member of the **research project** *"Riduzione del modello in sistemi dinamici stocastici in dimensione infinita a due scale "* supported by GNAMPA - Gruppo Nazionale per l'Analisi Matematica e la Probabilità. Head: G. Guatteri.
- 2022: Member of the **UNA-Random**, a consortium of 6 universities within the alliance UNA Europa.
- 2019: Member of the **research project** *"Problemi di controllo ottimo stocastico con osservazione parziale in dimensione infinita"* supported by GNAMPA - Gruppo Nazionale per l'Analisi Matematica e la Probabilità. Head: A. Calvia.
- 2018: Head of the **research project** *"Controllo ottimo stocastico con osservazione parziale: metodo di randomizzazione ed equazioni di Hamilton-Jacobi-Bellman sullo spazio di Wasserstein"* supported by GNAMPA - Gruppo Nazionale per l'Analisi Matematica e la Probabilità.
- 2017: Member of the **research project** *"Nuovi metodi probabilistici nello studio di problemi di controllo ottimo stocastico"* supported by GNAMPA - Gruppo Nazionale per l'Analisi Matematica e la Probabilità. Head: A. Cosso.

- 2015-2016: Member of the LUISS Roma unit (responsible F. Gozzi) of the **PRIN project** *"Deterministic and stochastic evolution equations"*. Head of the national project: A. Lunardi.
- 2015: Member of the **research project** *"Applicazioni innovative di processi di punto marcato"* supported by GNAMPA - Gruppo Nazionale per l'Analisi Matematica e la Probabilità. Head: F. Confortola.
- 2013: Member of the **research project** *"Controllo ottimo di processi di punto e controllo impulsivo: il metodo delle equazioni retrograde con salti"* supported by GNAMPA - Gruppo Nazionale per l'Analisi Matematica e la Probabilità. Head: F. Confortola.
- 2010-2011: Member of the Politecnico di Milano unit (responsible M. Fuhrman) of the **PRIN project** *"Problemi differenziali di evoluzione: approcci deterministici e stocastici e loro interazioni"*. Head of the national project: M. Fuhrman.

Other scientific activities

June 13-16, 2022 **Third Second Italian Meeting on Probability and Mathematical Statistics**, Bologna, Italy. Component of the Local Organizing Committee.

June 17-21, 2019 **Second Italian Meeting on Probability and Mathematical Statistics**, Vietri sul Mare, Salerno. Co-organizer (with A. Calvia) of the special session "*Methods for Stochastic Filtering and Optimal Control of Processes with Jumps*".

July 3-6, 2018 **14th Viennese Conference on Optimal Control and Dynamic Games**, Technische Universität Wien, Wien. Co-organizer (with F. Gozzi and G. Fabbri) of the special session "*Infinite dimensional stochastic modeling in economics and finance*".

Published and accepted papers

[1] E. Bandini, *Existence and uniqueness for BSDEs driven by a general random measure, possibly non quasi-left-continuous*. **Electronic Communications in Probability**, 20(71), 1–13, 2015.

[2] E. Bandini, F. Confortola, *Optimal control of semi-Markov processes with a backward stochastic differential equations approach*. **Mathematics of Control, Signals, and Systems**, 29(1), 1-35, 2017.

[3] E. Bandini, M. Fuhrman, *Constrained BSDEs representation of the value function in optimal control of pure jump Markov processes.* **Stochastic Processes and their Applications**, 127(5), 1441–1474, 2017.

[4] E. Bandini, F. Russo, *Weak Dirichlet processes with jumps.* **Stochastic Processes and their Applications**, 127(12): 4139-4189, 2017.

[5] E. Bandini, F. Russo, *Special weak Dirichlet processes and BSDEs driven by a random measure.* **Bernoulli** 24(4A): 2569-2609, 2018.

[6] E. Bandini, *Optimal control of Piecewise-Deterministic Markov Processes: a BSDE representation of the value function.* **ESAIM: Control, Optimization and Calculus of Variations**, 24(1), 311-354, 2018.

[7] E. Bandini, A. Cosso, M. Fuhrman, H. Pham, *Backward SDEs for optimal control of partially observed path-dependent stochastic systems: a control randomization approach.* **The Annals of Applied Probability** 28(3), 1634-1678, 2018.

