

Curriculum Vitae of Ugo Boscain

(update August 2016)

Professional Addresses

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Present Position

- **Directeur de recherche CNRS (DR1)** at the Center of Applied Mathematics (CMAP) of École Polytechnique . SECTION 07
- **“Professeur chargé de cours”** in numerical analysis and optimization at Ecole Polytechnique (department of applied mathematics).
- Deputy team leader of the **“equipe-INRIA”** GECO, Inria Saclay.

Personal Data

Birthday : October 24th 1968
Birthplace : Ivrea (Turin), Italy
Nationality : Italian
Military Service : from 13/3/1993 to 22/3/1994
Family : one child

Associate Editor of SIAM Journal on Control and Optimization

Managing Editor of Journal of Dynamical and Control Systems

Associate Editor of ESAIM Control, Optimisation and Calculus of Variations

Associate Editor of Mathematical Control and Related Fields

Associate Editor of Analysis and Geometry in Metric Spaces



Laureat ERC starting grants 2009. The project GeCoMethods was funded for 785.000 euro.

Laureat ERC POC 2016. The project GeCoMethods was funded for 150.000 euro

Coordinator of the Saclay node of the ANR project SRGI (October 2015-September 2019)

Former PhD students

	year of PhD	presente position
Paolo Mason	2006	CR1 CNRS, LSS (class 07)
Francesco Rossi	2009	Maître de Conférence at Marseille University
Roberta Ghezzi	2010	Maître de Conférence at Bourgogne University
Davide Barilari	2011	Maître de Conférence at Paris 7
Dario Prandi	2013	CR2 CNRS at LSS (class 07), Paris (from October 2016)
Moussa Gaye	Dec. 2014	Maître de Conférence at Université Alioune Diop de Bambey, Senegal

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0.1 Academic Positions, Fellowships

0.1.1 Qualifications at professor level

- February 14th, 2007, Habilitation à diriger des recherches, **HDR**, (Spécialité : Mathématiques et Automatique). Title: Motion Planning and Optimal Control for Quantum Mechanical Systems.
- February 2006: “**Qualification**” as **professor** of class 26 (Applied Mathematics) in France.
- December 30 2013, “Abilitazione scientifica nazionale” per professore di prima fascia (**full professor**). Italy

0.1.2 Academic Positions

- From 1st October 2013, “**director of Research of first class**” (DR1) CNRS at the Center of Applied Mathematics (CMAP) of the Ecole Polytechnique.
- From 1st september 2011, “**professeur chargé de cours**” in numerical analysis and optimization at Ecole Polytechnique (department of applied mathematics).
- From 1st June 2011 Deputy team Leader of the equipe-INRIA GECO (Inria Saclay).
- From 1st October 2009, **Director of Research** (DR2) CNRS at the Center of Applied Mathematics (CMAP) of the Ecole Polytechnique.
- From 1st January 2009, Chargé de recherche CNRS of first class (CR1) at CMAP, École Polytechnique.
- From 1st November 2006, Chargé de recherche CNRS of first class (CR1) at the Laboratoire Le2i of the Université de Bourgogne.
- April 2002–October 2006: Full time Permanent Researcher at the International School for Advanced Studies (SISSA-ISAS), Trieste. Sector: Functional Analysis and Applications. Activity: Applied Mathematics.

0.1.3 Post Doc Positions

- 19th December 2001 to 18th December 2003: Individual Marie Curie Post doc. fellowship, at Bourgogne University.
- 1st December 2000 – 30th November 2001: TMR (Training and Mobility of Researchers) Post Doc fellowship of the Non Linear Control Network (NCN), Bourgogne University.

0.2 Education

0.2.1 PH.D

November 1996, October 2000, Ph.D in Mathematics SISSA – *Scuola Internazionale Superiore di Studi Avanzati*, Trieste, Italy, with fellowship.

- Dissertation: October 20th 2000.
- Supervisor of the Thesis: Prof. Benedetto Piccoli, IAC, CNR Rome
- Referee of the Thesis: Prof. Gianna Stefani, Università degli Studi di Firenze, Italy
- Title of the Thesis: *Extremal Synthesis and Morse Property for Minimum Time.*
- Member of Thesis Committee:
Prof. Andrei Agrachev, SISSA, Trieste, Italy, and Steklov Institute of Mathematics, Moscow, Russia
Prof. Antonio Ambrosetti, SISSA, Trieste, Italy
Prof. Andrea Braides, Università “Tor Vergata”, Roma, Italy
Prof. Alberto Bressan, SISSA, Trieste, Italy

0.2.2 Degrees

1. July 4th, 1996: Laurea (Degree) in Theoretical Physics, University of Torino, with full marks Cum Laude and the special mention for the Thesis Dignita’ di Stampa.
 - Supervisor of the Thesis: Prof. Leonardo Castellani, “Università del Piemonte Orientale”, Italy.
 - Referee of the Thesis: Prof. Vittorio de Alfaro, “Università di Torino”.
 - Title of the Thesis: “Integrazione su Gruppi Quantici e sul q-spazio di Minkowski”
2. September 1991: Diploma (Degree) in Music (Piano) at “Conservatorio di Alessandria”, Italy.

0.3 Awards

- Special Mention for the Degree Thesis: “Dignita’ di Stampa”, University of Torino, July 1996.
- Pontryagin medal for the organization of a session at the 100th Pontryagin birthday (July 2008).
- Laureat **ERC** starting grants 2009.
- Annales de l’Institut Henri Poincare: Top Cited Article 2007-2011. This paper still appear in 2014 as the most cited article in the web site of the journal.
- Laureat **ERC** POC 2016.

0.4 Research Activity

0.4.1 Research Areas

-) Automatics/geometric control theory: controllability, optimal control, control on Lie groups, quantum control.
-) Application to Mechanics
-) **Quantum Control**, control of PDEs (Schrödinger equation), **Nuclear Magnetic Resonance**
-) **Image processing**
-) Sub-Riemannian geometry and hypoelliptic operators

0.4.2 Referee Activity

Journal of Differential equations, AIMS Book series: Applied mathematics, International Journal of Control, SIAM J. on Control and Optimization, ESAIM, Control Optimization and Calculus of Variations, Automatica, Rendiconti dei Lincei, Matematica ed Applicazioni, Physica A, Mathematics of Control Signal and Systems, Journal of Dynamical and Control System, IEEE Trans. on Automatic Control, IEEE Transactions on Circuits and Systems, Preprint server: "Control Theory and Partial Differential Equations", System and Control Letters, Journal of Computational and Applied Mathematics, Journal of Mathematical Analysis and Applications, Journal of Geometric Analysis, Acta Applicanda Mathematicae, ACC 2002-2004-2005-2006-2007-2008-2009-2010, CDC 2002-2004-2005-2007-2008-2009-2010-2011, ECC 2001, MTNS 2004, IFAC 2007.

0.4.3 Editorial Activity

- Associate Editor of SIAM Journal of Control and Optimization (from 01/01/2013)
- Managing Editor of Journal of Dynamical and Control Systems
- Associate Editor of ESAIM Control, Optimisation and Calculus of Variations (from 01/01/2009)
- Associate Editor of Mathematical Control and Related Fields (from 01/01/2011)
- Associate editor of Analysis and Geometry in Metric Spaces
- Member of the scientific committee of the "Third (2004) and Fourth (2005) Junior meeting on control theory and stabilization".
- Member of the editorial board of the Proceedings of the conference *Control Systems: Theory, Numerics and Applications*, Rome 30 March - 1 April 2005.

