Francesca Carlotta Chittaro

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Personal Data

Date of birth: September 2nd, 1979
Birthplace: Ovada (AL), Italy
Citizenship: Italian

1 Curriculum Vitæ

1.1 Present occupation

- Since September 2012: Maître de conférences (*Assistant Professor*) at IUT- Université de Toulon (France).

1.2 Post-doc fellowships

- October 2011 - August 2012: ATER (*research and teaching fellow*) at IUT- Université de Toulon (France). Scientific Advisor: Prof. J.-P. Gauthier.

- May-October 2011: post-doc fellowship at the Centre des Mathématiques Appliquées (CMAP) of École Polytechnique, Palaiseau (France). Scientific Advisor: Prof. Y. Chitour.

- November 2009 - May 2011: post-doc fellowship at the Laboratoire des signaux et systèmes (L2S), Supélec, Gif-sur-Yvette (France). Scientific Advisor: Prof. Y. Chitour.

- November 2007 - October 2009: post-doc fellowship (*assegno di ricerca*), Dipartimento di Matematica Applicata "G. Sansone", Università di Firenze, Italy. Scientific Advisor: Prof. G. Stefani.

1.3 Education

PhD in Mathematics

November 2003 - October 2007 : PhD in Mathematics at SISSA/ISAS (sector of Functional Analysis and Applications), Trieste, Italy, with fellowship.

Defense: October 25th, 2007;
Supervisor: Prof. A. A. Agrachev (SISSA/ISAS, and Steklov Institut of Mathematics, Moscow, Russia);

Referees: Prof. L. Rifford (Université de Nice, France), Prof. A. Sarychev (Università di Firenze, Italy);
Title of the Thesis: *Hyberbolicity and Curvature in Dynamics and Control.*

Degree

Degree in Theoretical Physics, Università degli Studi di Trieste, Italy.
Defense: September 29th, 2003
Mark: 110/110 cum laude.
Supervisor: Dr. Fabio Benatti (Università di Trieste);
Title of the Thesis: *Entropia dinamica in sistemi discreti con noise (Dynamical entropy in discrete systems with noise).*

1.4   Informatics skills

- Programming languages: Fortran77, C.

- Computational softwares: Mathematica, Matlab/Octave, Simulink/Scicos, Mathcad.

1.5   Languages

Italian, English, French.

2 Scientific Activity

Keywords: Geometric control theory, optimal control, quantum control, dynamical systems.

2.1 Talks

2.1.1 Invited talks in conferences and workshops

- July, 1st-6th, 2018, International Symposium on mathematical programming, Bordeaux, France. Talk: *Strong local optimality for generalised L^1 optimal control problems.*

- December, 8th-12th, 2016, International Conference on Geometric Analysis and Control Theory, Sobolev Institute of Mathematics, Novosibirsk, Russia. Talk: *Asymptotic ensemble stabilizability of the Bloch equation.*

- March, 9th-11th, 2015, Journées bisontines sur le contrôle quantique : systèmes d'EDPs et applications à l'IRM , LMB, Université de Franche Comté, Besançon. Talk: *Ensemble stabilizability for two-level quantum systems.*

- October 28th-30th, 2013, Journées scientifiques du Laboratoire LAROMAD, University of Tizi-Ouzou, Algeria. Talk: *Conditions suffisantes pour l'optimalité des extremaux singulières pour le problème du temps minimum.*

- April 18th–19th, 2013, Conference on Non Linear Control: Geometric Methods and Applications, Florence, Italy. Talk: *Minimum-time strong optimality of a singular arc: the multi-input non-involutive case.*

- January 31st–February 2nd, 2012, Workshop on Geometric Control for PDE's-GCPDES-2012, Beirut, Lebanon. Talk: *Quantum control via Adiabatic Theory.*

- September 12th–16th, 2011, 25th IFIP Conference on System Modeling and Optimization, Berlin, Germany. Talk: *Sufficient second order conditions for multi-input singular extremals.*

- April 3rd–8th, 2011, BIRS Workshop on Quantum Control, Banff, Canada. Talk: *Quantum control via Adiabatic Theory.*

2.1.2 Invited Seminars

- May 22nd, 2018, Università degli Studi di Firenze, *Asymptotic ensemble stabilizability of the Bloch equation*

- December 17th, 2014, Seminars MODANT of Laboratoire Jean Kuntzmann, Université Joseph Fourier, Grénoble, *Control design for quantum systems.*

- June 23rd, 2014, Groupe de Travail en Physique Mathématique de Toulon, *Contrôle adiabatique de l'Équation de Schrödinger via intersections coniques des valeurs propres.*

- April, 4th, 2013, IMATH- Université du Sud Toulon–Var, *Minimum-time strong optimality of a singular arc: the multi-input non-involutive case.*

- December 20th, 2010, Université de Florence, Italie, *Modelli di Controllo Ottimo per la locomozione umana*.

