Dario **Prandi**

Chargé de recherche CNRS at Université Paris-Saclay

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Experience

Chargé de Recherche CNRS, Université Paris-Saclay, CentraleSupélec, L2S 2016–now
Researcher in Section 07.

Post-doc, CEREMADE, Université Paris-Dauphine, Paris 2015–2016
Supervisors: G. Peyré and J.-M. Mirebeau.

Post-doc, LSIS, Université de Toulon, Toulon 2014–2015
Grant of the LabEx Archimede (Aix-Marseille Université). Supervisor: J.-P. Gauthier.

Education

Philosophiae Doctor (Ph.D.), École Polytechnique, Palaiseau 2010–2013
Subject of the dissertation: Geometry and analysis of control-affine systems: motion planning, heat and Schrödinger evolution. Supervisors: Ugo Boscain, Fréderic Jean, and Mario Sigalotti.

Master of Science (M.Sc.), Dep. of Mathematics, Univ. di Padova, Italy 2008 – 2010
Final grade 110/110 *cum laude*. Specialised curriculum in mathematical analysis. Subject of the dissertation: Rearrangements in Metric Spaces. Supervisor: Roberto Monti.

Bachelor of Science (B.Sc.), Dep. of Mathematics, Univ. di Modena e Reggio Emilia, Italy 2005 – 2008
Final grade 110/110 *cum laude*. General curriculum in mathematics. Subject of the dissertation: Area and coarea formulae. Supervisor: Gian Paolo Leonardi.

Teaching

Lecturer, Geometric Control Theory (CM, 12h). 2018
Master course, Université Paris-Sud Orsay.

Lecturer, Analyse et Topologie (CM and TD, 60h). 2015 – 2020
Bachelor course (L2). PSL Research University, Paris.

Teaching assistant, Contrôle Géométrique (TD, 10h). 2013 & 2016
Master course, Université Paris-Sud Orsay.

Teaching assistant, Outils Logiciels (TP, 50h). 2014
Bachelor course, IUT de Toulon.

Organization

Cortical models for visual perception and imaging applications, LJLL, UPMC, Paris. 22 nov 2018
Website: https://liftme.sciencesconf.org/. Co-organised with L. Calatroni, V. Franceschi, and B. Franceschiello.

Cortical Inspired Non-holonomic Control for Imaging, Institut Henri Poincaré, Paris. 28 nov 2017
Co-organised with L. Calatroni and V. Franceschi.

Séminaire d'Automatique du Plateau de Saclay, L2S, CentraleSupélec, Gif-sur-Yvette. oct 2016 – now
Website: https://icode-seminars.github.io. Co-organised with N. Amini.

A day in control theory, CMAP, École Polytechnique, Palaiseau. 2 may 2017
Thematic day in honour of A. Agrachev 65th birthday. Co-organised with F. Chittaro and R. Ghezzi.

Spectral properties of hypoelliptic operators, Institut Henri Poincaré, Paris. 9 dec 2015
Website: http://webusers.imj-prg.fr/ davide.barilari/seminar.php.

INDAM meeting on Geometric Control and sub-Riemannian Geometry, Cortona, Italy. may 2012
Website: http://www.cmap.polytechnique.fr/geometric-control-srg/.

Grants and awards

Emergence en Recherche de Idex Université de Paris, "BioSpeech" 2019
Principal investigator: Giuseppina Turco, in collaboration with U. Boscain

Financing from iCODE institut, "Control theoretical modelling of contrast perception" 2019
"Porteur" of the project, in collaboration with V. Franceschi and L. Calatroni

PEPS Blanc INS2I, "Lifting approaches for cortical inspired methods in imaging (LiftME)" 2018
"Porteur" of the project, in collaboration with V. Franceschi and L. Calatroni

PEPS Blanc INS2I, "Cortical Inspired Non-holonomic Control for Imaging (CINCIN)" 2017
"Porteur" of the project, in collaboration with J.-P. Gauthier, V. Franceschi, L. Calatroni.

ERC Proof of Concept, "An artificial visual cortex for image processing (ARTIV1)" 2016
Principal investigator: Ugo Boscain. In collaboration with J.-P. Gauthier and M. Sigalotti.

BOUM SMAI Project, "Quantum confinement and spectral properties of singular operators" 2016
In collaboration with L. Rizzi and M. Seri.

BOUM SMAI Project, "Formule de Santalò en géométrie sous-riemannienne et applications" 2016
In collaboration with L. Rizzi and M. Seri.

Supervision

Nouamane Tazi, CentraleSupélec student. 2018–pres.
Supervised under the "parcours recherche" offering of CentraleSupélec.

Hippolyte Charvin, Master student in Mathematics at Université de Paris. 2020.
Supervised in collaboration with D. Barilari. Subject of the dissertation: " Geometric visual hallucinations, and the functional architecture of striate cortex".