0.4.4 Participation to Scientific Committees

- Member of the commission for the PhD defense of Valentina Franceschi, Padue, March 2016.
- Member of the commission for the PhD defense of Laurent Sifre, Ecole Polytechnique, October 2014.
- Member of the commission for the HDR of Gregoire Charlot, Université de Grenoble, September 2014.
- Referee of the PhD thesis of Sylvain arguillère, Paris VI. July 2014.
- Member of the jury for positions of CR at INSMI 2014.
- Member of the commission for the PhD defense of Morgan Morancey, Ecole Polytechnique, Novembre 2013.
- Member of the commission for the PhD defense of Xavier Dupuis, Ecole Polytechnique, Novembre 2013.
- Member of the jury for positions of CR at INSMI 2013.
- Member of the **ANR** committee SIMI1 2013.
- Member of the commission for the PhD defense of Fouad El Hachemi. Nancy 2012.
- Member of the commission for the PhD defense of Elie Assemat. Dijon 2012.
- Member of the commission for the PhD defense of Olivier Cots. Dijon 2012.

- Member of the commission for position of “Maître de Conférence” (CNU 61) at the University of Toulon. 2012
- Member of the commission for the HDR of Frederic Lafont in Automatics at the Université de Toulon, 2011.
- Member of the “Conseil Scientifique” of the “Institut national des sciences mathématiques et leurs interactions (INSMI)”. **Coordinator of the group studying the interactions between Mathematics and Automatics.** (2010-2014).
- Member of the commission for the PhD defense Nguyen Tiem Khai. Università di Padova. March 16th 2011.
- Member of the commission for the PhD defense of Anna Korolko. University of Bergen. February 4th 2011. “Main opponent”.
- Member of the commission for the PhD defense of Andreea Grigoriu, Université Paris-Dauphine, November 26th 2010.
- Member of the commission for the HDR of Mazyar Mirrahimi in Applied Mathematics at the Université de Paris VI, 2010.
- Member of the scientific committee of the trimester “Control of Partial and Differential Equations and Applications”, October 1st – December 18th 2010. IHP, Paris.
- Member of the commission for the PhD defense of Ruixing LONG in Mathematics, Ecole Polytechnique, July 6th, 2010.
- President of the commission for the PhD defense of Kenneth D Sebesta in Automatic Control, at University of Luxemburg, June 24th 2010.
- President of the commission for the PhD defense of Thomas Loquen in Automatic Control, at LAAS, Toulouse, May 7th 2010.
- Referee of the HDR of Dominique Sugny in Physics at the Université de Bourgogne, 2010
- Member of **AERES** for evaluation of Ecole de Mines, Paris. 2008.
- Member of the committee for a position of “ricercatore” (Maître de Conférence) in mathematical analysis at the University Federico II of Naples, (facoltà di scienze), 2007.
- Member of the editorial board of the Proceedings of the conference *Control Systems: Theory, Numerics and Applications*, Rome 30 March - 1 April 2005.
- Member of the Ph.D thesis committee at SISSA in 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011
- Member of the committee for Ph.D entrance examination at SISSA in 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011.
- Member of the committee for the “Laurea Magistrale” 2006, 2007, University of Trieste.
- Member of GNAMPA (Gruppo nazionale per l’analisi matematica, la probabilità e le applicazioni)

0.5 Administrative Activity

0.5.1 European Networks and Other Projects

- Co-writing of the Italian projects: Cofin 2002, Progetto intergruppo INDAM 2004, Cofin 2004, PRIN 2006, PRIN 2008. (P.I. A. Agrachev)
- FABER, personal grant of 40.000 euro from Region Bourgogne (2007,2008). P.I. Ugo Boscain
- Coordinator of the node at SISSA of the **ESF** network “OPTPDE”, 2009- 2013.

- Partenariat Hubert Curien, Programme Ulysses 2009 (French-Irish research collaboration), Stabilité et stabilisation de systèmes à commutation (P.I. Yacine Chitour)
- Coordinator of the node at Ecole Polytechnique of the **GDRE** CNRS/INDAM: Control of PDEs (2009-2011).
- **ERC starting grants IDEAS GeCoMethods** (2009). Funding 785000 euro. (2010-20014). P.I. Ugo Boscain
- **Coordinator of the node at Ecole Polytechnique of the project Ile de France-DIGITEO CONGEO (2009-2012).**
- **Coordinator of the node in Paris of the ANR GCM (financed for 218000 euros). (2009-2012).**
- **Coordinator of the node in Paris of the European project QUAINI. This project has been financed for 410218 euros in total 17474 euros to the node in Paris). (2012-2015).**
- **Coordinator of the Saclay node of the ANR project SRGI (October 2015-September 2019)**
- Member of the ICODE institut (Paris Saclay)
- **ERC POC ARTIV1** (2016). Funding 150.000 euro. (2017-2018). P.I. Ugo Boscain

0.5.2 Organization and co-organization of conferences and sessions:

1. Member of the organising committee of the conference “Mathematical Control Theory. With a special session in honor of Gianna Stefani’s 70th birthday”. Porquerolles, France, June 2017.
2. Principal organizer (together with Mario Sigalotti) of the “Workshop on quantum dynamics & control”, IHP, Paris, France, May 23-24, 2016.
3. Member of the scientific committee of the workshop Nonlinear Control and Geometry. 23-29/08/2015. Banach Center Conferences. Bedlewo. Poland.
4. Member of the scientific committee of the “Workshop on Nonholonomic mechanics and optimal control”. Paris IHP. Paris - November 25 - 28, 2014
5. Principal organizer of an **IHP trimester** ”Geometry, Analysis and Dynamics on Sub-Riemannian Manifolds” to be held in 2014 at the Institut Henri Poincare in Paris. <http://www.cmap.polytechnique.fr/subriemannian/>
6. CIRM School (Marseille) Géométrie sous-riemannienne: des géodésiques aux diffusions hypoelliptiques. September 2014.
7. June 25-27, 2013. **SIAM** Conference on Control and Its Applications. Organization of the Session: Geometric Methods for PDEs: Modeling and Control
8. June 25-27, 2013. **SIAM** Conference on Control and Its Applications. Organization of the Session: Geometric Methods for PDEs: Sub-Riemannian Geometry
9. Workshop on Mathematical Control Theory, Sissa Trieste, December 2013.
10. Workshop “Conical Intersections in Mathematical Physics”, IHP, Paris May 2013.
11. 18-19 April 2013. Firenze. Workshop: Non Linear Control: Geometric Methods and Applications.
12. Second meeting of the QUAINI coordination action on Optimal Control of Quantum Systems. Dijon April 8-10 2013.
13. INDAM Meeting on Geometric on “Control Theory and sub-Riemannian geometry Cortona,” Italy. May 21-25, 2012.
14. Organization of a session of Geometric Control at PICOF 2012. Ecole Polytechnique, Palaiseau April 2-4, 2012.
15. “Control and Topology”, Topolo, 29-31 May 2011 (main organizer with M. Sigalotti).

