

## CURRICULUM VITAE

Elsa Maria Marchini

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place and date of birth: Crema, CR (I), August 30th, 1975;  
citizenship: italian; married, two children.

### Education

high school degree “Maturità Scientifica”, Liceo Scientifico L. Da Vinci of Crema (CR) (1994);  
violin diploma, Conservatorio G. Verdi of Milano (1997);  
degree in Mathematics, Università degli Studi di Milano, advisor Prof. Roberto Lucchetti, final mark: 110 cum laude (2001);  
PhD in Pure and Applied Mathematics, Università degli Studi di Milano-Bicocca, advisor Prof. Arrigo Cellina (2004).

### Academic appointments

research fellowship at Ecole Polytechnique, Paris (2004–2005);  
research fellowship at Università di Milano-Bicocca (2005–2008);  
ricercatore of Mathematical Analysis (tenured assistant professor) at Politecnico di Milano (2008–2015);  
professore di ruolo di II fascia of Mathematical Analysis at Politecnico di Milano (2015–today).  
*abilitazione scientifica nazionale* as professore ordinario (full professor) area 01/A3, Analisi Matematica, Probabilità e Statistica Matematica, since January 2020.

### Main scientific interests

optimal control theory in finite and infinite dimension.

### Research projects

member of GNAMPA (2002–today);  
member of the MIUR-PRIN Research Project “Transizioni di fase, isteresi e scale multiple” (2008–2010);  
member of the GDRE INdAM-CNRS “Control of Partial Differential Equations” (2013–2017);  
coordinator of the projects financed by GNAMPA:  
“Equazioni di evoluzione con memoria e controllo ottimo: un approccio deterministica e stocastico” (2011);  
“Equazioni integro-differenziali: aspetti teorici e applicazioni” (2019); “Controllo ottimo infinito dimensionale: aspetti teorici ed applicazioni” (2024);  
member of the projects financed by GNAMPA:  
“Sistemi differenziali con memoria” (2010); “Analisi e controllo per sistemi con memoria” (2012); “Controllo moltiplicativo per modelli diffusivi nonlineari” (2014); “Proprietà asintotiche di sistemi differenziali con memoria degenera” (2015); “Regolarità e comportamento asintotico di soluzioni di equazioni paraboliche” (2016); “Algoritmi di ottimizzazione ed equazioni di evoluzione ereditarie” (2017); “Evoluzione e controllo ottimo in spazi di Wasserstein” (2022); “Metodi di mean field control e mean field game per la mobilità e lo sviluppo sostenibile” (2023).

### Visits

CREA, Ecole Polytechnique, Paris (2005, 2006, 2007);  
Dipartimento di Matematica, Università di Roma Tor Vergata (2006, 2011, 2012);  
Department of Electrical and Electronic Engineering, Imperial College, London (2008, 2017, 2019, 2023, 2024);  
Institut de Mathématiques de Jussieu, Paris (2011, 2013, 2014, 2015, 2016, 2017, 2018, 2020, 2022, 2023);  
Penn State University Mathematics Department, State College (2021, 2023, 2024).

### Academic activity

member of the faculty of the Phd program in Mathematical Models and Methods in Engineering at Politecnico di Milano (2013–today).

### **Congress organization**

Workshop on Mathematical Control Theory, Università di Milano-Bicocca (2007);  
Trends in Mathematical Analysis, Politecnico di Milano (2012);  
Workshop on Control Theory and Related Topics, Politecnico di Milano (2015);  
Two-day workshop on deterministic and stochastic control, Politecnico di Milano (2022).