- November 29th, 2007, Université de Nice, *Smooth optimal synthesis for infinite horizon variational problems*.

2.1.3 Contributed talks in conferences and workshops

- December, 12th-15th, 2017 56th IEEE Conference on Decision and Control, Melbourne, Australia. Talk: *Optimality Conditions for Extremals Containing Bang and Inactivated Arcs*.

- April, 3rd-5th, 2017, TUM-IAS Workshop on Quantum Control Theory: Mathematical Aspects and Physical Applications, TUM, Munich, Germany. Talk: *Asymptotic ensemble stabilizability of the Bloch equation*.

- December, 15th-18th, 2015 54th IEEE Conference on Decision and Control, Osaka, Japan. Talk: *Approximate controllability by adiabatic methods of the Schrödinger equation with nonlinear Hamiltonian*.

- December, 10th-13th, 2013 52nd IEEE Conference on Decision and Control, Florence, Italy. Talk: *Minumum-time strong optimality of a singular arc: extended Dubins Problem*.

- May 29th–31st, 2013, Workshop on Conical intersections in Mathematical Physics, IHP, Paris, France. Talk: *Geometry of conical intersections: constructive methods for adiabatic control*.

- June 29th–July 4th 2012, International Conference on Differential Equations and Dynamical Systems, Suzdal, Russian Federation. Talk: *Optimal control problems for the human locomotion: stability and robustness of minimizers*.

- December 8th–11th, 2010, Workshop on Quantum Control, IHP, Paris, France. Talk: *Quantum Control via Adiabatic Theory and intersection of eigenvalues*.

- October 24th-28th, 2010, Workshop on Nonlinear Control and Singularities, Porquerolles, France. Talk: *Quantum Control via Adiabatic Theory*.

- April 20th–21st, 2009, Meeting on Mathematical Control Theory: Controllability, Optimization, Stability (PRIN 2006), Turin, Italy. Talk: *Estremali singolari per problemi di tempo minimo con controlli vettoriali: una condizione sufficiente*.

- June 17th–22nd, 2008, International Conference on Differential Equations and Topology, Moscow, Russian Federation. Talk: *Optimal synthesis in infinite horizon problems*.

- May 30th–June 1st, 2007, Workshop on Control, Optimization and Stability di Non-linear Systems: Geometric and Analytic Methods, SISSA-ISAS, Trieste, Italy. Talk: *On the optimal synthesis for infinite horizon variational problems*.

2.2 Publications

2.2.1 Journals

1. F. Chittaro, L. Poggiolini *Strong local optimality for generalized L^1 optimal control problems*, JOTA, 2018.

2. F. C. Chittaro, J.-P. Gauthier *Asymptotic ensemble stabilizability of the Bloch equation*, Syst. Contr. Lett., (2018), 113, 36–44.

3. F. C. Chittaro, P. Mason *Approximate controllability via adiabatic techniques for the three-inputs controlled Schrödinger equation*, SIAM J. Control Optim., (2017), 55(6), 4202–4226

4. R. Azouit, F. Chittaro, A. Sarlette, P. Rouchon *Towards generic adiabatic elimination for bipartite open quantum systems* Quantum Science and Technology, (2017) **2**, No. 4

5. F. C. Chittaro, G. Stefani *Minimum-time strong optimality of a singular arc: the multi-input non involutive case* ESAIM-COCV, (2016), **22**, No. 3, 786–810

6. F. Jean, P. Mason, F. C. Chittaro *On the inverse optimal control problems of the human locomotion: stability and robustness of the minimizers*, Journal of Mathematical Sciences, (2014) 195, 3 269–287

7. U. Boscain, F. C. Chittaro, P. Mason, M. Sigalotti *Quantum Control via Adiabatic Theory and intersection of eigenvalues*, IEEE-TAC, (2012) vol 57, n. 8, 1970–1983.

8. F. C. Chittaro, G. Stefani *Singular extremals in multi-input time-optimal problem: a sufficient condition*, Control and Cybernetics, (2010) **39**, No. 4, 1029–1068.

9. A. A. Agrachev, F. C. Chittaro *Smooth Optimal Synthesis for infinite horizon variational problems*, ESAIM-COCV, (2009), **1**, 173–188.

10. F. C. Chittaro *An estimate for the entropy of Hamiltonian flows*, J. Dynamical and Control Systems, (2007), **13**, 55–67.