16. IFIP 2011, Double session on “Optimization and Control of Nanosystems I-II”, September 2011 (with A. Borzi)
17. IFIP 2011, Double session on “Analytic and Geometric Optimal Control I-II”, September 2011(with J.B. Caillau).
18. ERC Quantum Control, IHP Paris, 8-11 December 2010 (main organizer).
19. Nonlinear control and singularities (Bilateral Scientific Seminar France-Russia), Porquerolles, France, October 24th-28th, 2010.
20. Colloque LIA LEM2I- Geometric Control for ODEs and PDEs-Tipaza, Algeria June 19th-22th 2010.
21. Special (double) session on “Geometric control of quantum and classical models”. Physcon 2009. September 1st-4th, 2009. University of Catania.
22. Geometric optimal control theory and its applications, A special session at the “International conference on Differential Equations and Topology dedicated to the centennial Anniversary of L.S. Pontryagin” Moscow, June 17-22, 2008.
23. Workshop Contrôle et Optimisation, Ardaillers (Valleraugue), France September 6-9, 2007.
24. CONTROL, OPTIMIZATION AND STABILITY OF NON-LINEAR SYSTEMS: GEOMETRIC AND ANALYTIC METHODS” SISSA/ISAS, Trieste, Italy, May 30, 31 - June 1 2007
25. 44th IEEE Conference on Decision and Control and European Control Conference ECC 2005 organization of a session on ”Control of PDEs and Applications”
26. 22nd IFIP. Conference on System Modeling and Optimization Turin, Italy, July 18-22, 2005, Session on “Geometric methods in optimal control”.
27. 42nd IEEE Conference on Decision and Control Maui, Hawaii, Usa, December 9-12, 2003, Session on “New Trends in Geometric and Optimal Control”.
28. Second Junior European Meeting on: Control Theory and Stabilization, Torino, Italy, Italy, 3-5 December 2003.
29. Trimester on ”Dynamical and Control Systems” SISSA-ICTP, Italy, Sept. 8 - Dec. 7, 2003.
30. International Conference PhysCon 2003 August 20-22, 2003, Saint Petersburg, Russia, Session on ”Geometric and Optimal Control Methods for Quantum Dynamical Systems”.
31. Workshop on ”Feedback control and optimal control”, Siena, Italy, July 28-31, 2003.
32. First Junior European Meeting on: Control Theory and Stabilization, Dijon, France, October 2-4 2002.
33. “European Control Conference” 4-7 September, 2001 Seminario de Vilar, Porto, Portugal (ECC2001) Session on “Optimal Control”.
34. 39th IEEE Conference on Decision and Control, Sidney, December 2000, Session on “Optimal Control And Applications”.
35. Workshop on ”Mathematical Control Theory and Robotics” SISSA, Trieste, Italy, 25–27 June 2000.

0.6 Conference “grand publique”

1. 18/06/2015. Rencontres Mathématiques de Rouen. Communication Géométrie sous-riemannienne: un nouvel outil pour les applications.

0.7 Invited Conferences and Talks

1. 24-26 August 2016. Geometry, PDE's and Lie Groups in Image Analysis. Opening talk: "Geodesics, Laplacians and random walks in sub-Riemannian geometries". Eindhoven, The Netherlands.
2. 27-29 June 2016. "Recent Trends in Differential equations". Communication: "Geodesic random walks in sub-Riemannian geometry via optimal control". Aveiro. Portugal.
3. 26/05/2016. Departement de Mathematiques d'Orsay. Seminar: Geodesics, Laplacians and random walks in sub-Riemannian geometries
4. 9-14 May 2016. Geometric Analysis in Control and Vision Theory. Voss, Norway. Plenary talk: "Geodesics, Laplacians and random walks in sub-Riemannian geometries"
5. 2-4/12/2015. Journées annuelles 2015 du GdR MOA. Université de Bourgogne. Plenary talk: Anthropomorphic image reconstruction via optimal control and hypoelliptic diffusion
6. 21/10/2015. Séminaire de géométrie sous-riemannienne. IHP, Paris. Communication "Random walks in sub-Riemannian geometry via volume sampling"
7. 29/09-01/10. Workshop on Analysis and PDE, Leibniz Universität Hannover. Communication: Geodesics, Laplacians and random walks in sub-Riemannian geometries
8. 24-25/09/2015, INRIA Sophia Antipolis. Workshop: Stochastic Analysis and Numerical Perspectives. Communication: Heat-kernels and intrinsic random walks in Riemannian and sub-Riemannian geometry.
9. 13-18/09/2015. Quantum Information Processing and Communication (QIPC2015). Leeds. UK. Communication: Simultaneous controllability of quantum systems
10. 23-29/08/2015. Banach Center Conferences. Bedlewo. Poland. Nonlinear Control and Geometry. Communication (plenary talk): Geodesics, Laplacians and random walks in sub-Riemannian geometries.
11. 08-10/07/2015. Paris. SIAM Conference on Control and Its Applications (CT15). Communication: "Time-Zero Controllability and Density of Orbits for Quantum Systems"
12. 01-03/07/2015. Fifth QUAINT Workshop. Swansea. UK. Communication: "Ensemble controllability via conical intersections"
13. 29/06-3/07, 2015 27th IFIP TC7 Conference 2015. Sophia Antipolis, France. Communication: "Controllability of Quantum Ensembles".
14. 22-27/06/2015. Cortona, Italy, INDAM meeting: The Hamilton-Jacobi Equation: at the crossroads of PDE, Dynamical Systems and Geometry. Communication "Small-time heat kernel asymptotics for generic Riemannian and sub-Riemannian manifolds in small dimension"
15. 22-26/06/2015 Mariatrost, Graz, Austria. Workshop "From Open to Closed Loop Control". Communication: Controlling the Schroedinger equation via adiabatic methods using conical intersection of eigenvalues.
16. 09-11/03/2015. Besancon. Journées bisontines sur le contrôle quantique : systèmes d' EDPs et applications l'IRM.
17. 03/03/2015, Penn State University, State College, USA. Communication: Anthropomorphic image reconstruction via optimal control and hypoelliptic diffusion.
18. 13/02/2015, séminaire Darboux Montpellier. Communication: the volume and the Laplacian in Riemannian and sub-Riemannian geometry.
19. 12-16 January 2015, Infinite-dimensional Riemannian geometry, Wien Austria. Communication: The intrinsic hypoelliptic Laplacian on sub-Riemannian manifolds.
20. 15-17 December, 2014, 53th IEEE Conference on Decision and Control. Los Angeles Usa. Communication: Image Reconstruction Via Non-Isotropic Diffusion
21. 22-24 October 2014. Institut Henri Poincaré Paris Workshop "Geometrical Models in Vision". Communication: Hypoelliptic diffusion and human vision: a semi-discrete new twist.
22. 29/09-3/10 2014. IHP, Paris. Workshop Geometric Analysis on sub-Riemannian manifolds. Communication: The Laplace-Beltrami operator on conic and anti-conic type surfaces
23. 3-8 August 2014, Baikal, Russia, GEOMETRIC CONTROL THEORY AND ANALYSIS ON METRIC STRUCTURES, satellite conference to International Congress of Mathematicians 2014. Communication: Small-time heat kernel asymptotics for generic Riemannian and sub-Riemannian manifolds in small dimension.
24. June 12-18, 2014. 8th International Conference CURVES and SURFACES. Communication: Hypoelliptic Diffusion and Human Vision: a Semi-discrete New Twist.
25. June 9-13, 2014. INDAM, Rome, Italy. Workshop "Analysis and geometry in control theory and its applications". Communication On the relation between the heat diffusion and the value function for problems of Riemannian and sub-Riemannian geometry.
26. June 23-27 2014. SADCO Conference on New Trends in Optimal Control, Tours, France. Communication: Spectral conditions for the controllability of the Schroedinger equation.
27. July 7-11, 2014, 21st International Symposium on Mathematical Theory of Networks and Systems University of Groningen, Groningen, The Netherlands. Controllability of Quantum Mechanical Systems: From Conical Eigenvalue Intersections to Lie Bracket Conditions.
28. April 23-25 2014. QUAINT 2014. Third meeting of the QUAINT coordination action on Optimal Control of Quantum Systems. Communication: Controlling Rotating molecules. Sandbjerg, The Nederland.
29. January 27, 2014, Jyväskylä university (Finland). Communication: The Laplace-Beltrami operator in Almost Riemannian Manifolds.

