

Curriculum vitae et studiorum

Name Francesca Bucci

Personal data Born in Perugia, Italy, on November 28, 1962. Italian citizen.
Married, two children.¹

Current position *Ricercatrice*² (confermata) in *Mathematical Analysis* at the Dipartimento di Matematica Applicata, Università degli Studi di Firenze.

Education

– PhD in Mathematics, Università di Pisa, September 1993 (official ratification: October 20, 1995).

Advisor: Giuseppe Da Prato (Scuola Normale Superiore, Pisa)

Thesis: *Some results on control of Partial Differential Equations.*

– Italian Doctoral Degree in Mathematics (former “Laurea in Matematica”) *summa cum laude*, Università degli Studi di Firenze, Italy, 1987.

Advisor: Roberto Conti (Università degli Studi di Firenze)

Thesis: *Soluzioni periodiche dell’equazione di Liénard generalizzata.*

Employment/Academic Positions

– November 1994–present: *Ricercatrice*, Università degli Studi di Firenze, Faculty of Engineering;

– November 1990–November 1994: *Ricercatrice*, Università degli Studi di Modena, Faculty of Sciences.

Visiting Appointments

– Institut Henri Poincaré (IHP), Université Paris VI, within the trimester “Theorie du controle et applications”, two weeks during March 1998;

– University of Virginia, Department of Mathematics, as an awardee of the NATO-CNR “Senior” Fellowships programme (April–June 2001).

– Centro di Ricerca Matematica Ennio De Giorgi, within the programme “Research in Pairs”, with Daniel Toundykov (University of Nebraska-Lincoln), two weeks during February 2008.

Fellowships, Awards

– Scholarship of the C.N.R. (Italian National Research Council): Firenze, 1987;

– 1989 Premio di Laurea “Giovanni Sansone” of the Fondazione Pontello: received an award (along with a prize of one million of Italian Lire) for her “Tesi di Laurea” (Master thesis) on Ordinary Differential Equations;

– Fellowship of the *Istituto Nazionale di Alta Matematica*: Firenze, 1987–1988;

– Grant of the *Scuola di Dottorato di Ricerca* (PhD) in Mathematics of the Università di Pisa: 1988–1990.

– Fellowship of the *NATO-CNR Senior Fellowships programme* (1999), to support research at the Department of Mathematics of University of Virginia (April–June 2001).

¹On maternity leave: April–December 2000, November 2003 – June 2004.

²*Ricercatore* is equivalent to *Assistant Professor*, “confermato” means that it is a tenured position.

- “Research in Pairs” programme, Centro di Ricerca Matematica Ennio De Giorgi, Pisa (February 2008).

Research Interests

F. Bucci’s research interests lie in the following themes of the *Analysis and Control of Partial Differential Equations (PDE) of evolutionary type*:

- analysis of initial/boundary value problems for a single evolutionary PDE or composite systems of PDE, such as systems for acoustic-structure or fluid-structure interactions: well-posedness, sharp interior or boundary regularity of the solutions, *etc.*
- optimal control with quadratic functionals and Riccati equations for systems described by PDE with boundary or point control;
- long-time behaviour of linear and nonlinear PDEs:
 - stability/stabilizability properties,
 - nonlinear dissipative PDE systems: existence of global attractors (and their structure—fractal dimension, regularity, *ecc.*);
- the LQR problem with non-definite cost functionals and *frequency domain* techniques.

Publications

A) Refereed articles on international journals or books:

1. F. BUCCI, On the existence of periodic solutions for the generalized Liénard equation, *Boll. UMI* **3-B** (1989), n. 7, 155–168.
2. F. BUCCI E G. VILLARI, Phase portrait of the system $x' = y$, $y' = F(x, y)$, *Boll. UMI* **4-B** (1990), n. 7, 265–274.
3. F. BUCCI, A Dirichlet boundary control problem for the strongly damped wave equation, *SIAM J. Control Optim.* **30** (1992), n. 5, 1092–1100.
4. F. BUCCI, Singular perturbation for controlled wave equations, *J. Math. Syst. Estim. Control* **6** (1996), n. 2, 135–149 (“Summary” pubblicato nel Vol. 4, n. 3, (1994)).
5. F. BUCCI, A hyperbolic problem with boundary control: a solution through parabolic regularization, in: “Control of Partial Differential Equations”, *Lect. Notes Pure Appl. Math.* 165 (1994), Marcel Dekker, Inc., New York, 23–35.
6. F. BUCCI, Regularization and approximation of the wave equation with boundary input: an abstract approach, *Dynamic Syst. Appl.* **3** (1994), 453–464.
7. F. BUCCI, A remark on regularization of the wave equation with boundary input, in: “Partial Differential Equations Methods in Control and Shape Analysis”, *Lect. Notes Pure Appl. Math.* 188 (1997), Marcel Dekker, Inc., New York, 53–62.
8. F. BUCCI AND L. PANDOLFI, Finite horizon regulator problem: the non-standard case, in: “Modelling and optimization of distributed parameter systems”, (K. Malanowski, Z. Nahorski e M. Peszyńska Ed.), Chapman & Hall Publ., New York, (1996), 131–138.
9. F. BUCCI AND L. PANDOLFI, The value function of the singular quadratic regulator problem with distributed control action, *SIAM J. Control Optim.* **36** (1998), n. 1, 115–136.

10. F. BUCCI, Absolute stability of feedback systems in Hilbert spaces, in: *Optimal Control: Theory, Algorithms, and Applications* (W.W. Hager e P.M. Pardalos Ed.), Kluwer Academic Publishers, Boston, (1998), 24–39.
11. F. BUCCI, Frequency domain stability of nonlinear feedback systems with unbounded input operator, *Dyn. Contin. Discrete Impuls. Syst. Ser. A* **7** (2000), 351–368.
12. F. BUCCI, Stability of holomorphic semigroup systems under non-linear boundary perturbations, in: “Optimal Control of Partial Differential Equations”, *International Series of Numerical Mathematics* 133 (1999), Birkhäuser Verlag Basel, 63–76.
13. F. BUCCI, The non-standard LQR problem for boundary control systems, in: “Control Theory and Related Topics”, *Rend. Sem. Mat. Univ. e Politec. Torino* **56** (1998), n. 4, 105–114.
14. F. BUCCI AND L. PANDOLFI, The regulator problem with indefinite quadratic cost for boundary control systems: the finite horizon case, *Systems Control Lett.* **39** (2000), 79–86.
15. F. BUCCI, I. LASIECKA AND R. TRIGGIANI, Singular estimates and uniform stability of coupled systems of hyperbolic/parabolic PDEs, *Abstr. Appl. Anal.* **7** (2002), n. 4, 169–237.
16. F. BUCCI AND I. LASIECKA, Exponential decay rates for structural acoustic model with an overdamping on the interface and boundary layer dissipation, *Appl. Anal.* **81** (2002), n. 4, 977–999.
17. F. BUCCI, Uniform stability of a coupled system of hyperbolic/parabolic PDEs with internal dissipation, in: “Analysis and Optimization of Differential Systems” (V. Barbu, I. Lasiecka, D. Tiba e C. Varsan Eds.), Kluwer Academic Publishers, Boston/Dordrecht/London, 2003, 57–68.
18. F. BUCCI, Uniform decay rates of solutions to a system of coupled PDEs with nonlinear internal dissipation, *Differential Integral Equations* **16** (2003), n. 7, 865–896.
19. F. BUCCI AND I. LASIECKA, Singular estimates and Riccati theory for thermoelastic plate models with boundary thermal control, *Dyn. Contin. Discrete Impuls. Syst. Ser. A* **11** (2004), 545–568.
20. P. ACQUISTAPACE, F. BUCCI AND I. LASIECKA, A trace regularity result for thermoelastic equations with application to optimal boundary control, *J. Math. Anal. Appl.* **310** (2005), n. 1, 262–277.
21. P. ACQUISTAPACE, F. BUCCI AND I. LASIECKA, Optimal boundary control and Riccati theory for abstract dynamics motivated by hybrid systems of PDEs, *Adv. Differential Equations* **10** (2005), n. 12, 1389–1436.
22. F. BUCCI, I. CHUESHOV AND I. LASIECKA, Global attractor for a composite system of nonlinear wave and plate equations, *Commun. Pure Appl. Anal.* **6** (2007), n. 1, 113–140.
23. F. BUCCI, Control-theoretic properties of structural acoustic models with thermal effects, I. Singular estimates, *J. Evol. Equ.* **7** (2007), 387–414.