[8] E. Bandini, A. Cosso, M. Fuhrman, H. Pham, *Randomized filtering and Bellman equation in Wasserstein space for partial observation control problem.* **Stochastic Processes and their Applications**, 129(2), 674-711, 2019.

[9] E. Bandini, F. Confortola, A. Cosso, *BSDE representation and randomized dynamic programming principle for stochastic control problems of infinite-dimensional jump-diffusions.* **Electronic Journal of Probability**, 24(81), 1-37, 2019.

[10] E. Bandini, *Constrained BSDEs driven by a non quasi-left-continuous random measure and optimal control of PDMPs on bounded domains.* **SIAM Journal on Control and Optimization**, 57(6), 3767-3798, 2019.

[11] D. Addona, E. Bandini, F. Masiero, *A nonlinear Bismut-Elworthy formula for HJB equations with quadratic Hamiltonian in Banach spaces.* **Nonlinear Differential Equations and Applications**, 27(37), 2020. Published online: 13 June 2020.

[12] E. Bandini, M. Thieullen, *Optimal control of infinite dimensional Piecewise Deterministic Markov Processes: a BSDE approach. Application to the control of an excitable cell membrane.* **Applied Mathematics and Optimization**, Published online: 30 May 2020, DOI: 10.1007/s00245-020-09687-y.

[13] E. Bandini, F. Russo, *The identification problem for BSDEs driven by possibly non quasi-left-continuous random measures*. **Stochastics and Dynamics**, 20(6), 2040011 (27 pages), 2020.

[14] E. Bandini, T. De Angelis, G. Ferrari, F. Gozzi, *Optimal Dividend Payout under Stochastic Discounting*. **Mathematical Finance** 32, 627-677, 2022.

[15] E. Bandini, A. Calvia, K. Colaneri, *Stochastic filtering of a pure jump process with predictable jumps and path-dependent local characteristics*. **Stochastic Processes and their Applications** 151, 396-435, 2022.

[16] E. Bandini, F. Russo, *Weak Dirichlet processes and generalized martingale problems*. **Stochastic Processes and their Applications** 170, 104261, 2024.

[17] E. Bandini, F. Confortola, P. Di Tella, *Progressive Enlargement of Filtrations and Control Problems for Step Processes*. Preprint arXiv:2112.12884. To appear in **ALEA**.

Papers under review

[18] E. Bandini, F. Russo, *Path-dependent SDEs with jumps and irregular drift: well-posedness and Dirichlet properties*. Preprint arXiv:2211.03444.

[19] E. Bandini, F. Russo, *Characteristics and Itô's formula for weak Dirichlet processes: an equivalence result*. Preprint HAL:04019358.

[20] E. Bandini, G. Guatteri, G. Tessitore, *Singular limit of BSDEs and optimal control of two scale systems with jumps in infinite dimensional spaces*. Preprint arXiv:2401.07952.

Works in progress

[21] E. Bandini, C. Keller, *Path-dependent Hamilton-Jacobi-Bellman equations with u-dependence and time-measurable Hamiltonians*.

[22] E. Bandini, C. Keller, *Non-local Hamilton-Jacobi-Bellman equations and constrained Backward SDEs for the stochastic optimal control of path-dependent Piecewise Deterministic Processes*.

[23] E. Bandini, A. Calvia, *Optimal control of McKean-Vlasov PDPs*.

Talks

June 27, 2022 **Annecy, France**, Invited talk, "*Progressive enlargement of filtrations and control problems for step processes*", 9^{th} colloquium on Backward Stochastic Differential Equations and Mean Field Systems.

February 22, 2022 **Dipartimento di Matematica, Università di Torino**, Invited talk, "*Semimartingales with jumps, weak Dirichlet processes and martingale problems*", Torino seminar series in Stochastics and Mathematical Statistics.

February 21, 2022 **Online Workshop**, Invited seminar, "*Weak Dirichlet processes with jumps and generalized martingale problems*", UNA-Random Workshop.

December 20, 2021 **Dipartimento di Matematica, Università di Bologna**, Invited talk, "*BSDEs driven by general random measures*", Topics in Mathematics (series of seminars for PhD students).

November 19, 2020 **Dipartimento di Economia e Finanza, Università LUISS Roma**, Invited seminar, "*Optimal Dividend Payout under Stochastic Discounting*".