30. January 27, 2014, Jyväskylä university (Finland). Communication: Small time heat kernel asymptotics at the Riemannian and sub-Riemannian cut locus.
31. September 2013, Lehigh University. Communication: A model of geometry of vision based on Sub-Riemannian geometry and hypoelliptic diffusion.
32. July 23, 2013. Munich University Communication: Time optimal control on the Bloch sphere.
33. June 25-27, 2013. SIAM Conference on Control and Its Applications. Communication: Heat and Schroedinger Equations on Degenerate Riemannian Manifolds
34. June 25-27, 2013. Mathematical Aspects of Quantum Modeling, Estimation and Control. Padova University. Communication: Spectral conditions for the controllability of the Schroedinger equation
35. June 11, 2013 CMAP, Ecole Polytechnique. Communication: Small-time heat kernel asymptotics in Riemannian and sub-Riemannian manifolds
36. 18-19 April 2013. Firenze. Workshop: Non Linear Control: Geometric Methods and Applications Firenze. Communication: Normal forms and invariants for 2-dimensional almost-Riemannian structures.
37. April 8-10, 2013. Second meeting of the QUANT coordination action on Optimal Control of Quantum Systems. Dijon. Communication: A spectral condition for the controllability of quantum systems.
38. 51st IEEE Conference on Decision and Control December 10-13, 2012, Maui, Hawaii, USA. Communication: Controllability of the Bilinear Schrödinger Equation with Several Controls and Application to a 3D Molecule.
39. 51st IEEE Conference on Decision and Control December 10-13, 2012, Maui, Hawaii, USA. Communication: Optimal Control for Reconstruction of Curves without Cusps.
40. 07/12/2012. Rouan. Normal forms and invariants for 2-dimensional almost-Riemannian structures
41. 23/11/2012. Paris VI. Small time heat kernel asymptotics at the Riemannian and sub-Riemannian cut locus.
42. November 15-17. Telc. Workshop on neurogeometry in Telc. Communication: A model of geometry of vision based on sub-Riemannian geometry.
43. 04/10/2012. Grenoble. Institut Fourier. Small time heat kernel asymptotics at the Riemannian and sub-Riemannian cut locus.
44. September 24-26, 2012. Meeting of the QUANT coordination action on Optimal Control of Quantum Systems. Southampton. Communication: "Controllability of the Schroedinger equation: the geometric approach"
45. International Conference on Inverse Problems and PDE Control. July 30–August 3, 2012, Sichuan University, Chengdu, China. Communication "Controllability of the Schroedinger equation: the geometric and the adiabatic approach"
46. Sub-Riemannian Geometry and PDEs, Levico Terme (Trento), Italy July 2-5 2012. Communication "Small time heat kernel asymptotics at the sub-Riemannian cut locus".
47. 05-06-2012. University of Brest. "On the relation between the minimum time function and the heat diffusion".
48. SADC workshop and School on "Applied and Numerical Optimal Control," 23-27 April 2012, ENSTA, Paris Communication "Controllability of the Schroedinger equation via geometric methods"
49. 04-04-2012. IHP seminar on sub-Riemannian geometry. Communication "A model of geometry of vision based on sub-Riemannian geometry".
50. January 7th 2012. 2012 Joint Mathematics Meetings, Boston. Communication "Adiabatic control of the Schroedinger equation via conical intersections of the eigenvalues."
51. November 15th 2011, Institut Eli Cartan, The Laplace-Beltrami operator on certain degenerate Riemannian manifolds.
52. November 9th 2011, Department of Mathematics, Imperial College London, The Laplace-Beltrami operator on certain degenerate Riemannian manifolds.
53. November 10th 2011, Department of Mathematics, Imperial College London, Reconstruction of images via hypoelliptic diffusion on the group of roto-translations of the plane $SE(2)$.
54. October 25th, 2011, Nice, Controle, Imagerie et Probabilités en Méditerranée, LEM2I, The Laplace-Beltrami operator on certain degenerate Riemannian manifolds.
55. September 26-27, 2011, Orleans, Control of Partial differential Equations days in Orléans, Image reconstruction via optimal control and hypoelliptic diffusion.
56. September 12th, 2011, Berlin IFIP 2011, Anthropomorphic image reconstruction via sub-Riemannian geometry.
57. September 13th, 2011, Berlin IFIP 2011, Controllability of the Schroedinger equation via intersections of the eigenvalues
58. July 31 - August 5, 2011, Gordon Conference on Quantum Control of Light & Matter Mount Holyoke College South Hadley, MA, Communication "Controllability of the Bilinear Schrödinger Equation."
59. July 6-9 2011. International conference on control and optimization of nonholonomic systems. Pereslav (Russia). Communication: The Hausdorff Volume in corank 1 sub-Riemannian structures.
60. July 1-5 2011. International conference on mathematical control theory and mechanics. Suzdal (Russia). Communication: The Laplace-Beltrami operator in almost-Riemannian Geometry.
61. June 13-15, 2011. New Trends in Analysis and Control of Nonlinear PDEs. INDAM, Rome. Communication: The Laplace-Beltrami operator in almost-Riemannian Geometry.
62. June 11, 2011. Rencontre "Contrôle quantique dans le Grand-Est". Dijon. Communication: Adiabatic quantum control.
63. May 11th, 2011, CMAP, Ecole Polytechnique. Groupe de Travail Calcul des Variations. Communication: Anthropomorphic image reconstruction via hypoelliptic diffusion.

