

# Dario Prandi

Chargé de recherche CNRS at L2S

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## Experience

- Chargé de Recherche CNRS**, L2S, CentraleSupélec, Gif-sur-Yvette 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](#), [Frédéric 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**, Analyse et Topologie (CM and TD, 60h). Fall 2017  
Bachelor course (L2). PSL Research University, Paris.
- Lecturer**, Analyse et Topologie (CM and TD, 60h). Fall 2016  
Bachelor course (L2). PSL Research University, Paris.
- Teaching assistant**, Contrôle Géométrique (TD, 10h). Spring 2016  
Master course, Université Paris-Sud Orsay.
- Lecturer**, Analyse et Topologie (CM and TD, 60h). Fall 2015  
Bachelor course (L2). PSL Research University, Paris.
- Teaching assistant**, Outils Logiciels (TP, 32h). Fall 2014  
Bachelor course, IUT de Toulon.
- Teaching assistant**, Outils Logiciels (TP, 18h). Spring 2014  
Bachelor course, IUT de Toulon.
- Teaching assistant**, Contrôle Géométrique (TD, 10h). Spring 2013  
Master course, Université Paris-Sud Orsay.

## Organization

- 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>.
- A day in control theory**, CMAP, École Polytechnique, Palaiseau. 2 may 2017  
Thematic day in honour of [A. Agrachev](#) 65th birthday.
- 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

- 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

- Amine Bohi**, Ph.D student in Computer Science, LSIS, Université de Toulon. 2014  
Supervised in collaboration with F. Bouchara and J.-P. Gauthier. Subject of the dissertation: “Descripteurs de Fourier inspirés de la structure du cortex visuel primaire humain. Application à 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)

### Peer-reviewed journals

- [1] Quantum confinement on non-complete Riemannian manifolds  
Dario Prandi, Luca Rizzi, Marcello Seri  
*J. Spectr. Theory* (To appear)
- [2] A sub-Riemannian Santalò formula with applications to isoperimetric inequalities and Dirichlet spectral gap of hypoelliptic operators  
Dario Prandi, Luca Rizzi, Marcello Seri  
*J. Differential Geom.* (To appear)
- [3] 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](https://doi.org/10.1007/s10851-018-0810-4)
- [4] 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](https://doi.org/10.1016/j.jde.2015.10.011)
- [5] 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](https://doi.org/10.1080/03605302.2015.1095766)
- [6] 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](https://doi.org/10.1007/s10851-016-0669-1)
- [7] Complexity of control-affine motion planning  
F. Jean, D. Prandi  
*SIAM J. Control Optim.* 53.2 (2015), pp. 816–844. doi: [10.1137/130950793](https://doi.org/10.1137/130950793)

- [8] 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](https://doi.org/10.1051/cocv/2014014)

## Peer-reviewed conferences and workshops

- [1] Image inpainting via a control-theoretical model of human vision  
U. Boscain, J. P. Gauthier, D. Prandi  
*2018 14th IEEE International Conference on Control Automation (ICCA)*. (2018). To appear
- [2] 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](https://doi.org/10.1007/978-3-319-25040-3_67)
- [3] 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](https://doi.org/10.1109/CDC.2014.7040056)

## Preprints

- [1] On the regularity of abnormal minimizers for rank 2 sub-Riemannian structures  
Davide Barilari, Yacine Chitour, Frédéric Jean, Dario Prandi, Mario Sigalotti  
arXiv: [1804.00971](https://arxiv.org/abs/1804.00971) [math.OA]
- [2] Cortical-inspired image reconstruction via sub-Riemannian geometry and hypoelliptic diffusion  
Ugo Boscain, Roman Chertovskih, Jean-Paul Gauthier, Dario Prandi, Alexey Remizov  
arXiv: [1801.03800](https://arxiv.org/abs/1801.03800) [cs.CV]
- [3] On the essential self-adjointness of sub-Laplacians  
Valentina Franceschi, Dario Prandi, Luca Rizzi  
arXiv: [1708.09626](https://arxiv.org/abs/1708.09626) [math.DG]
- [4] Generalized Fourier-Bessel operator and almost-periodic interpolation and approximation  
J.-P. Gauthier, D. Prandi  
arXiv: [1612.00056](https://arxiv.org/abs/1612.00056) [math.NA]

## Talks in international conferences

- [1] Anthropomorphic image reconstruction via sub-Riemannian geometry and hypoelliptic diffusion  
Delays and constraints in distributed parameter systems, Gif-sur-Yvette, France. 24 November 2017.
- [2] Quantum confinement and spectral analysis of degenerate operators on Riemannian manifolds  
VII Partial differential equations, optimal design and numerics, Benasque, Spain. 22 August 2017.
- [3] 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.
- [4] Image processing in the semidiscrete group of rototranslations  
2nd Conference on Geometric Science of Information, École Polytechnique. 20 October 2015.
- [5] 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.
- [6] Self-adjointness of intrinsic diffusions in almost-Riemannian structures  
Thematic day on Analysis and geometry of almost-Riemannian manifolds, IHP, Paris. 03 December 2014.
- [7] Intrinsic hypoelliptic diffusions in sub-Riemannian and almost-Riemannian geometry  
Thematic day on Hypoelliptic diffusion: analysis and control, IHP, Paris. 06 November 2014.
- [8] Spectral properties and Aharonov-Bohm effect on Grushin-like structures  
First International Joint Meeting, Bilbao, Spain. 02 July 2014.
- [9] The Laplace-Beltrami operator on conic and anti-conic surfaces  
Geometry and Control, Steklov Institute, Moscow, Russia. 17 April 2014.
- [10] Heat and Schrödinger equation on conical and anticonical-type manifolds  
Control of PDEs, CNAM, Paris. 02 April 2014.

- [11] Complexity in control-affine systems  
Mathematical Control in Trieste, SISSA, Trieste, Italy. 05 December 2013.
- [12] Dynamics of a quantum particle on a conical-like surface  
Conical Intersections in Mathematical Physics, IHP, Paris. 31 May 2013.
- [13] 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, Università di Modena e Reggio Emilia, Italy. 25 January 2018.
- [2] Loi de Weyl avec reste et estimés du noyau de la chaleur sur variétés riemanniennes non-complètes  
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, Università 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 Problèmes spectraux et physique 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  
Other languages<sup>1</sup>

**English<sup>2</sup>**  
**French**

**Italian**

Understanding				Speaking				Writing	
Listening		Reading		Interaction		Production			
C2	Fluent	C2	Fluent	C2	Fluent	C2	Fluent	C2	Fluent
C2	Fluent	C2	Fluent	C1	Fluent	C1	Fluent	C1	Fluent

<sup>1</sup>Common European Framework of Reference for Languages (CEFR)

<sup>2</sup>TOEFL iBT Test. Score of 110/120.