June 18, 2019 **Vietri sul Mare, Salerno**, Invited talk, "*BSDEs driven by general random measure and optimal control for piecewise deterministic Markov processes*", The Second Italian Meeting on Probability and Mathematical Statistics.

March 12, 2019 **Dipartimento di Statistica, Università di Bologna**, Invited seminar, "*BSDEs driven by general random measure and optimal control for piecewise deterministic Markov processes*".

July 3, 2018 **Technische Universität Wien**, Invited talk, "*The dividend problem with stochastic discount*", 14th Viennese Workshop on Optimal Control and Dynamic Games.

April 22, 2018 **Shanghai Jiao Tong University**, Invited talk, "*Constrained BSDEs driven by a non quasi-left-continuous and optimal control of Piecewise Deterministic Markov Processes*", The Fourth Young Researchers Meeting on BSDEs, Nonlinear Expectations and Mathematical Finance.

April 19, 2018 **Politecnico di Milano**, Invited talk, "*La società e le donne scienziate oggi*", Conversazione con Maria Gaetana Agnesi: Donna, matematica, milanese.

July 4, 2017 **University of Edimburgh**, Contributed talk, "*Existence and uniqueness for BSDEs driven by a general random measure, possibly non quasi-left-continuous. Application to the optimal control of Piecewise Deterministic Markov Processes*", Workshop on BSDEs and SPDEs, Edimburgh.

June 21, 2017 **Politecnico di Torino**, Contributed talk, "*Well-posedness results for BSDEs driven by a general random measure, possibly non quasi-left-continuous*", First Italian Meeting on Probability and Mathematical Statistics.

December 8, 2016 **Université Paris Diderot**, Invited seminar, "*Well-posedness results for BSDEs driven by a general random measure, possibly non quasi-left-continuous. Application to the optimal control of Piecewise Deterministic Markov Processes*".

June 1, 2016 **Levico Terme**, Invited short seminar, "*Existence and uniqueness for BSDEs driven by a general random measure, possibly non quasi-left-continuous*", Stochastic Partial Differential Equations and Applications - X.

May 17, 2016 **Dipartimento di Matematica, Università di Parma**, Invited seminar, "*Nonlinear Feynman-Kac representation for fully nonlinear Hamilton-Jacobi-Bellman integro-differential equations*".

March 15, 2016 **Dipartimento di Economia, Università di Parma**, Invited seminar, "*Randomization method and backward SDEs for optimal control of partially observed path-dependent stochastic systems*".

October 21, 2015 **Dipartimento di Matematica, Università di Padova**, Invited seminar, "*Optimal control of non-diffusive stochastic processes: constrained BSDE representation of the value function*".

June 15, 2015 **ENSTA ParisTech**, Invited seminar, "*Optimal control of non-diffusive stochastic processes: constrained BSDE representation of the value function*".

May 14, 2015 **Technische Universität Wien**, Contributed talk, "*Optimal control of pure jump Markov processes and constrained BSDEs with nonpositive jumps*", 13th Viennese Workshop on Optimal Control and Dynamic Games.

February 10, 2015 **Siem Reap, Cambogia**, Contributed talk, "*Optimal control of Piecewise Deterministic Markov Processes: constrained BSDE representation of the value function*", Paris-Southeast Asia Conference in Mathematical Finance.

February 4, 2015 **National University of Singapore**, Contributed talk, *NUS-Paris Diderot Workshop on Quantitative Finance*, "Optimal control of pure jump Markov processes and constrained BSDEs with nonpositive jumps".

November 24, 2014 **ENSTA ParisTech**, Invited seminar, "*Optimal control of pure jump Markov processes and constrained backward stochastic differential equations*".

November 20, 2013 **Dipartimento di Matematica, Politecnico di Milano**, Invited seminar, "*Optimal control of semi-Markov processes with a backward stochastic differential equations approach*".

Teaching Experience

2023–2024 **Complementi di Probabilità e Statistica Matematica** (LECTURER [48h]), Master Degree in Mathematics, Università di Bologna.

Calcolo delle Probabilità e Statistica (LECTURER [52h]), Bachelor Degree in Informatics, Università di Bologna.

2022–2023 **Equazioni Differenziali Stocastiche I** (LECTURER [26h]), Master Degree in in Mathematics, Università di Bologna.

Complementi di Probabilità e Statistica Matematica (LECTURER [48h]), Master Degree in Mathematics, Università di Bologna.