64. May 2th 2011. Séminaire de philosophie et mathématiques. Ecole normale supérieure, Paris. Communication: Anthropomorphic image reconstruction via hypoelliptic diffusion.
65. April 26th. CNRS meeting for the preparation of the candidates admitted at the second step. ENS Paris
66. April 14th 2011. Institut JACQUES MONOD. Séminaire "Mathématiques et Biologie" CNRS-Université Paris Diderot. Paris. Communication: Anthropomorphic image reconstruction via hypoelliptic diffusion.
67. March 16th, 2011. Università di Padova. Communication: The intrinsic volume and the intrinsic Laplacian in sub-Riemannian geometry.
68. March 8th, CMAP, Ecole Polytechnique. On the Hausdorff volume in sub-Riemannian geometry.
69. March 3th, 2011. LSS Paris. Anthropomorphic image reconstruction via hypoelliptic diffusion
70. February 8th, 2011. ENS Lyon, Anthropomorphic image reconstruction via hypoelliptic diffusion.
71. December 15-17, 2010. 49th IEEE Conference on Decision and Control, Atlanta, USA. Motion Planning in Quantum Control Via Intersection of Eigenvalues.
72. December 15-17, 2010. 49th IEEE Conference on Decision and Control, Atlanta, USA. Image Reconstruction Via Optimal Control on the Bundle of Directions of the Plane.
73. December 14th. Princeton, Dep of Chemistry. Control of the Schroedinger equation in finite and infinite dimension.
74. Friday, December 3rd. IHP, Paris, Controllability of the Schrodinger equation via adiabatic methods.
75. June 29 - July 3, 2010, Jacobs University, Bremen, Germany. New Trends in Harmonic and Complex Analysis. Communication: The intrinsic hypoelliptic Laplacian and its heat kernel on unimodular Lie Groups.
76. June 26th 2010. Curves and Surfaces 2010. Avignon. Communication: Minimizing length and curvature on planar curves I.
77. Premières Journées Scientifiques du LEM2I 13-22 juin 2010 Tipaza Algérie. Communication: Controllability of the Schroedinger equation via geometric methods
78. June 17th. CEA Saclay Quatrième appel ERC "STARTING GRANT" Réunion d'information.
79. May 17th. Séminaire Parisien d'Optimisation. Communication: On the Hausdorff volume in sub-Riemannian geometry.
80. May 4 2010. University of Paris VI. Communication: Reconstruction d'image par diffusion hypo-elliptique sur le groupe des rotations du plan.
81. March 29th, 2010. New Trends in sub-Riemannian geometry. University of Nice. Communication: On the Hausdorff volume in sub-Riemannian geometry
82. March 17th, 2010. Session d'information Appel ERC Starting Grants 2010 (Jeunes chercheurs) Préparation aux auditions ERC.
83. February 25th 2010. Colloquium SISSA: Nonholonomic variational problems: applications to NMR and reconstruction of images
84. February 9th 2010. University of Milano Bicocca. Communication "Controllability of the Bilinear Schroedinger equation via geometric methods".
85. January 25th-29th 2010, CIRM Luminy. Conference GDRE Control of PDEs. Title "Controllability of the Bilinear Schroedinger equation via geometric methods".
86. December 16-18, 2009, Shanghai, P.R. China. Joint 48th IEEE Conference on Decision and Control and 28th Chinese Control Conference. "Minimization of length and curvature on planar curves"
87. December 16-18, 2009, Shanghai, P.R. China. Joint 48th IEEE Conference on Decision and Control and 28th Chinese Control Conference. "Two-Dimensional Almost-Riemannian Structures with Tangency Points".
88. September 1st-4th, 2009. University of Catania. Physcon 2009. "Controllability of the rotation of a quantum planar molecule".
89. July 20th-24th, 2009. University of Toulouse, France. Conference on Distributed Parameter Systems. "The intrinsic hypoelliptic Laplacian and its heat kernel in sub-Riemannian geometry".
90. July 2th, 2009. La Rochelle, France, Conference on Clifford Algebras, "Image reconstruction via hypoelliptic evolution on the bundle of direction of the plane".
91. February 23th-27th 2009, Wien, Wolfgang Pauli Institut. Workshop on Quantum Control. "Controllability of the bilinear Schroedinger equation: theory and applications".
92. February 17th 2009, ENSTA, Paris, "Reconstruction of a curve on the plane via optimal control."
93. December 9th, 47th IEEE Conference on Decision and Control, December 9-11, 2008. Cancun, Mexico. Communication: "Shortest paths on 3-D simple Lie groups with nonholonomic constraint".
94. December 11th, 47th IEEE Conference on Decision and Control, December 9-11, 2008. Cancun, Mexico. Communication: "Controllability properties of discrete-spectrum Schrodinger equations".
95. October 14th 2008. Institut Eli Cartan, Nancy. Title of the talk: "The intrinsic hypoelliptic Laplacian and the corresponding heat kernel on Lie groups"
96. June 24-25, 2008. Conference: Optimal Control Theory In Space and Quantum Dynamics. Institut Carnot et Institut de Mathématiques de Bourgogne, Dijon. Title of the talk: "Controllability of the discrete-spectrum Schroedinger equation driven by an external field."
97. June 19th, 2008. International conference on Differential Equations and Topology dedicated to the centennial Anniversary of L.S. Pontryagin" Moscow, June 17-22, 2008. Title of the talk: "Sub-Riemannian structures and hypoelliptic heat kernels on unimodular Lie groups."

98. June 16th 2008. Conference “Control of Physical Systems and Partial Differential Equations” Institut Henri Poincaré. Paris. Title of the talk “Approximate Controllability of the bilinear Schroedinger equation in the case of discrete spectrum.”
99. February 28, 2008. Universita’ di Bologna. Sub-Riemannian structures and hypoelliptic heat kernels on unimodular Lie groups
100. December 5th, 2007, University of Graz. Mathematics Department, “Geometry of Vision, Optimal Control and Hypoelliptic operators”.
101. November 27th 2007, Ecole Polytechnique, Paris, “Applications of Control Techniques to problems of Quantum Mechanics and of Geometry of Vision”.
102. October 13th 2007, Bedlewo, Poland, ESF Mathematics Conferences on Control, Constraints and Quanta, “Controllability of the Schrödinger equation via intersection of eigenvalues”
103. September 20th, 2007, 13th Czech-French-German Conference on Optimization (CFG07), Heidelberg, “Almost Riemannian Geometry”
104. September 7th, Ardaillers (Valleraugue), France, Workshop on Control et Optimisation, “Geometry of Vision”.
105. June 1th, 2007, SISSA Trieste, Workshop on CONTROL, OPTIMIZATION AND STABILITY OF NON-LINEAR SYSTEMS: GEOMETRIC AND ANALYTIC METHODS, “Almost-Riemannian geometry from a geometric control point of view”
106. January 16th 2007, University of Bologna, “Singular Riemannian Geometry from a Control Theory Point of View”
107. February 2th 2007, Dep. Mathematique, Dijon, “A generalization of the Gauss-Bonnet theorem in almost Riemannian geometry.”
108. November 23th 2006, Grenoble University, Institut Fourier “Almost Riemannian geometry from a control theory point of view”.
109. November 07th 2006, Université Montpellier II, Département de mathématique, “Stability of Nonlinear Switched Systems”.
110. Meeting on Subelliptic PDE’s and Applications to Geometry and Finance. June 12-17th 2006, CORTONA (Italy). “Singular Riemannian Geometry from a Control Theory Point of View”.
111. Conference on: “Geometric Control and Nonsmooth Analysis” on the occasion of the 73rd birthday of H. Hermes and of the 71st birthday of R.T. Rockafellar. INDAM, ROME, Italy, June 5 - 9, 2006. “Stability of Nonlinear Switched Systems”
112. March 7th 2006, University of Padova, Dep. of Mathematics, “Singular Riemannian geometry from a control theory point of view”.
113. February 28th, 2006, University of Rome, “La Sapienza”, Colloquia di Teoria del Controllo ed EDP, INDAM, “Singular Riemannian geometry from a control theory point of view”.
114. Mathematisches Forschungsinstitut Oberwolfach (MFO), Research in Pairs with Mario Sigalotti on “A Gauss-Bonnet-like Theorem on 2-D Singular Riemannian Manifolds”. February 12-26th, 2006.
115. 44th IEEE Conference on Decision and Control and European Control Conference ECC 2005, Seville, (Spain). 12-15 December 2005. Communications: “Stability of Nonlinear Switched Systems on the Plane”.
116. 22nd IFIP, Conference on System Modeling and Optimization Turin, Italy, July 18-22, 2005, Communication “Time Minimal Trajectories for two-level Quantum Systems”.
117. Universita’ di Roma “La Sapienza”, May 18 2005. Communication: “Stability of Dynamical Systems under Random Switchings”
118. Workshop of the INDAM intergroup project “Controllo e Numerica” Control Systems: Theory, Numerics and Applications. Rome 30-31 March, 1 April 2005. Communication: Controllability of the Schrödinger Equation via Intersection of Eigenvalues.
119. Invitation to the Mathematisches Forschungsinstitut Oberwolfach (MFO) for the workshop “Entanglement and Decoherence: Mathematics and Physics of Quantum Information and Computation”, organized by Sergio Albeverio, Gianfausto Dell’Antonio, Francesco De Martini, January 23rd - January 29th, 2005.
120. Miniworkshop on Subriemannian Geometry and pde’s, November 26th, 2004, Dipartimento di Matematica, Universita’ di Bologna. Communication: “Sub-Riemannian and Singular-Riemannian Problems on Lie Groups and Applications to Quantum Mechanics.”
121. Third Junior European Meeting on “Control, Optimization and Computation”, September 6-8, 2004 Department of Mathematics University of Aveiro Portugal Communication: “Stability of Switched Systems for Random Switching Functions: A Survey”
122. Politecnico di Torino, Italy, July 15th, 2004. Communication: “On the existence of a common polynomial Lyapunov function for linear switched systems”
123. INRIA, Sophia-Antipolis, France, March 18th, 2004. Communication: Stability of planar switched systems for arbitrary switchings.”
124. I.A.C. CNR, Rome, February 12th, 2004. Communication: “Controllo ottimo di sistemi quanto-meccanici in dimensione finita”,
125. Convegno Nazionale “Problemi Matematici in Meccanica Quantistica” Modena, 18-20, December 2003. Communication: “Controllo ottimo per sistemi quantistici finito dimensionali.”
126. 42nd IEEE Conference on Decision and Control, Maui Hawaii, USA, December 9-12, 2003, Communications: “Resonance of Minimizers for N-Level Quantum Systems”.
127. 42nd IEEE Conference on Decision and Control, Maui Hawaii, USA, December 9-12, 2003, Communications: “Stability of Planar Nonlinear Switched Systems”.