Cyprien Tamekue Woundja, Master student in Mathematics at IMSP, Porto-Novo, Benin. 2019.
Supervised in collaboration with Y. Chitour. Subject of the dissertation: "Null controllability of Grushin-type operators".

Louis Gradt, Master student in Mathematics at Université de Paris. 2019.
Supervised in collaboration with R. Petrides. Subject of the dissertation: "Spectral theory of almost-Riemannian manifolds".

Amine Bohi, Ph.D student in Computer Science, LSIS, Université de Toulon. 2017
Supervised in collaboration with F. Bouchara and J.-P. Gauthier. Subject of the dissertation: "Descripteurs de Fourier inspirès de la structure du cortex visuel primaire humain. Application á la reconnaissance de navires dans le cadre de la surveillance maritime".

Leonardo Suriano, INRIA Saclay engineer. 2015
Supervised in collaboration with M. Sigalotti.

Publications

Books and edited proceedings

[1] A semidiscrete version of the Petitot model as a plausible model for anthropomorphic image reconstruction and pattern recognition
Dario Prandi, Jean-Paul Gauthier
SpringerBriefs in Mathematics. Springer International Publishing. (2018). DOI: 10.1007/978-3-319-78482-3

Peer-reviewed journals

[1] Cortical-inspired Wilson-Cowan-type equations for orientation-dependent contrast perception modelling
Marcelo Bertalmío, Luca Calatroni, Valentina Franceschi, Benedetta Franceschiello, Dario Prand i
J. Math. Imaging Vision (to appear), arXiv:1910.06808

[2] Visual illusions via neural dynamics: Wilson-Cowan-type models and the efficient representation principle
Marcelo Bertalmío, Luca Calatroni, Valentina Franceschi, Benedetta Franceschiello, Alexander Gomez-Villa, Dario Prandi
Journal of Neurophysiology (2020). DOI: https://doi.org/10.1152/jn.00488.2019

[3] Hardy-Type Inequalities for the Carnot–Carathéodory Distance in the Heisenberg Group
Valentina Franceschi, Dario Prandi
The Journal of Geometric Analysis (Jan. 2020). DOI: 10.1007/s12220-020-00360-y

[4] On the regularity of abnormal minimizers for rank 2 sub-Riemannian structures
Davide Barilari, Yacine Chitour, Fréderic Jean, Dario Prandi, Mario Sigalotti
Journal de Mathématiques Pures et Appliquées (Apr. 2018). DOI: 10.1016/j.matpur.2019.04.008

[5] A sub-Riemannian Santaló formula with applications to isoperimetric inequalities and first Dirichlet eigenvalue of hypoelliptic operators
Dario Prandi, Luca Rizzi, Marcello Seri
J. Differential Geom. 111.2 (Feb. 2019), pp. 339–379. DOI: 10.4310/jdg/1549422105

[6] On the Essential Self-Adjointness of Singular Sub-Laplacians
Valentina Franceschi, Dario Prandi, Luca Rizzi
Potential Analysis (Jan. 2019). DOI: 10.1007/s11118-018-09760-w

[7] Quantum confinement on non-complete Riemannian manifolds
Dario Prandi, Luca Rizzi, Marcello Seri
J. Spectr. Theory (July 2018). DOI: 10.4171/JST/226

[8] Highly Corrupted Image Inpainting Through Hypoelliptic Diffusion
Ugo V. Boscain, Roman Chertovskih, Jean-Paul Gauthier, Dario Prandi, Alexey Remizov
J. Math. Imaging Vision (Apr. 2018). DOI: 10.1007/s10851-018-0810-4

[9] Self-adjoint extensions and stochastic completeness of the Laplace-Beltrami operator on conic and anti-conic surfaces
Ugo Boscain, Dario Prandi
J. Differential Equations. 260.4 (2016), pp. 3234–3269. DOI: 10.1016/j.jde.2015.10.011

[10] Spectral analysis and the Aharonov-Bohm effect on certain almost-Riemannian manifolds
U. Boscain, D. Prandi, M. Seri
Comm. Partial Differential Equations. 41.1 (2016), pp. 32–50. DOI: 10.1080/03605302.2015.1095766

[11] Fourier descriptors based on the structure of the human primary visual cortex with applications to object recognition
Amine Bohi, Dario Prandi, Vincente Guis, Frédéric Bouchara, Jean-Paul Gauthier
J. Math. Imaging Vision. 57.1 (2017), pp. 117–133. DOI: 10.1007/s10851-016-0669-1

[12] Complexity of control-affine motion planning
F. Jean, D. Prandi
SIAM J. Control Optim. 53.2 (2015), pp. 816–844. DOI: 10.1137/130950793