24. F. BUCCI AND I. CHUESHOV, Long-time dynamics of a coupled system of nonlinear wave and thermoelastic plate equations, *Discrete Contin. Dyn. Syst. Ser. A.* **22** (2008), n. 3, 557–586.
25. F. BUCCI, Control-theoretic properties of structural acoustic models with thermal effects, II. Trace regularity results, *Appl. Math.*, Vol. 35 (2008), n. 3, 305-321.
26. F. BUCCI AND I. LASIECKA, Optimal boundary control with critical penalization for a PDE model of fluid-solid interactions, *Calc. Var. Partial Differential Equations*, Vol. 37 (2010), no. 1-2, 217–235; DOI:10.1007/s00526-009-0259-9
27. F. BUCCI AND I. LASIECKA, Regularity of boundary traces for a fluid-solid interaction model, *Discrete Contin. Dyn. Syst. Ser. S* (to appear); *e-Print* arXiv:0912.4344v1 [math.AP] (2009).
28. F. BUCCI AND D. TOUNDYKOV, Finite dimensional attractor for a composite system of wave/plate equations with localised damping, *e-Print* arXiv:0912.5464v2 [math.DS] (version 1: 2009; v2: 2010), 40 pp. (submitted to *Nonlinearity*).

B) Other publications:

29. F. BUCCI, A boundary control problem with infinite horizon for the strongly damped wave equation, Dipartimento di Matematica, Università di Pisa, *Rapporto* n. 2.43.(530) (1990).
30. F. BUCCI, Alcuni risultati sul controllo di Equazioni a Derivate Parziali (PhD thesis), Dipartimento di Matematica, Università di Pisa, 1993.

Invited Presentations Starting in 1990 F. Bucci has given numerous invited talks at various international conferences held in Italy, France, Germany, UK, Poland, Romania, India, Marocco, USA. The most recent ones are listed below.

2001

- Bath, UK: (one hour lecture at the) LMS (London Mathematical Society) Workshop on *Mathematical Theory of Nonlinear Control*, Department of Mathematical Sciences, University of Bath (June 18-22, 2001);
- San Diego, USA: Fifth SIAM Conference on Control and its Applications, Minisymposium *Control Theory for Interactive PDE Structures* (July 11-14, 2001).

2002

- Constanta, Romania: International Conference *Analysis and Optimization of Differential Systems*, Universitatea Ovidius (September 10-14, 2002).

2003

- Gargnano, Italy: International Conference *Third Meeting on Inverse and Direct Problems and Applications*, Palazzo Feltrinelli (March 31-April 4, 2003);
- Sophia Antipolis, France: 21st IFIP TC7 Conference on System Modeling and Optimization, Minisymposium *Analysis and Control of systems governed by Partial Differential Equations* (July 21-25, 2003);
- Siena: Workshop on *Feedback Control and Optimal Control*, Certosa di Pontignano (July 28-31, 2003).

2004 (Maternity leave)

2005

- Torino: 22nd IFIP TC7 Conference on System Modeling and Optimization, Session *Analysis and Optimization of Systems modelled by PDEs*, Politecnico di Torino (July 18-22, 2005).