128. 42nd IEEE Conference on Decision and Control, Maui Hawaii, USA, December 9-12, 2003, Communications: "Time Optimal Synthesis for a $So(3)$ -Left-Invariant Control System on a Sphere."
129. Second Junior meeting on Control Theory and Stabilization, Politecnico di Torino, Italy, December 3-5, 2003., Communication: "Resonance of Minimizers for n-level Quantum Systems with an Arbitrary Cost."
130. Workshop on: Feedback Control and Optimal Control, Siena, Italy, July 28-31, 2003, Communication: "Bound on the number of switchings for a minimum time problem on the rigid body"
131. CIMPA School and Workshop on Geometric Non-linear Control, State University of Campinas, Brazil, July 14-26, 2003. Communication: "Optimal control on a n-level quantum system"
132. Bimestre su "Probabilità e Meccanica Statistica nella Scienza dell'Informazione", CENTRO DI RICERCA MATEMATICA ENNIO DE GIORGI, Pisa, Italy, June-July 2003. Communication: "Optimal Control of a N-level Quantum System" (9 June)
133. University of Genova, June 3, 2003, Communication: "Stability of Switched Systems"
134. IFAC 2nd Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control LHMNLC'03, Seville, SPAIN, April 3-5, 2003. Communication: "Optimal Control on a n-level Quantum System"
135. 41nd IEEE Conference on Decision and Control, Las Vegas, Nevada, USA, December 10-13, 2002. Communications: "On the K+P Problem for a Three Level Quantum"
136. 41nd IEEE Conference on Decision and Control, Las Vegas, Nevada, USA, December 10-13, 2002. Communications: "Stability of Planar Switched Systems: The Linear Single Input Case"
137. International Conference on Differential and Functional Differential Equations Moscow, Russia, August 11-17, 2002, (satellite conference of the International Congress of Mathematicians, 2002, Beijing, China). Communication: "On the K+P problem for a three level quantum system"
138. Fourth International Conference on Dynamical Systems and Differential Equations, Wilmington, NC, USA, May 24-27, 2002, Special session on "Stabilization and optimal control of dynamical systems". Communication "Lower and upper bounds for the number of switchings for time optimal trajectories of the Dubin's problem on $SO(3)$."
139. Mini-workshop on Switched Systems. Politecnico di Torino. February 26, 2002. Communication: "Stabilità di sistemi switched bidimensionali"
140. European Control Conference, 4-7 September, 2001 Seminario de Vilar, Porto, Portugal (ECC2001). Communication: "Stability of Switched Systems: The Single Input Case."
141. 4th Nonlinear Control Network Workshop: Nonlinear and Adaptive Control, Sheffield, UK, June 25-28, 2001. Communication: "Optimal control of the Schrodinger equation with two or three levels."
142. University of Paris Orsay, France, April 19th, 2001. Communication: "Control on a Three Level Schrodinger Equation".
143. International Conference on Differential Equations and Dynamical Systems, Suzdal, August 2000. Communication: "Projection Singularities of Extremals for Planar Control Systems".
144. Workshop on "Mathematical Control Theory and Robotics", SISSA Trieste Italy, 25-27 June 2000. Communication: "Stability of Planar Switched Systems". Moreover presentation of the Poster: "Projection Singularities for planar Systems".
145. 38th IEEE Conference on Decision and Control", Phoenix-Arizona, USA, December 7-10, 1999. Communication: "Projection Singularities of Extremals for Planar systems."

0.8 Didactic Activities (Courses and short Courses)

- 14-16/06/2016. Minicourse "Introduction to Quantum Control", SISSA, Trieste, Italy (4h).
- April 2016. Random walks and Laplacians in Riemannian and sub-Riemannian geometry. SISSA, Trieste, Italy (20h).
- January 2016 Corse: Geodesics, Laplacians and random walks in sub-Riemannian geometry. TU Berlin. Germany (8h).
- January-March 2016. Courses at Ecole Polytechnique: Automatic Control (with Yacine Chitour) (27.5 hours: Amphi et TD). Level M1, about 50 students. MODAL of applied mathematics (20h).
- December 2015. M2 "Optimization". University of Paris-Saclay; Geometric Control (12 hours). About 15 students.
- April-May 2015. SISSA, Trieste Italy. "Geometric control theory". PhD course. 18h.
- March 2015. Diffusion on sub-Riemannian manifolds. Sobolev Institute of Mathematics. Novosibirsk. 10h
- January-March 2015. Courses at Ecole Polytechnique: Automatic Control (with Yacine Chitour) (27.5 hours: Amphi et TD). Level M1, about 50 students.
- November 2014 - December 2014. M2 Equations aux dérivés partielles et au calcul scientifique. Geometric Control 12 hours. About 15 students.