### **Invited talks**

Università degli Studi di Padova (2003);  
Università di Modena e Reggio Emilia (2004);  
Institut Henri Poincaré, Parigi; Spring School on Variational Problems in Nonlinear Analysis, SISSA, Trieste;  
Workshop on Evolution Equations for Deterministic and Stochastic Systems, Pisa; Université de Bretagne Occidentale, Brest; Institut Henri Poincaré, Parigi; Università degli Studi di Padova (2005);  
Workshop on Evolution Equations for Deterministic and Stochastic Systems, Vienna; Views on ODEs, Conference in Honor of Arrigo Cellina and James A. Yorke, Aveiro University; Variational and Differential Problems with Constraints, Conference in honor of Arrigo Cellina, Venezia (2006);  
Università degli Studi di Roma “Tor Vergata”; ICIAM 07, 6<sup>th</sup> International Congress on Industrial and Applied Mathematics, Zurigo (2007);  
The 8<sup>th</sup> AIMS Conference on Dynamical Systems, Differential Equations and Applications, Dresda; Ottava Giornata di Studio Università di Pavia–Politecnico di Milano, Equazioni Differenziali e Calcolo delle Variazioni, Politecnico di Milano (2010);  
Institut de Mathématiques de Jussieu, Université Pierre et Marie Curie (Paris 6); Nonlinear differential equations and control, celebrating Arrigo Cellina’s 70th birthday, Milan (2011);  
Università degli Studi di Roma “Tor Vergata”; INDAM Workshop Mathematical models and analytical problems in special materials, Rome (2012);  
Università degli Studi di Milano-Bicocca (2013);  
INDAM Workshop Analysis and Geometry in Control Theory and its Applications, with a special tribute to Hélène Frankowska and Héctor J. Sussmann, Rome; PDE methods and challenges in control and inverse problems, the First Joint Meeting RSME-SCM-SEMA-SIMAI-UMI, Bilbao; The 10<sup>th</sup> AIMS Conference on Dynamical Systems, Differential Equations and Applications, Madrid (2014);  
Conference on Partial Differential Equations, Munich; Workshop on Control of PDEs organized jointly by the GDRE CONEDP and the Gran Sasso Science Institute, L’Aquila; New advances in PDE’s, Inverse Problems and Control Theory, Parma; One-day workshop on deterministic and stochastic differential equations, Universidad de Sevilla (2015);  
Recent trends in differential equations, Conference in Honor of Arrigo Cellina and Alberto Bressan, Aveiro University (2016);  
Partial Differential Equations and Applications, Bologna; International Conference on Differential and Difference Equations and Applications 2017, Amadora; Conference on Control of state constrained dynamical systems, Padova (2017);  
Workshop Nonsmooth and Variational Analysis, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna; Congresso UMI 2019, Pavia; 2019 IEEE 58th Conference on Decision and Control (CDC), Nice (2019);  
Università degli Studi di Roma “Tor Vergata” (2020);  
8th European Congress of Mathematics; Conference Analysis, Control, and Numerics for PDE Models of Interest to Physical and Life Sciences, Levico Terme; Computational and Applied Mathematics Colloquium, Penn State University Mathematics Department (2021);  
School-Workshop on Analysis, Control and inverse problems for diffusive systems with application to natural and social sciences, Bari (2022);  
New Trends and Challenges in Optimization Theory Applied to Space Engineering conference, Gran Sasso Science Institute, L’Aquila (2023);  
Two-day Workshop on Nonlinear Analysis, Politecnico di Torino (2024).

### **Teaching activity**

courses of Mathematical Analysis 1 and 2 and Geometry, for degrees in Engineering at Politecnico di Milano;  
tutorials of Measure Theory for the degree in Mathematics at Università di Milano Bicocca and Real Anal-

ysis and Functional Analysis for the master in Mathematical Engineering at Politecnico di Milano;  
Phd course of Optimal Control Theory for the Phd program in Mathematical Models and Methods in Engineering at Politecnico di Milano.

### Editorial work

has served as a referee for Asymptotic Analysis, Canadian Journal of Mathematics, ESAIM: Control, Optimisation and Calculus of Variations, Journal of Mathematical Analysis and Applications, Journal of Optimization Theory and Applications, Milan Journal of Mathematics, Nonlinear Differential Equations and Applications, Nonlinear Analysis, SIAM J. Control Optim.

### List of publications

- [1 ] E.M. Marchini, *Porosity and variational principles*, Serdica Math. J. 28 (2002), 37–46.
- [2 ] A. Cellina, A. Ferriero, E.M. Marchini, *Reparametrizations and approximate values of integrals of the Calculus of Variations*, J. Differential Equations 193 (2003), 374–384.
- [3 ] A. Ferriero, E.M. Marchini, *On the validity of the Euler-Lagrange equation*, J. Math. Anal. Appl. 304 (2005), 356–369.
- [4 ] A. Cellina, A. Ferriero, E.M. Marchini, *On the existence of solutions to a class of minimum time control problems and applications to Fermat's Principle and to the Brachystocrone*, Systems and Control Letters 55 (2006), 119–123.
- [5 ] S. Bertone, A. Cellina, E.M. Marchini, *On Hopf's Lemma and on the Strong Maximum Principle*, Comm. Partial Differential Equations, 31 (2006), 701–733.
- [6 ] H. Frankowska, E.M. Marchini, *Lipschitzianity of optimal trajectories for the Bolza optimal control problem*, Calc. Var. Partial Differential Equations, 27 (2006), 467–492.
- [7 ] V. Felli, E.M. Marchini, S. Terracini, *On Schrödinger operators with multipolar inverse-square potentials*, J. Func. Anal., 250 (2007), 265–316.
- [8 ] V. Felli, E.M. Marchini, S. Terracini, *On the behavior of solutions to Schrödinger equations with dipole type potentials near the singularity*, Discrete Contin. Dyn. Syst., 21 (2008), 91–119.
- [9 ] P. Cannarsa, H. Frankowska, E.M. Marchini, *Lipschitz continuity of optimal trajectories in deterministic optimal control*, Differential equations, chaos and variational problems, 105–116, Progr. Nonlinear Differential Equations Appl., 75, Birkhäuser, Basel, 2008.
- [10 ] P. Cannarsa, H. Frankowska, E.M. Marchini, *On Bolza optimal control problems with constraints*, Discrete Contin. Dyn. Syst., 11 (2009), 629–653.
- [11 ] P. Cannarsa, H. Frankowska, E.M. Marchini, *Existence and Lipschitz Regularity of solutions to Bolza problems in optimal control*, Trans. Amer. Math. Soc., 361 (2009), 4491–4517.
- [12 ] V. Felli, E.M. Marchini, S. Terracini, *On Schrödinger operators with multisingular inverse-square anisotropic potentials*, Indiana Univ. Math. J., 58 (2009), 617–676.
- [13 ] M. Conti, E.M. Marchini, V. Pata, *Semilinear wave equations of viscoelasticity in the minimal state framework*, Discrete Contin. Dyn. Syst., 27 (2010), 1535–1552.
- [14 ] M. Conti, E.M. Marchini, *Wave equations with memory: the minimal state approach*, J. Math. Anal. Appl., 384 (2011), 607–625.
- [15 ] M. Conti, E.M. Marchini, V. Pata, *Approximating infinite delay with finite delay*, Commun. Contemp. Math., 14 (2012), no.1250012, 13 pp.
- [16 ] P. Cannarsa, H. Frankowska, E.M. Marchini, *Optimal control for evolution equations with memory*, J. Evol. Equ. 13 (2013), 197–227.