Calcolo delle Probabilità e Statistica (LECTURER [12h]), Bachelor Degree in Informatics, Università di Bologna.

2021–2022 **Matematica con Elementi di Statistica** (LECTURER [80h]), Bachelor Degree in Agricultural Technology, Università di Bologna.

2020–2021 **Algebra Lineare** (LECTURER [48h]), Bachelor Degree in Statistics, Università degli Studi di Milano-Bicocca.

Calcolo delle Probabilità (TEACHING ASSISTANT [24h]), Bachelor Degree in Mathematics, Università degli Studi di Milano-Bicocca. Course held by Prof. F. Caravenna.

2019–2020 **Markov Decision Models** (LECTURER [10h]), Master Degree in Quantitative Finance (Department of Statistics), Università di Bologna.

Algebra Lineare (LECTURER [42h]), Bachelor Degree in Statistics, Università degli Studi di Milano-Bicocca.

Calcolo delle Probabilità (TEACHING ASSISTANT [12h]), Bachelor Degree in Mathematics, Università degli Studi di Milano-Bicocca. Course held by Prof. F. Caravenna.

2018–2019 **Algebra Lineare** (LECTURER [42h]), Bachelor Degree in Statistics, Università degli Studi di Milano-Bicocca.

Calcolo delle Probabilità (TEACHING ASSISTANT [24h]), Bachelor Degree in Mathematics, Università degli Studi di Milano-Bicocca. Course held by Prof. F. Caravenna.

2017–2018 **Algebra Lineare** (LECTURER [21h]), Bachelor Degree in Statistics, Università degli Studi di Milano-Bicocca.

Matematica II (TEACHING ASSISTANT [24h]), Bachelor Degree in Chemistry, Università degli Studi di Milano-Bicocca. Course held by Prof. D. Noja.

2016–2017 **Portfolio Optimization** (LECTURER [40h]), Master Degree in Economics and Finance, Università Statale di Milano.

Mathematical Methods for Economics and Finance (TEACHING ASSISTANT [24h]), Master Degree in Economics and Finance, Università LUISS Guido Carli. Course held by Prof. F. Gozzi.

2015–2016 **Portfolio Optimization** (LECTURER [40h]), Master Degree in Economics and Finance, Università Statale di Milano.

2014–2015 **Statistica e Calcolo delle Probabilità** (TEACHING ASSISTANT [40h]), Bachelor Degree in Informatics Engineering, Politecnico di Milano. Course held by Prof. A. Barchielli.

Controllo Ottimo Stocastico (TEACHING ASSISTANT [6h]), Master Degree in Mathematical Engineering, Politecnico di Milano. Course held by Prof. M. Fuhrman.

2013–2014 **Statistica e Calcolo delle Probabilità** (TEACHING ASSISTANT [24h]), Bachelor Degree in Industrial Engineering, Politecnico di Milano. Course held by Prof. F. Confortola.

Calcolo delle Probabilità (TUTOR [12h]), Bachelor Degree in Mathematical Engineering, Politecnico di Milano. Course held by Prof. M. Fuhrman.

Statistica e Calcolo delle Probabilità (TEACHING ASSISTANT [40h]), Bachelor Degree in Informatics Engineering, Politecnico di Milano. Course held by Prof. A. Barchielli.

2012–2013 **Calcolo delle Probabilità** (TUTOR [12h]), Bachelor Degree in Mathematical Engineering, Politecnico di Milano. Course held by Prof. M. Fuhrman.

Supervisor Activity

2024 *Co-Supervisor* of the **Master Degree Thesis in Mathematics** of Francesca Penna.

2023 *Supervisor* of the **Master Degree Thesis in Mathematics** of Sara Scaltriti.

Supervisor of the **Bachelor Degree Thesis in Mathematics** of Marianna Selleri.

2022 *Supervisor* of the **Bachelor Degree Thesis in Mathematics** of Dario Lanzoni.

Institutional duties

2023 *Member* of the **PhD Committee** for the PhD dissertation of Benedetta Santerini, Phd Program in Mathematics, Informatics and Statistics at the Universities of Firenze and Perugia.

from 2022 *Member* of **Commissione Didattica** of the Department of Mathematics, University of Bologna.

Le dichiarazioni rese nel presente curriculum sono da ritenersi rilasciate ai sensi degli art. 46 e 47 del D.P.R. 445/2000.