

ELENA
BANDINI

CURRICULUM
VITAE

Università di Bologna
Dipartimento di Matematica
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PRESENT POSITION

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

LEAVE PERIODS

06/09/2023– 16/02/2024 Maternity leave.

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 **Junior Assistant Professor** (RTD-A) at Dipartimento di Matematica e Applicazioni, Università degli Studi di Milano-Bicocca.
- 01/2016– 10/2017 **Post-doc** at Dipartimento di Economia e Finanza, LUISS Guido Carli, Roma. Supervisor: Fausto Gozzi.

EDUCATION

- 2013–2015 **PhD in Mathematical Models and Methods in Engineering** at Politecnico di Milano and ENSTA ParisTech. Advisors: Marco Fuhrman and Francesco Russo.
- 2010–2012 **Master of Science in Mathematical Engineering** at Politecnico di Milano. Advisor: Marco Fuhrman.

- 09/2011– Graduate Exchange Program at Université Pierre et Marie
01/2012 Curie - Paris 6.
- 2007–2010 **Bachelor of Science in Mathematical Engineering** at
Politecnico di Milano. Advisor: Marco 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
- Stochastic filtering
- Backward stochastic differential equations
- Hamilton-Jacobi-Bellman equations

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. PI: Alessandro Calvia.
- 2023: Member of the **research project** “*Riduzione del modello in sistemi dinamici stocastici in dimensione infinita a due scale*” supported by GNAMPA. PI: Giuseppina Guatteri.
- 2022-2023: Member of the Bologna unit of the **PRIN project** “*Entropy Martingale Optimal Transport and McKean-Vlasov equations*”. PI of the national project: Marco Frittelli.
- 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. PI: Alessandro Calvia.
- 2018: PI 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.
- 2017: Member of the **research project** “*Nuovi metodi probabilistici nello studio di problemi di controllo ottimo stocastico*” supported by GNAMPA. PI: Andrea Cosso.

- 2015-2016: Member of the LUISS Roma unit of the **PRIN project** “*Deterministic and stochastic evolution equations*”. PI of the national project: Alessandra Lunardi.
- 2015: Member of the **research project** “*Applicazioni innovative di processi di punto marcato*” supported by GNAMPA. PI: Fulvia 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. PI: Fulvia Confortola.
- 2010-2011: Member of the Politecnico di Milano unit (responsible Marco Fuhrman) of the **PRIN project** “*Problemi differenziali di evoluzione: approcci deterministici e stocastici e loro interazioni*”. PI of the national project: Marco Fuhrman.

OTHER SCIENTIFIC ACTIVITIES

- June 10-14, 2024, **4th Italian Meeting on Probability and Mathematical Statistics**, Roma, Italy. Organizer of the invited session “*Stochastic optimal control of McKean-Vlasov equations*”.
- June 13-16, 2022, **3rd Italian Meeting on Probability and Mathematical Statistics**, Bologna, Italy. Component of the Local Organizing Committee.
- June 17-21, 2019, **2nd Italian Meeting on Probability and Mathematical Statistics**, Vietri sul Mare, Salerno. Co-organizer (with Alessandro 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 Fausto Gozzi and Giorgio Fabbri) of the special session “*Infinite dimensional stochastic modeling in economics and finance*”.

PUBLISHED 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.
- [12] 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.

- [13] 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**, 84, 1549-1603, 2021.
- [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.* **ALEA** 120, 21-95, 2024.

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 Piecewise Deterministic Processes.*

TALKS

- June 11, **Rome, Italy**, Invited talk, “*Optimal Control of McKean-Vlasov Piecewise Deterministic Processes*”, 4th Italian Meeting on Probability and Mathematical Statistics.
- June 27, **Annecy, France**, Invited talk, “*Progressive enlargement of filtrations and control problems for step processes*”, 9th colloquium on Backward Stochastic Differential Equations and Mean Field Systems.
- February 22, **Università di Torino, Dipartimento di Matematica**, 2022 Invited seminar, “*Semimartingales with jumps, weak Dirichlet processes and martingale problems*”, Torino seminar series in Stochastics and Mathematical Statistics.
- February 21, **Online Workshop**, Invited talk, “*Weak Dirichlet processes with jumps and generalized martingale problems*”, 2022 UNA-Random Workshop.
- December 20, 2021 **Università di Bologna, Dipartimento di Matematica**, Invited seminar, “*BSDEs driven by general random measures*”, Topics in Mathematics (series of seminars for PhD students).
- November 19, 2020 **Università LUISS Roma, Dipartimento di Economia e Finanza**, Invited seminar, “*Optimal Dividend Payout under Stochastic Discounting*”.
- June 18, **Vietri sul Mare, Salerno**, Invited talk, “*BSDEs driven by general random measure and optimal control for piecewise deterministic Markov processes*”, 2nd Italian Meeting on Probability and Mathematical Statistics.
- March 12, **Università di Bologna, Dipartimento di Statistica**, 2019 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, **Shanghai Jiao Tong University**, Invited talk, “*Constrained BSDEs driven by a non quasi-left-continuous and optimal control of Piecewise Deterministic Markov Processes*”, 4th Young Researchers Meeting on BSDEs, Nonlinear Expectations and Mathematical Finance.
- April 19, **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*”, 1st 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 talk, “*Existence and uniqueness for BSDEs driven by a general random measure, possibly non quasi-left-continuous*”, 10th Meeting on Stochastic Partial Differential Equations and Applications.
- May 17, 2016 **Università di Parma, Dipartimento di Matematica**, Invited seminar, “*Nonlinear Feynman-Kac representation for fully nonlinear Hamilton-Jacobi-Bellman integro-differential equations*”.
- March 15, 2016 **Università di Parma, Dipartimento di Economia**, Invited seminar, “*Randomization method and backward SDEs for optimal control of partially observed path-dependent stochastic systems*”.
- October 21, 2015 **Università di Padova, Dipartimento di Matematica**, 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, ,
 “*Optimal control of pure jump Markov processes and constrained BSDEs with nonpositive jumps*”, NUS-Paris Diderot Workshop on Quantitative Finance.
- November 24, 2014 **ENSTA ParisTech**, Invited seminar, "*Optimal control of pure jump Markov processes and constrained backward stochastic differential equations*".
- November 20, 2013 **Politecnico di Milano, Dipartimento di Matematica**, Invited seminar, “*Optimal control of semi-Markov processes with a backward stochastic differential equations approach*”.