[13] Hölder equivalence of the value function for control-affine systems
Dario Prandi
ESAIM: COCV. 20.4 (2014), pp. 1224–1248. DOI: 10.1051/cocv/2014014

Peer-reviewed conferences and workshops

[1] A bio-inspired geometric model for sound reconstruction (Extended Abstract)
Ugo Boscain, Ludovic Sacchelli, Dario Prandi, Giuseppina Turco
20th IFAC World Congress. (to appear)

[2] On the decay rate for degenerate gradient flows subject to persistent excitation
Dario Prandi, Yacine Chitour, Paolo Mason
20th IFAC World Congress. (to appear)

[3] A Cortical-Inspired Model for Orientation-Dependent Contrast Perception: A Link with Wilson-Cowan Equations
Marcelo Bertalmío, Luca Calatroni, Valentina Franceschi, Benedetta Franceschiello, Dario Prandi
Scale Space and Variational Methods in Computer Vision. (2019). ISBN: 978-3-030-22368-7

[4] Cortical-inspired image reconstruction via sub-Riemannian geometry and hypoelliptic diffusion
Boscain, Ugo, Chertovskih, Roman, Gauthier, Jean-Paul, Prandi, Dario, Remizov, Alexey
SMAI 2017 – ESAIM: ProcS. 64 (2018), pp. 37–53. DOI: 10.1051/proc/201864037

[5] Image inpainting via a control-theoretical model of human vision
Ugo V. Boscain, Jean-Paul Gauthier, Dario Prandi
2018 14th IEEE International Conference on Control Automation (ICCA). (2018). DOI: 10.1109/ICCA.2018.8444289

[6] Recent results on the essential self-adjointness of sub-Laplacians, with some remarks on the presence of characteristic points
Dario Prandi Valentina Franceschi, Luca Rizzi

Séminaire de Théorie spectrale et géométrie (Grenoble), 33. (2015-2016). DOI: 10.5802/tsg.311

[7] Image processing in the semidiscrete group of rototranslations
Dario Prandi, Ugo Boscain, Jean-Paul Gauthier
Geometric science of information. Lecture Notes in Comput. Sci. Vol. 9389. (2015). DOI: 10.1007/978-3-319-25040-3_67

[8] Image reconstruction via non-isotropic diffusion in Dubins/Reed-Shepp-like control systems
U. Boscain, J. P. Gauthier, D. Prandi, A. Remizov
53rd IEEE Conference on Decision and Control. (Dec. 2014). DOI: 10.1109/CDC.2014.7040056

Preprints

[1] Worst Exponential Decay Rate for Degenerate Gradient flows subject to persistent excitation
Yacine Chitour, Paolo Mason, Dario Prandi
arXiv: 2006.02935 [math.OC]

[2] A bio-inspired geometric model for sound reconstruction
Ugo Boscain, Dario Prandi, Ludovic Sacchelli, Giuseppina Turco
arXiv: 2004.02450 [eess.AS]

[3] Weyl's law for singular Riemannian manifolds
Yacine Chitour, Dario Prandi, Luca Rizzi
arXiv: 1903.05639 [math.DG]

[4] Point interactions for 3D sub-Laplacians
Riccardo Adami, Ugo Boscain, Valentina Franceschi, Dario Prand i
arXiv: 1902.05475 [math.AP]

[5] Generalized Fourier-Bessel operator and almost-periodic interpolation and approximation
J.-P. Gauthier, D. Prandi
arXiv: 1612.00056 [math.NA]

Talks in international conferences

[1] On the essential self-adjointness of singular sub-Laplacians
Mini-workshop "Self-adjoint extensions in new settings", MFO, Obserwolfach, Germany. 10 October 2019.

[2] Weyl law for singular Laplace-Beltrami operators
Asymptotic Analysis & Spectral Theory, University Paris-Sud, Orsay, France. 02 October 2019.

[3] Weyl law for singular Riemannian manifolds
EquaDiff2019, Leiden, The Netherlands. 08 July 2019.

[4] Weyl law for singular Riemannian manifolds
Journées sous-riemanniennes, Grenoble, France. 16 October 2018.

[5] Weyl law for singular elliptic operators
A sub-Riemannian day in Padova, Italy. 14 September 2018.

[6] Cortical-inspired functional lifting for image inpainting
SIAM conference on Imagining Science, Bologna, Italy. 5 June 2018.

[7] Anthropomorphic image reconstruction via sub-Riemannian geometry and hypoelliptic diffusion
Delays and constraints in distributed parameter systems, Gif-sur-Yvette, France. 24 November 2017.

[8] Quantum confinement and spectral analysis of degenerate operators on Riemannian manifolds
VII Partial differential equations, optimal design and numerics, Benasque, Spain. 22 August 2017.

[9] A variational formulation of the sub-Riemannian model of the primary visual cortex
Geometric Analysis in Control and Vision Theory, Voss, Norway. 11 May 2016.