- [17 ] M. Conti, E.M. Marchini, V. Pata, *Exponential stability in hyperbolic heat conduction with hereditary memory*, Discrete Contin. Dyn. Syst., 18 (2013), 1555–1565.
- [18 ] M. Conti, E.M. Marchini, V. Pata, *A well posedness result for nonlinear viscoelastic equations with memory*, Nonlinear Anal., 94 (2014), 206–216.
- [19 ] M. Conti, E.M. Marchini, V. Pata, *Reaction-diffusion with memory in the minimal state framework*, Trans. Amer. Math. Soc., 366 (2014), 4969–4986.
- [20 ] M. Conti, E.M. Marchini, V. Pata, *Nonclassical diffusion with memory*, Math. Methods Appl. Sci., 38 (2015), 948–958.
- [21 ] H. Frankowska, E.M. Marchini, M. Mazzola, *A relaxation result for state constrained inclusions in infinite dimension*, Math. Control Relat. Fields, 6 (2016), 113–141.
- [22 ] M. Conti, E.M. Marchini, *A remark on nonclassical diffusion equations with memory*, Appl. Math. Optim., 73 (2016), 1–21.
- [23 ] M. Conti, E.M. Marchini, V. Pata, *Global attractors for nonlinear viscoelastic equations with memory*, Comm. Pure Appl. Anal., 15 (2016), 1893–1913.
- [24 ] M. Conti, T.F. Ma, E.M. Marchini, P.N. Seminario Huertas, *Asymptotics of viscoelastic materials with nonlinear density and memory effects*, J. Differential Equations, 264 (2018), 4235–4259.
- [25 ] H. Frankowska, E.M. Marchini, M. Mazzola, *Necessary optimality conditions for infinite dimensional state constrained control problems*, J. Differential Equations, 264 (2018), 7294–7327.
- [26 ] H. Frankowska, E.M. Marchini, M. Mazzola, *Distance estimates for state constrained trajectories of infinite dimensional differential inclusions*, ESAIM Control Optim. Calc. Var., 24 (2018), 1207–1229.
- [27 ] H. Frankowska, E.M. Marchini, M. Mazzola, *On second order necessary conditions in infinite dimensional optimal control with state constraints*, 2019 IEEE 58th Conference on Decision and Control (CDC) (2019), 2416–2421.
- [28 ] F. Gazzola, E.M. Marchini, *The moon lander optimal control problem revisited*, Mathematics in Engineering, 3 (2021), 1–14.
- [29 ] F. Gazzola, E.M. Marchini, *A minimum time optimal control for a drone landing problem*, ESAIM Control Optim. Calc. Var., 27 (2021), 1–34.
- [30 ] H. Frankowska, E.M. Marchini, M. Mazzola, *Second-order necessary conditions in optimal control of evolution systems*, J. Evol. Equ., 23, 5 (2023), 1–43.
- [31 ] H. Frankowska, E.M. Marchini, M. Mazzola, *Second-order sufficient conditions in optimal control of evolution systems*, J. Evol. Equ., 24, 40 (2024), 1–40.
- [32 ] R.B. Vinter, E.M. Marchini, *The maximum principle for lumped-distributed control systems*, a preprint (2023).