- April-May 2014. SISSA Trieste. Sub-Riemannian geometry and hypoelliptic diffusion. (18 hours).
- January-March 2014. Courses at Ecole Polytechnique: Automatic Control (with Yacine Chitour) (27.5 hours: Amphi et TD). Level M1, about 50 students.
- November 2013 - January 2014. M2 Equations aux dérivés partielles et au calcul scientifique. Geometric Control 12 hours. About 15 students.
- April-May 2013. SISSA Trieste. Introduction to sub-Riemannian geometry. (18 hours).
- June 4-6, 2013. Field Institute TORONTO. Minicourse on Sub-Riemannian Geometry and Reconstruction of Images (9 hours).
- January-March 2013. Courses at Ecole Polytechnique: Automatic Control (with Yacine Chitour) (27.5 hours: Amphi et TD). Level M1, about 50 students.
- November 2012 - January 2013. M2 Equations aux dérivés partielles et au calcul scientifique. Geometric Control 12 hours. About 15 students.
- May 2012 “Structures Géométriques et Théorie du Contrôle”. CIMPA School Dakar, Senegal. Title of the course: “sub-Riemannian geometry” (10 hours). About 40 students.
- April-May 2012. “Control Theory” (SISSA, 18 hours). Level: PhD. About 10 students.
- January-March 2012. Courses at Ecole Polytechnique: Automatic Control (with Yacine Chitour) (27.5 hours: Amphi et TD). Level M1, about 50 students. Numerical Analysis and optimization (16 hours: TD).
- Erasmus Mundus Master in Complex Systems (M2). Paris November-December 2012. Course “Neurogeometrical models of vision. Part 3” (10 hours). About 10 students.
- June 19th-24th 2011. Seventh School on Analysis and Geometry in Metric Spaces. Levico Terme, Italy (5 hours).
- January-March 2011. Automatic Control, Ecole Polytechnique (with Yacine Chitour) (16.5 hours). Level M1, about 50 students.
- January-March 2011. MODAL, Ecole Polytechnique (with Yacine Chitour and Mario Sigalotti) (18 hours).
- April-May 2011. Introduction to Sub-Riemannian geometry. (SISSA, 18 hours). Level PhD course, about 10 students.
- Anthropomorphic image reconstruction via hypoelliptic diffusion (3 hours). Level PhD. 5^e Ecole Recherche Multimodale d’Information - TEchniques & Sciences. Vision and Cognition. Toulon. 28-30 Septembre 2010, Presqu ’île de Giens. France.
- 23-27 August 2010. Belem. Franco-Brazilian Workshop on Sub-Riemannian Geometry. Hausdorff volume in SRG. (4 hours).
- April 2010. Introduction to sub-Riemannian geometry, Dakar University (10 hours). Level M2, about 10 students.
- Spring 2010. Automatic Control, Ecole Polytechnique (with Yacine Chitour) (52 hours). Level M1, about 70 students.
- November 2009. Introduction to sub-Riemannian geometry (SISSA, 18 hours). Level PhD course, about 10 students.
- January-February 2009. Automatic Control, Ecole Polytechnique (with Yacine Chitour and Mario Sigalotti) (18 hours). Level M1, about 70 students.
- March 2009. Exercises of sub-Riemannian geometry, SISSA PhD program (18 hours). Level PhD course, about 10 students.

- Hypocoelliptic heat kernels on Lie groups (An introduction to non-isotropic diffusion), SISSA April-May 2008 (20 hours). Level PhD course, about 10 students.
- Advanced Winter School on “Mathematical Foundations of Control and Quantum Information Science” Title of the course: “Quantum Control”, 10-15 February 2008. CIEM Castro Urdiales, Cantabria, Spain (8 hours). Level PhD course, about 30 students.
- September 2007, ICTP Diploma Program in Mathematics, Ordinary Differential Equations (7.5 hours). Level M1, about 10 students.
- January 2007, Master “Matematica per le applicazioni”, Bologna University. “Tecniche di controllo per sistemi meccanici” (12 hours). Level M2, about 20 students.
- December 2006, Laurea Specialistica in Matematica, SISSA-Universita’ di Trieste. Title of the course “Ordinary Differential Equations” (20 hours)
- November 2006, Bourgogne University, Research Master, “Analyse d’image” (10 hours).
- September 2006, Padova University, Minicourse on “Introduzione ai sistemi ibridi e switching in teoria del controllo” (Introduction to Hybrid and Switching systems in Control Theory) (3 hours).
- September 2006, ICTP Diploma Program in Mathematics, Ordinary Differential Equations (7.5 hours)
- May 2006, Laurea Specialistica in Matematica, SISSA-Universita’ di Trieste. Title of the course “Esercitazioni di Analisi Funzionale” (6 hours)
- March 2006, UCAD, Dakar, Senegal, Introduction to Control Theory (10 hours).
- October-November 2005, Laurea Specialistica in Matematica, SISSA-Universita’ di Trieste and SISSA Ph.D program. Title of the course “Esercitazioni di equazioni differenziali ordinarie” (26 hours)
- October 2005, University of Milano Bicocca, Ph.D Program, “Introduzione alla teoria del controllo geometrico” (12 hours).
- September 2005, ICTP Diploma Program in Mathematics, Calculus in \mathbb{R}^n (7.5 hours)
- September 2005, ICTP Diploma Program in Mathematics, Ordinary Differential Equations (7.5 hours)
- 28-29 June 2005, Corso di Dottorato, Universita’ di Bologna. Introduction to Optimal Control Theory (4 hours).
- October-December 2004, Laurea Specialistica in Matematica, SISSA-Universita’ di Trieste. Title of the course “Esercitazioni di equazioni differenziali ordinarie” (16 hours)
- April-May 2004, ICTP / SISSA joint master’s degree program in Modeling and Simulation of Complex Realities. Title of the course “Optimization and Control Theory”. (16 hours)
- February 3,4,5 2004, INFN, University of Naples, “Introduzione alla Teoria del Controllo Quantistico” (6 hours)
- January-April 2004, SISSA Ph.D program. Title of the course: ”Introduction to Control Theory” (20 hours).
- September 8 - December 7, 2003. Trimester on Dynamical and control systems, **ICTP**, SISSA, Italy. Title of the course ”Control of Quantum Systems, ” (4 hours).
- April 26 - May 8 2003, CIMPA school on *Contrôle non linéaire et application.*, Tlemcen (Algeria). Title of the course: ”Optimal control and applications” (14 hours).
- May 2003, SISSA Ph.D program. Title of the course: ”Optimal Synthesis and Applications to Quantum Mechanics” (18 hours)

0.9 Supervision of Students and Post Doc

Supervision of Ph.D Thesis

- Nicolas Augier. (Co-supervision with M. Sigalotti). Expected PhD defense 2019.
- Lorenzo Pinna (Co-supervision with G. Panati and P. Mason). Financed by Università di Roma “La Sapienza”. Expected PhD defense 2017.
- Ludovic Sacchelli. Financed by FMJH. Expected PhD defense 2018.
- Moussa Gaye, Ecole Doctorale X, Financed by Fondation Hadamard, PhD defence November 2014.
- Dario Prandi, CMAP, Ecole Polytechnique. PhD defence October 2013.
- Davide Barilari, SISSA PhD program. Defence October 27th 2011. (Co-supervision. Main supervisor A. Agrachev). Now maître de conference at Paris VII.
- Roberta Ghezzi, SISSA PhD program. Defence October 29th, 2010. Now maître de conference at Bourgogne University.
- Francesco Rossi, Université de Bourgogne. Defence October 2009. Now Maître de Conférence at Marseille University.
- Paolo Mason, SISSA Ph.D program. Co-direction with A Agrachev. Defense: 26th October 2006. Title: “Stability, optimization and motion planning for control affine systems”. Now CR1 at CNRS, LSS, Paris.
- Rebecca Salmoni, Naples University and Paris XI (Orsay), Ph.D defense in Italy February 2th 2006. Title “Su una sintesi ottima per un sistema quantistico a due livelli”. Ph.D defence in France: 21/12/2007.

Supervision of post-docs

- Luca Rizzi, Post-doc ERC and DGA- Ecole Polytechnique DIGITEO (June 2014—). Post doc on random walks in sub-Riemannian geometry.
- Alexei Remizov, Post-doc DIGITEO and ERC (November 2011–March 2014). Co-supervision with Jean Paul Gauthier on problems of reconstruction of images.
- Mauricio Godoy Molina. Post doc Ecole Polytechnique (September 2011-August 2012). Co-supervision with Yacine Chitour on Rolling Bodies.
- Davide Barilari, Post doc ERC GeCoMethods (nov. 2011-oct. 2013).
- Camille Laurant, Post doc ERC GeCoMethods (oct. 2010-sept. 2011). Now CR2 CNRS, Section 01.
- Francesca Chittaro. Post-doc DIGITEO, LSS (nov. 2009-oct. 2011) Co-supervision with Paolo Mason. Quantum control with adiabatic methods and applications of optimal control methods to problems of physiology. Now MCF at Toulon University. (CNU61)
- Gregoire Charlot, Post Doc Marie Curie (Network NACO2). Oct. 2002-Sept. 2001. Now MCF at Grenoble (CNU 25)

Supervision of Master Thesis (M2)

- Nicolas Augier. “The adiabatic and the rotating wave approximations in quantum control”. September 2016.
- Alexandre Terrand. “Contrôle optimal appliqué aux problématiques de la RMN” Stage M2R-ATSI. Encadrants : Nicolas Boulant, Ugo Boscain et Mario Sigalotti.
- Moussa Gaye, ICTP Diploma in Mathematics, Trieste, (from may 2011 to August 2011).
- Viktoriya Victorovna Semeshenko, ICTP / SISSA joint master’s degree program in Modeling and Simulation of Complex Realities, (from August 2002 to September 2003). Title of the Master Thesis “Geometric Control Techniques for Three and Four Levels Quantum Systems”.