[10] Image processing in the semidiscrete group of rototranslations
2nd Conference on Geometric Science of Information, École Polytechnique. 20 October 2015.

[11] A sub-Riemannian Santaló formula with applications to isoperimetric inequalities and Dirichlet spectral gap of hypoelliptic operators
PGMO Days 2015, ENSTA ParisTech, Palaiseau. 28 October 2015.

[12] Self-adjointness of intrinsic diffusions in almost-Riemannian structures
Thematic day on Analysis and geometry of almost-Riemannian manifolds, IHP, Paris. 03 December 2014.

[13] Intrinsic hypoelliptic diffusions in sub-Riemannian and almost-Riemannian geometry
Thematic day on Hypoelliptic diffusion: analysis and control, IHP, Paris. 06 November 2014.

[14] Spectral properties and Aharonov-Bohm effect on Grushin-like structures
First International Joint Meeting, Bilbao, Spain. 02 July 2014.

[15] The Laplace-Beltrami operator on conic and anti-conic surfaces
Geometry and Control, Steklov Institute, Moscow, Russia. 17 April 2014.

[16] Heat and Schrödinger equation on conical and anticonical-type manifolds
Control of PDEs, CNAM, Paris. 02 April 2014.

[17] Complexity in control-affine systems
Mathematical Control in Trieste, SISSA, Trieste, Italy. 05 December 2013.

[18] Dynamics of a quantum particle on a conical-like surface
Conical Intersections in Mathematical Physics, IHP, Paris. 31 May 2013.

[19] The Laplace-Beltrami operator on conic-type surfaces
Non Linear Control: Geometric Methods and Applications, Firenze, Italy. 19 April 2013

Other talks

[1] Self-adjointness e teoria spettrale per (sub-)laplaciani singolari
Seminario FIM, Universitá di Modena e Reggio Emilia, Italy. 25 January 2018.

[2] Loi de Weyl avec reste et estimés du noyau de la chaleur sur varietés riemanniennes non-completes
Séminaire de Théorie spectrale et géométrie, Institut Fourier, Grenoble. 30 November 2017.

[3] Sur le caractère auto-adjoint et la théorie spectrale des opérateurs de type Hörmander singuliers
Séminaire d'Analyse, Université de Tours. 09 November 2017.

[4] Quantum confinement and spectral theory of (sub-)Laplacians
Séminaire de Géométrie sous-riemannienne, IHP, Paris. 04 October 2017.

[5] Quantum confinement in non-complete Riemannian manifolds
25e colloque Jeunes Chercheurs Alain Bouyssy, Orsay, Paris. 02 March 2017.

[6] Neuro-geometry of vision and applications to image processing
Seminario FIM, Universitá di Modena e Reggio Emilia, Italy. 11 February 2016.

[7] A variational formulation of the sub-Riemannian model for the primary visual cortex
Séminaire "Analyse numérique et EDP", Université Paris Sud-Orsay. 26 November 2015.

[8] Reconstruction and pattern recognition via the Citti-Petitot-Sarti model
Séminaire "Statistique et imagerie", Université Paris-Dauphine. 19 January 2015.

[9] Complexity of control-affine motion planning
Séminaire de Théorie du Contrôle de Toulon, Université de Toulon. 30 January 2014.

[10] The heat and Schrödinger equations on conic and anticonic-type
Gdt Problémes spectraux et physisque mathématique, Université Paris Sud-Orsay. 18 December 2013.

[11] Complexity of control-affine motion planning
Séminaire de Géométrie sous-riemannienne, IHP, Paris. 02 October 2013.

[12] The heat and Schrödinger equations on conic and anticonic-type surfaces
A geometry day in Bicocca, Milan, Italy. 27 September 2013.

[13] Complexity in affine control systems
Journée GECO, UPMC, Paris. 25 June 2012.

[14] Complexity in affine control systems
Functional Analysis sector's seminar, SISSA, Trieste, Italy. 19 April 2012.

Posters

[1] Hardy-type inequalities and spectral bounds for hypoelliptic operators of Hörmander type
Contrôle des EDP et applications, CIRM, Marseille. 10 November 2015

[2] Highly corrupted image inpainting through hypoelliptic diffusion
Workshop on Geometrical Models in Vision, IHP, Paris. 23 October 2014.

Languages

Mother tongue **Italian**

Other languages[1]	Understanding				Speaking				Writing	
	Listening		Reading		Interaction		Production			
English[2]	C2	Fluent	C2	Fluent	C2	Fluent	C2	Fluent	C2	Fluent
French	C2	Fluent	C2	Fluent	C1	Fluent	C1	Fluent	C1	Fluent

[1] *Common European Framework of Reference for Languages (CEFR)*

[2] *TOEFL iBT Test. Score of 110/120.*