2006

- Roma: Workshop *Partial Differential Equations and Applications*, Università degli Studi di Roma “La Sapienza” (March 1-3, 2006);
- Roma: Workshop *Inverse and Control Problems for PDE’s*, Istituto Nazionale di Alta Matematica (March 13-17, 2006);
- Poitiers, France: AIMS Sixth International Conference on Dynamical Systems, Differential Equations and Applications, session *New developments in nonlinear partial differential equations*, Université de Poitiers (June 25-28, 2006),

2007

- Firenze: International Conference on *Topological Methods, Differential Equations, Dynamical Systems*, Università degli Studi di Firenze (June 13-16, 2007);
- Perugia: Joint Meeting UMI-DMV, Session *Operator Semigroups and Evolution Equations*, Università degli Studi di Perugia (June 18-22, 2007);
- Roma: Workshop *Direct, Inverse and Control Problems for PDE’s*, Istituto Nazionale di Alta Matematica (June 25-28, 2007);
- Cracow, Poland (cancelled because of health problems): 23rd Conference on System Modelling and Optimization, Minisymposium *Control and Optimization of Nonlinear Evolutionary PDE Systems*, (July 23-27, 2007).

2008

- Arlington, Texas (USA): 7th AIMS International Conference on Dynamical Systems, Differential Equations and Applications, Session *Asymptotic behaviour of PDEs*, University of Texas at Arlington (May 18-21, 2008);
- Roma: Conference *Viscosity, metric and control theoretic methods in nonlinear PDEs*, Sapienza Università di Roma (September 3-5, 2008);
- Cortona, Italy: INdAM Meeting *Direct, Inverse and Control Problems for PDE’s*, (September 22-26, 2008).

2009

- Taranto: International Conference *Evolution Equations and Mathematical Models in the Applied Sciences*, Università degli Studi di Bari, II Facoltà di Scienze MM.FF.NN. (June 29-July 3, 2009).

Professional Activities

1. **Organization of Minisymposia/Special Sessions/Workshops** F. Bucci has been co-organizer of the following international meetings:
 - Minisymposium “Analysis and Control of systems governed by PDEs”, within the *21st IFIP TC7 Conference on System Modeling and Optimization*, Sophia Antipolis, (July 21-25, 2003);
co-organizers: George Avalos (University of Nebraska-Lincoln) and Catherine Lebieczik (Pole Universitaire Leonard de Vinci, Paris); the session included 26 speakers.

- Invited Session “Analysis and Optimization of Systems modelled by PDEs”, within *22nd IFIP TC7 Conference on System Modeling and Optimization*, Torino (July 18-22, 2005);
co-organizer: George Avalos (University of Nebraska-Lincoln); the session included 38 speakers.
- Special Session “Control and optimisation of nonlinear evolutionary systems”, within the *7th ISAAC Congress* at Imperial College, London (UK) (July 13-18, 2009);
co-organizer: Irena Lasiecka (University of Virginia); the session included 23 speakers.

2. Editorial Activities

- (a) Area Editor for ISAAC³ in the field *Control and optimisation of nonlinear evolutionary systems*; in particular, for
- the volume (in preparation) “Modern Aspects of Partial Differential Equations” of the series *Advances in Partial Differential Equations*, Birkhäuser, and
 - the General Proceedings of the *7th ISAAC Congress* at Imperial College London, M. Ruzhansky and J. Wirth Editors, World Scientific (to appear).
- (b) *Referee* for various mathematical journals, such as the *Journal of Mathematical Analysis and Applications*, *Nonlinear Analysis*, *Communications on Pure and Applied Analysis*, *SIAM Journal on Control and Optimization*, *The Quarterly Journal of Mechanics & Applied Mathematics*, *Applicable Analysis*, *IEEE Transactions on Automatic Control*.

3. Memberships

November 2001–present: member of the Working Group 7.2 (“Computational Techniques in Distributed Systems”) of the Technical Committee on “System Modelling and Optimization” (TC7) of the IFIP (International Federation for Information Processing; see <http://www.ifip.or.at/>)

Teaching activity F. Bucci’s teaching activity has been in the area of Mathematical Analysis⁴, at various levels, and of Partial Differential Equations (with full responsibility of the courses taught since the academic year 1994–1995).

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³ISAAC stands for “International Society for Analysis, its Applications and Computation”.

⁴The broad area of Mathematical Analysis includes Elementary Calculus, Multivariable Calculus, Complex Analysis, Ordinary Differential Equations, Fourier series.