Supervision of mémoire de la “Laurea Specialistica in Matematica”

- Roberta Ghezzi SISSA-Università di Trieste, Laurea Magistralis in Matematica. (defence: July , 2007). Title: “Punti Coniugati in Geometria quasi Riemmaniana”.
- Francesco Rossi, SISSA-Università di Trieste, Laurea Magistralis in Matematica. (defence: July 19th, 2006). Title: “Problemi di Geometria sub-Riemmaniana su gruppi di Lie compatti”.

Stages M1 Ecole Polytechnique

- Nicolas Brosse. Étude du contrôle adiabatique simultané. 2015.
- Jacek Jendrej, “Small time heat kernel asymptotics at a cut-conjugate point on 2-spheres of revolution” co-supervision with Davide Barilari. 2012
- Fredrik Gronberg “Time-Optimal Trajectories for Two-Level Quantum Systems with Two Bounded Controls”. 2012
- Petter Nilsson “Invariant Sets of 2-Dimensional Linear Switched Systems”. 2012

0.10 Publications

Type of Publication	#
Books	1
Lecture Notes	1
Chapters of Books	4
Preprints	5
International Journals	53
Refereed Conference Proceedings:	49
Software:	1
Book Editor	3

Almost all my papers are available on my web page:

<http://www.cmapx.polytechnique.fr/~boscain/>

Book Editor

- [3] D. Barilari, U. Boscain, M. Sigalotti, *Geometry, Analysis and Dynamics on Sub-Riemannian Manifolds: Volume II* to appear on EMS Series of Lectures in Mathematics.
- [2] D. Barilari, U. Boscain, M. Sigalotti (Editors), *Geometry, Analysis and Dynamics on Sub-Riemannian Manifolds: Volume I* (EMS Series of Lectures in Mathematics). ISBN-10: 3037191627
- [1] G. Stefani, U. Boscain, J.P. Gauthier, A. Sarychev, M. Sigalotti, *Geometric Control Theory and Sub-Riemannian Geometry*, Springer, INDAM Series 2014.

Lecture Notes

- [1] A. Agrachev, D. Barilari, U. Boscain, *Introduction to Riemannian and Sub-Riemannian geometry*, <http://people.sissa.it/~barilari/Notes.html>

Books

- [1] U. Boscain, B. Piccoli, *Optimal Synthesis for Control Systems on 2-D Manifolds*, Springer, SMAI, Vol.43, 2004.

Chapters of Books

- [4] A. Agrachev, D. Barilari, U. Boscain, Introduction to geodesics in sub-Riemannian geometry. To appear in *Geometry, Analysis and Dynamics on Sub-Riemannian Manifolds: Volume II*, EMS Series of Lectures in Mathematics.
- [3] U. Boscain, B. Piccoli, *Synthesis theory in optimal control* in *Encyclopedia of Systems and Control*, Springer.
- [2] U. Boscain, *A review on stability of switched systems for arbitrary switchings*, in “Geometric Control and Nonsmooth Analysis,” Series on Advances in Mathematics for Applied Sciences 76, Eds. F. Ancona, A. Bressan, P. Cannarsa, F. Clarke, P.R. Wolenski (Worldscientific, Singapore, 2008), pp. 100–119.
- [1] U. Boscain, B. Piccoli *A Short Introduction to Optimal Control*, in “Controle non lineaire et applications”, edited by Tewfik Sari, Travaux en cours, Hermann, Paris. LES COURS DU CIMPA. pp. 19-66, 2005.

Preprints

- [5] D. Barilari, U. Boscain, R. Neel, Heat kernel asymptotics on sub-Riemannian manifolds with symmetries and applications to the bi-Heisenberg group. arXiv:1606.01159.
- [4] U. Boscain, L. Sacchelli, M. Sigalotti, Generic singularities of line fields on 2D manifolds. arXiv:1605.06295.
- [3] A. Agrachev, U. Boscain, R. Neel, L. Rizzi. Intrinsic random walks in Riemannian and sub-Riemannian geometry via volume sampling. arXiv:1601.03304.
- [2] U. Boscain, R. Neel, L. Rizzi Intrinsic random walks and sub-Laplacians in sub-Riemannian geometry. arXiv:1601.03304.
- [1] D. Prandi, A. Remizov, R. Chertovskih, U. Boscain, J.P. Gauthier, Highly corrupted image inpainting through hypoelliptic diffusion arXiv:1502.07331.

International Journals

- [53] D. Barilari, U. Boscain, E. Le Donne, M. Sigalotti, Sub-Finsler structures from the time-optimal control viewpoint for some nilpotent distributions. arXiv:1506.04339. To appear on *Journal of Dynamical and Control Systems*.
- [52] S. Glaser, U. Boscain, T. Calarco, C. Koch, W. Kckenberger, R. Kosloff, I. Kuprov, B. Luy, S. Schirmer, T. Schulte-Herbruggen, D. Sugny, F. Wilhelm “Training Schrödinger’s cat: quantum optimal control”. *Eur. Phys. J. D* (2015) 69: 279.
- [51] D. Barilari, U. Boscain, G. Charlot, R.W. Neel, On the heat diffusion for generic Riemannian and sub-Riemannian structures. To appear on *International Mathematics Research Notices*.
- [50] U. Boscain, P. Mason, G. Panati, M. Sigalotti, On the control of spin-boson systems. *J. Math. Phys.* 56 (2015), no. 9, 092101, 15 pp.
- [49] U. Boscain, D. Prandi, M. Seri, Spectral analysis and the Aharonov-Bohm effect on certain almost-Riemannian manifolds. *Comm. Partial Differential Equations* 41 (2016), no. 1, 32-50.

- [48] U. Boscain, D. Prandi, Self-adjoint extensions and stochastic completeness of the Laplace-Beltrami operator on conic and anticonic surfaces anticonic-type surfaces. *J. Differential Equations* 260 (2016) 3234-3269
- [47] U. Boscain, G. Charlot, M. Gaye, P. Mason, Local properties of almost-Riemannian structures in dimension 3. *Discrete and Continuous Dynamical Systems Volume 35, Issue 9, 2015*. Pages 4115-4147
- [46] U. Boscain, J.P. Gauthier, F. Rossi M. Sigalotti, Approximate controllability, exact controllability, and conical eigenvalue intersections for quantum mechanical systems.. *Comm. Math. Phys.* 333 (2015), no. 3, 1225-1239.
- [45] U. Boscain, F. Grönberg, R. Long, H. Rabitz, Time minimal trajectories for two-level quantum systems with two bounded controls. *J. Math. Phys.* 55 , 062106 (2014) ; <http://dx.doi.org/10.1063/1.4882158>.
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