2.2.2 Proceedings and conference papers

1. F. C. Chittaro, L. Poggiolini *Optimality Conditions for Extremals Containing Bang and Inactivated Arcs*, 56th IEEE Conference on Decision and Control, CDC 2017, Melbourne, Australia, December 2017

2. R. Azouit, F. Chittaro, A. Sarlette, P. Rouchon *Structure-preserving adiabatic elimination for open bipartite quantum systems* 20th IFAC World Congress, Toulouse, France, July 2017

3. F. C. Chittaro, P. Mason *Approximate controllability by adiabatic methods of the Schrödinger equation with nonlinear Hamiltonian*, 54th IEEE Conference on Decision and Control, CDC 2015, Osaka, Japan, December 2015

4. F. C. Chittaro, G. Stefani *Minimum-time strong optimality of a singular arc : extended Dubins problem* 52nd IEEE Conference on Decision and Control, CDC 2013, Firenze, Italy, December 2013

5. F. Jean, P. Mason and F.C. Chittaro *Geometric modeling of the movement based on an inverse optimal control approach* 52nd IEEE Conference on Decision and Control, CDC 2013, Firenze, Italy, December 2013

6. U. Boscain, F. C. Chittaro, P. Mason, R. and M. Sigalotti *Controllability of the Schrödinger equation via adiabatic methods and conical intersections of the eigenvalues*, 51st IEEE Conference on Decision and Control, CDC 2012, Maui, Hawai - USA, December 2012

7. U. Boscain, F. C. Chittaro, P. Mason, R. Pacqueau and M. Sigalotti *Motion planning in quantum control via intersection of eigenvalues*, 49th IEEE Conference on Decision and Control, CDC 2010, Atlanta, USA, December 2010

8. Y. Chitour, F. Jean, P. Mason and F. C. Chittaro *Analysis of optimal control models for the human locomotion*, 49th IEEE Conference on Decision and Control, CDC 2010, Atlanta, USA, December 2010

2.2.3 Chapters

1. A. A. Agrachev, F. C. Chittaro *Extremals flows and infinite horizon optimization*, in *Mathematical Control Theory and Finance*, A. Sarychev A. Shiraev M. Guerra and M. do Rosàrio-Grossinho Eds., Springer-Verlag.

3 Administrative and teaching activity

3.1 Administrative activity

- Co-leader of the Pole *Analyse et contrôle des systèmes* of the laboratory LIS

- Organizer of workshops, seminars and conferences:

  ★ (since 2018) Organizer of the Séminaire d'Analyse et des Systèmes of the laboratory LIS

  ★ Main Organizer (with L. Poggiolini) of the *Workshop on Mathematical Control Theory - with a special session in honor of Gianna Stefani*, Porquerolles (France), June, 27th–30th, 2017. `http://mct.univ-tln.fr/`

  ★ 2013-2017 Organizer of the Séminaire de Théorie de Contrôle de Toulon. `http://www.lsis.org/seminaire-theorieducontrol/`

  ★ Organizer of the *Workshop on Nonholonomic Mechanics and Geometric Control Theory*, IHP, Paris, November, 25th-28th, 2014. `http://nholmech-goc.lsis.org/`

  ★ Organizer of the *Workshop on Geometrical Models in Vision*, IHP, Paris, 22nd-24th, 2014. `http://gmvision.lsis.org/`

  ★ Organizer of the international conference "BIO Inspired Optimal Systems", Toulon, 9th-10th April 2013. `http://glotin.univ-tln.fr/bio2s`

  ★ Organizer of the *Workshop on Quantum Control*, IHP, Parigi (France), December 8th-11th, 2010. `http://www.cmapx.polytechnique.fr/~boscain/quantum-control.html`

- Project lead (for Toulon) of the *Agreement of Cultural and scientific cooperation* between the University of Florence and University of Toulon.

- Participation to Scientific Committees

  ★ Member of the committee for the PhD defense of Ouazna Oukacha, Université de Toulon, november 2017.

  ★ Member of the committee for the PhD defense of Marc-Aurèle Lagache, Université de Toulon, october 2017.

  ★ Member of the committee for a position of *Maître de conférences*, section 26, number 4057 at INP - Toulouse (spring 2014).

- Peer reviewer for international journals and conferences:

  ★ Journals: Acta Appl. Math., ESAIM-COCV, IEEE-TAC, IEEE-TCST, Int. Journal of Control, Journ. Dyn. Contr. Sys., J. Global Optim., J. Math. Anal. and Appl., Journal of Mathematical Sciences, MCSS, SIAM J. Contr. Opt., System & Control Letters.