VISITING PERIODS

- **Université Pierre et Marie Curie - Paris 6**, Invited by Michèle Thiullen, November 2017 (1 week), May 2017 (1 week), December 2016 (1 week).
- **ENSTA ParisTech, École Nationale Supérieure de Techniques Avancées**, Invited by Francesco Russo, 2014 (2 months), 2015 (2 months), May 2017 (1 week), December 2016 (1 week).

SUPERVISOR ACTIVITY

- 2024 Co-Supervisor of the **Master Degree Thesis in Mathematics** of Francesca Penna.
 Supervisor of the **Tirocinio Activity of the Master Degree in Mathematics** of Luca Denti.
- 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

- 2022– Present Member of the **Commissione Didattica**, Dipartimento di Matematica, Università di Bologna.
- 2023 Member of the **PhD Committee** for the PhD dissertation of Benedetta Santerini, Phd Program in Mathematics, Informatics and Statistics at Università di Firenze e Perugia.

TEACHING ACTIVITY

- 2023–2024 Lecturer of **Complementi di Probabilità e Statistica Matematica** [48h], Master Degree in Mathematics, Università di Bologna.
Lecturer of **Calcolo delle Probabilità e Statistica** [52h], Bachelor Degree in Informatics, Università di Bologna.
- 2022–2023 Lecturer of **Equazioni Differenziali Stocastiche I (modulo 2 - Controllo Ottimo Stocastico)** [26h], Master Degree in Mathematics, Università di Bologna.
Lecturer of **Complementi di Probabilità e Statistica Matematica** [48h], Master Degree in Mathematics, Università di Bologna.
Lecturer of **Calcolo delle Probabilità e Statistica (modulo 2)** [12h], Bachelor Degree in Informatics, Università di Bologna.
- 2021–2022 Lecturer of **Matematica con Elementi di Statistica** [80h], Bachelor Degree in Agricultural Technology, Università di Bologna.
- 2020–2021 Lecturer of **Algebra Lineare** [48h], Bachelor Degree in Statistics, Università degli Studi di Milano-Bicocca.
Teaching assistant of **Calcolo delle Probabilità** [24h], Bachelor Degree in Mathematics, Università degli Studi di Milano-Bicocca. Course held by F. Caravenna.
- 2019–2020 Lecturer of **Markov Decision Models** [10h], Master Degree in Quantitative Finance, Università di Bologna.
Lecturer of **Algebra Lineare** [42h], Bachelor Degree in Statistics, Università degli Studi di Milano-Bicocca.
Teaching assistant of **Calcolo delle Probabilità** [12h], Bachelor Degree in Mathematics, Università degli Studi di Milano-Bicocca. Course held by F. Caravenna.
- 2018–2019 Lecturer of **Algebra Lineare** [42h], Bachelor Degree in Statistics, Università degli Studi di Milano-Bicocca.
Teaching assistant of **Calcolo delle Probabilità** [24h], Bachelor Degree in Mathematics, Università degli Studi di Milano-Bicocca. Course held by F. Caravenna.
- 2017–2018 Lecturer of **Algebra Lineare** [21h], Bachelor Degree in Statistics, Università degli Studi di Milano-Bicocca.
Teaching assistant of **Matematica II** [24h], Bachelor Degree in Chemistry, Università degli Studi di Milano-Bicocca. Course held by D. Noja.
- 2016–2017 Lecturer of **Portfolio Optimization** [40h], Master Degree in Economics and Finance, Università Statale di Milano.

- Teaching assistant of **Mathematical Methods for Economics and Finance** [24h], Master Degree in Economics and Finance, Università LUISS Guido Carli. Course held by F. Gozzi.
- 2015–2016 Lecturer of **Portfolio Optimization** [40h], Master Degree in Economics and Finance, Università Statale di Milano.
- 2014–2015 Teaching assistant of **Statistica e Calcolo delle Probabilità** [40h], Bachelor Degree in Informatics Engineering, Politecnico di Milano. Course held by A. Barchielli.
- Teaching assistant of **Controllo Ottimo Stocastico** [6h], Master Degree in Mathematical Engineering, Politecnico di Milano. Course held by M. Fuhrman.
- 2013–2014 Teaching assistant of **Statistica e Calcolo delle Probabilità** [24h], Bachelor Degree in Industrial Engineering, Politecnico di Milano. Course held by F. Confortola.
- Tutor of **Calcolo delle Probabilità** [12h], Bachelor Degree in Mathematical Engineering, Politecnico di Milano. Course held by M. Fuhrman.
- Teaching assistant of **Statistica e Calcolo delle Probabilità** [40h], Bachelor Degree in Informatics Engineering, Politecnico di Milano. Course held by A. Barchielli.
- 2012–2013 Tutor of **Calcolo delle Probabilità** [12h], Bachelor Degree in Mathematical Engineering, Politecnico di Milano. Course held by M. Fuhrman.