

CURRICULUM VITAE

Elsa Maria Marchini

Dipartimento di Matematica “Francesco Brioschi”, Politecnico di Milano
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Personal data

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

Education

1994 high school degree “Maturità Scientifica”, Liceo Scientifico L. Da Vinci of Crema (CR)
1997 violin diploma, Conservatorio G. Verdi of Milano
2001 degree in mathematics, Università degli Studi di Milano, thesis title: *Porosità e principi variazionali* (Porosity and variational principles), advisor Prof. Roberto Lucchetti, final mark: 110 cum laude
2004 PhD in pure and applied mathematics, Università degli Studi di Milano-Bicocca, thesis title: *Techniques in the Calculus of Variations*, advisor Prof. Arrigo Cellina

Academic appointments

2004–2005 research fellowship under the supervision of Prof. Hélène Frankowska at Ecole Polytechnique, Paris
2005 research fellowship under the supervision of Prof. Susanna Terracini at Università di Milano-Bicocca
2006–2008 research fellowship at Università di Milano-Bicocca
2008–2015 ricercatore of mathematical analysis (tenured assistant professor) at Politecnico di Milano
2015–today associate professor of mathematical analysis at Politecnico di Milano

Research projects

2002–today member of GNAMPA
2008–2010 member of the MIUR-PRIN Research Project 2008 “Transizioni di fase, isteresi e scale multiple”, coordinated by A. Visintin
2013–2017 member of the Groupement De Recherche Europeen INdAM-CNRS “Control of Partial Differential Equations”

- 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)
- 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)

Main scientific interests

optimal control theory in finite and infinite dimension; asymptotic analysis of evolution equations with memory; the classical problem of the calculus of variations, necessary conditions satisfied by the solutions, the Lavrientiev phenomenon

List of publications

- [1] E.M. Marchini, *Porosity and variational principles*, Serdica Math. J. 28 (2002), 1, 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), 2, 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), 2, 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), 5, 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), 4, 467–492.
- [7] V. Felli, E.M. Marchini, S. Terracini, *On Schrödinger operators with multipolar inverse-square potentials*, J. Func. Anal., 250 (2007), 2, 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), 1, 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), 3, 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), 2, 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), 4, 1535–1552.
- [14] M. Conti, E.M. Marchini, *Wave equations with memory: the minimal state approach*, J. Math. Anal. Appl., 384 (2011), 2, 607–625.
- [15] M. Conti, E.M. Marchini, V. Pata, *Approximating infinite delay with finite delay*, Commun. Contemp. Math., 14 (2012), 2, no.1250012, 13 pp.
- [16] P. Cannarsa, H. Frankowska, E.M. Marchini, *Optimal control for evolution equations with memory*, J. Evol. Equ. 13 (2013), 1, 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), 6, 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), 6, 4969–4986.

- [20] M. Conti, E.M. Marchini, V. Pata, *Nonclassical diffusion with memory*, Math. Methods Appl. Sci., 38 (2015), 5, 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), 1, 113–141.
- [22] M. Conti, E.M. Marchini, *A remark on nonclassical diffusion equations with memory*, Appl. Math. Optim., 73 (2016), 1, 1–21.
- [23] M. Conti, E.M. Marchini, V. Pata, *Global attractors for nonlinear viscoelastic equations with memory*, Comm. Pure Appl. Anal., 15 (2016), 5, 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), 7, 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), 12, 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*, Proceedings of the 58th IEEE Conference on Decision and Control, to appear.
- [28] H. Frankowska, E.M. Marchini, M. Mazzola, *A unified approach to first and second order necessary conditions in optimal control for PDEs*, a preprint (2019).

Visits

CREA, Ecole Polytechnique, Paris, November-December 2005, February-March 2006, February 2007;
 Dipartimento di Matematica, Univeristà di Roma Tor Vergata, July 2006, July 2011, March 2012;
 Department of Electrical and Electronic Engineering, Imperial College, London, May 2008, April 2017, April 2019;
 Institut de Mathématiques de Jussieu, Paris, March 2011, November 2011, November 2013, November 2014, March 2016, September 2016, September 2017, January 2018, May 2018, November 2018.

Congress organization

2007 Workshop on Mathematical Control Theory, Milano-Bicocca;
 2012 Trends in Mathematical Analysis, Politecnico di Milano;
 2015 Workshop on Control Theory and Related Topics, Politecnico di Milano.

Talks

2003 Università degli Studi di Padova
 2004 Università di Modena e Reggio Emilia
 2005 Institut Henri Poincaré, Parigi
 2005 Spring School on Variational Problems in Nonlinear Analysis, SISSA, Trieste
 2005 Workshop on Evolution Equations for Deterministic and Stochastic Systems, Pisa
 2005 Université de Bretagne Occidentale, Brest
 2005 Institut Henri Poincaré, Parigi
 2005 Università degli Studi di Padova
 2006 Workshop on Evolution Equations for Deterministic and Stochastic Systems, Vienna
 2006 Views on ODEs, Conference in Honor of Arrigo Cellina and James A. Yorke on the Occasion of their 65th Birthdays, Aveiro University, Aveiro

- 2006 Variational and Differential Problems with Constraints, Conference in honor of Arrigo Cellina on the occasion of his 65th birthday, Venezia
- 2007 Università degli Studi di Roma “Tor Vergata”
- 2007 ICIAM 07, 6th International Congress on Industrial and Applied Mathematics, Zurigo
- 2010 The 8th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Dresda
- 2010 Ottava Giornata di Studio Università di Pavia–Politecnico di Milano, Equazioni Differenziali e Calcolo delle Variazioni, Politecnico di Milano
- 2011 Institut de Mathématiques de Jussieu, Université Pierre et Marie Curie (Paris 6), Paris
- 2011 Nonlinear differential equations and control, celebrating Arrigo Cellina’s 70th birthday, Milan
- 2012 Università degli Studi di Roma “Tor Vergata”
- 2012 INDAM Workshop Mathematical models and analytical problems in special materials, Rome
- 2013 Università degli Studi di Milano-Bicocca
- 2014 INDAM Workshop Analysis and Geometry in Control Theory and its Applications, with a special tribute to Hélène Frankowska and Héctor J. Sussmann, Rome
- 2014 PDE methods and challenges in control and inverse problems, the First Joint Meeting RSME-SCM-SEMA-SIMAI-UMI, Bilbao
- 2014 The 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Madrid
- 2015 Conference on Partial Differential Equations, Munich.
- 2015 Workshop on Control of PDEs organized jointly by the GDRE CONEDP and the Gran Sasso Science Institute, L’Aquila
- 2015 New advances in PDE’s, Inverse Problems and Control Theory, Parma
- 2015 One-day workshop on deterministic and stochastic differential equations, Universidad de Sevilla
- 2016 Recent trends in differential equations, Conference in Honor of Arrigo Cellina and Alberto Bressan, Aveiro University, Aveiro
- 2017 Partial Differential Equations and Applications, Bologna
- 2017 International Conference on Differential and Difference Equations and Applications 2017, Amadora
- 2017 Conference on Control of state constrained dynamical systems, Padova
- 2019 Workshop Nonsmooth and Variational Analysis, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna
- 2019 Congresso UMI 2019, Pavia

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, Nonlinear Differential Equations and Applications, Nonlinear Analysis

Academic activity

2013–today member of the faculty of the Phd program in Mathematical Engineering at Politecnico di Milano

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 Analysis 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 Engineering at Politecnico di Milano.