  ★ Conferences: CDC 2010, ACC 2011, CDC 2013, CDC 2015, CDC 2016, CDC 2017, IFAC WC 2017.

- Participation to research projects

* ★ ANR QUACO *Quantum Control: PDE systems and MRI applications* (ANR appel à projets générique 2017) (coordinator : Dr. T. Chambrion)

* ★ Project *Partenariat Hubert Curien - Tassili 2015 PHC15MDU941 – Critères non-lisses en contrôle optimal* (coordinator : Pr. J.-P. Gauthier)

* ★ PEPS CoMoMo (2010) *Contrôle et Modélisation de la Motricité* (coordinator : Dr. P. Mason)

* ★ PRIN 2008 (National Interest Research Projects) project *Metodi geometrici per dinamiche controllate e applicazioni (Geometrical Methods for controlled dynamics and applications)* (national coordinator: Prof. A. A. Agrachev).

* ★ PRIN 2006 (National Interest Research Projects) projet *Teoria Matematica del Controllo: Controllabilità, Ottimizzazione, Stabilità (Mathematical Theory of Control: Controlability, Optimisation, Stability* (national coordinator: Prof. A. A. Agrachev).

3.2 Student supervision

3.2.1 Master students

* Toufeyili Mhoma, student of the Master 2 *Mathématiques Spé. Optimisation et Physique Mathématique* of Université de Toulon. Title of the manuscript: *Contrôlabilité de l'équation de Schrödinger bilinéaire.* (academic year 2014-2015)

* Tetiana Klymchuk, student of the Master 2 *Mathématiques Spé. Optimisation et Physique Mathématique* of Université de Toulon. Title of the manuscript: *How many are multiple eigenvalues ?.* (academic year 2014-2015)

* Dani Hammad, student of the Master 2 *Differential Geometry* of Lebanese University, Beirut. Co-supervision with Ali Wehbe and Amina Mortada. Title of the manuscript: *Sub-Finsler problem for Heisenberg distribution : the L^1 norm.* (academic year 2015-2016)

* Marwan Hariz, student of the Master 2 *Differential Geometry* of Lebanese University, Beirut. Co-supervision with Amina Mortada. Title of the manuscript: *Controllability of an ensemble of inverted pendula.* (academic year 2016-2017)

* Zahraa Sheik Ali, student of the Master 2 *Differential Geometry* of Lebanese University, Beirut. Co-supervision with Amina Mortada. Title of the manuscript: *Multi-input generalised L^1 problem.* (academic year 2017-2018)

3.2.2 PhD students

* (since October 2015) Fazia Harrache, PhD student of Université Mouloud Mammeri, Tizi-Ouzou (Algeria) and Université de Toulon. Co-supervision with Mohamed Aidène (Université Mouloud Mammeri) and Jean-Paul Gauthier (Université de Toulon). Subject: *Sub-Finsler metrics in dimension 3.*

* (since May 2017), Vincent Dutto, PhD student of Université de Toulon. Co-supervision with Eric Busvelle (Universié de Toulon) and Alexandre Choux (CEA). Subject: *Étude et développement d'un modèle mathématique pour la mesure et l'analyse par radiographie, des défauts géom étriques de surface de microballons nécessaires aux expériences sur les laser de puissance.*

3.3 Teaching activity

In charge of courses of Automatic Control and Applied Mathematics at IUT (*Institut Universitaire de Technologie*) of Toulon, Dep. GEII.

I also made the following interventions:

- University of Florence (Italy), Faculty of Civil Engineering - exercise lectures (20 hours) in Calculus of function of several variables (in charge of the course: Prof. G. Stefani), and Faculty of Mechanical Engineering: exercise lectures (10 hours) in Calculus of function of several variables (in charge of the course: Prof. G. Anichini), academic year 2008-2009.

- *Master Image & Systèmes - specialité SIS*, University of Marseille, *Optimal Control* (in charge of the course: Prof. N. M'Sirdi) , (8 hours) , academic years 2012-2013 and 2013-2014.

and I was in charge of the following courses:

- Polytech' Marseille, Diploma *Ingénieur Génie Industriel et Informatique* (5th year), *Optimal Control* (28 hours), academic year 2014-2015.

- Lebanese University (Lebanon), Master 2 in Differential Geometry, *Geometric Optimal Control* (14 hours), academic years 2015-2016, 2016-2017 and 2017-2018.

- Université de Toulon, Master 2 Physique et Sciences de l'Ingénieur Spé. Vision Commande (VC), *Planification de trajectoire en robotique* (22 hours), academic year 2016-2017 and 2017-2018.