1 Curriculum Vitæ of Jérémy Rouot

Date and place of birth:	7th March 1990 in Langres (Haute-Marne, France)
Nationality:	French
Marital status:	Single
Phone number:	06 70 15 93 77
Mail address:	LAAS-CNRS, 7 Avenue du Colonel Roche, 31 077 Toulouse Cedex 4
Email address:	jeremy.rouot@grenoble-inp.org
Personal page:	`http://jeremyrouot.github.io/homepage/`
Research areas:	Optimization, Geometric control, Optimal control and sub-Riemannian geometry.
Applications:	Orbital transfer with low thrust, Swimming at low Reynolds number, Magnetic Resonance Imaging, Robotic.

1.1 Current affiliation

Since 1th Dec. 2016	**Postdoctoral researcher in Applied Mathematics**, with Didier Henrion and Jean-Bernard Lasserre. Methods and Algorithms for Control, Laboratory for Analysis and Architecture of Systems (LAAS), Toulouse, France. Member of the Projet TAMING. `http://taming.laas.fr/`.

1.2 Education and Diplomas

2010 - 2013 **Ingénieur ENSIMAG**, Applied Mathematics and Computer Science, **Grenoble Institute of Technology**, Grenoble, France.

2013 - 2016 **PhD in Applied Mathematics**, Université Côte d'Azur, INRIA Sophia Antipolis.

Title: Geometric and numerical methods in optimal control and applications to the swimming problem at low Reynolds number and to low thrust orbital transfer

Keywords: sub-Riemannian geometry ; Periodic optimal control ; Necessary and sufficient optimality conditions ; Copepod and Purcell swimmers; Orbital transfer with low thrust ; Averaging in optimal control.

Advisors: Bernard Bonnard (University of Burgundy, Dijon)
Jean-Baptiste Pomet (INRIA, Sophia Antipolis)

Defense date: 28th November 2016

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Jury:

U. Boscain	DR, CNRS, École Polytechnique	Reviewer
E. Trélat	PR, Univ. Paris VI	Reviewer
B. Bonnard	PR, Univ. Bourgogne	Advisor
J.-B. Pomet	DR, INRIA Sophia Antipolis	Advisor
F. Alouges	PR, École Polytechnique	Examiner
P. Bettiol	PR, Univ. Bretagne Occidentale	Examiner
R. Epenoy	Ingénieur CNES Toulouse	Examiner
M. Tucsnak	PR, Univ. Bordeaux	Examiner

2 Some scientific formations

2013 Nov.	Conference on **Geometry and Algebra of Linear Matrix Inequalities**, GeoLMI at CIRM, Marseille, France (November 12-16).
2014, Mars	Course on **Polynomial optimization and control**, organized by GdR MOA, Insa Rennes, France (24-25 Mars).
2014	Course on **Resolution of algebraic systems using Gröbner's basis**, École Doctorale Carnot-Pasteur, Dijon.
2014, Sep. to Dec.	Trimester at Institut Henri Poincaré (Paris), **Geometry, Analysis and Dynamics on Sub-Riemannian Manifolds**. Courses: *Geodesics in sub-Riemannian manifolds* (24h), *Singularities and local geometry of vector distributions* (24h). Workshops: *Geometric analysis on sub-Riemannian manifolds, September 29-October 28* and *Nonholonomic mechanics and optimal control (November, 25th to 28th).*
2014, Nov.	Workshop on **New trends in Calculus of variations, Geometric control and related fields**, RICAM, Linz, Austria (November 17-21).
2015	Course on **Geometric optimal control**, École Doctorale Carnot-Pasteur, Dijon.
2016	Course on **Geometric optimal control and applications.**, École Doctorale Carnot-Pasteur, Dijon.

3 Research activities

Oral communications in international conferences.

2015, Aug.	Conference, **Nonlinear Control and Geometry**, Stefan Banach Center, Bedlewo, Poland. *Averaging techniques in the time minimal transfer using low propulsion*
2016, Jan.	Conference, **10th International Young Researcher Workshop on Geometry**, Mechanics and Control, Institut Henri Poincaré, Paris, France. *Geometric and numerical analysis between the Purcell swimmer and the Copepod swimmer*
2016, Dec.	Conference, **55th IEEE Conference on Decision and Control**, Las Vegas, USA. *Geometric and numerical approach to the optimal control and efficiency of the Copepod swimmer*
2016, Dec.	Conference, **55th IEEE Conference on Decision and Control**, Las Vegas, USA. *Optimal Control of an ensemble of Bloch equations with Applications in MRI.*

Oral communications in national conferences.

2016, Mar.	Conference **SMAI-MODE 2016** - Société de Mathématiques Appliquées Industrielles, ENSEEIHT, Toulouse. *Contrôle optimal géométrique pour les micro-organismes.*

Seminars.

2017, Mar.	Team's seminar, Methods and Algorithms for Control, LAAS-CNRS, Toulouse, France. *Local controllability and application to low thrust orbital transfer.*
2016, Sep.	Teams' Meeting, INRIA McTAO - INRIA Mokaplan, INRIA-Paris, Paris, France. *Geometric and numerical optimal control for microorganisms at low Reynolds number.*
2015, Dec.	Students seminar, Institut de Recherche Mathématique Avancée de Strasbourg, Strasbourg, France. *Nilpotent approximation in Sub-Riemannian geometry and applications to the Purcell swimmer.*
2015, Oct.	Students seminar, Mathematisches Institut - Universität Basel, Basel, Switzerland. *Nilpotent approximation in Sub-Riemannian geometry and applications to the Purcell swimmer.*
2015, May	16th Yearly meeting of the doctoral school Carnot-Pasteur, Université de Bourgogne Franche-Comté, Dijon. *Averaging in optimal control and application to orbital transfer with low thrust.*
2014, Dec.	Students seminar, Institut de Mathématiques de Bourgogne, Dijon. *Effect of the lunar perturbation on the metric associated with the average orbital transfer problem.*
2014, May.	Students seminar, Institut de Mathématiques de Bourgogne, Dijon. *Lunar perturbation and the three-body problem.*

4 Collective responsibilities

- Organizer of the student seminar of the doctoral school Carnot Pasteur, Institut Mathématiques de Bourgogne, 2015-2016.
- Reviews for "55th IEEE Conference on Decision and Control" and "20th IFAC 2017 World Congress, Toulouse, France".
- Presenter for "Fêtes de la science" in Dijon, *La Lumière,* with members of Institut Mathématiques de Bourgogne (2015 Oct.)
- Public open house of Université de Bourgogne, *Minimal surfaces and soap bubbles*, Dijon, Jan. 2014 and 2015.

5 Teaching

- Teaching Assistant - **Algebra, 64h** for 1st year students in Computer Science and Mathematics. *Université de Bourgogne, Dijon, 2015-2016.*
- Teaching Assistant - **Partial differential equations, 9h** for 4th year students of engineer school INP ENSEEIHT, Toulouse, 2016-2017.
- Teaching Assistant - **Optimal control, 14h** for 4th year students of engineer school INP ENSEEIHT, Toulouse, 2016-2017.

6 Publications

References

Submitted monograph

[1] B. Bonnard, M. Chyba, J. Rouot. *Working Examples In Geometric Optimal Control.* Submitted 2016.
http://hal.archives-ouvertes.fr/hal-01226734v2

Submitted papers

[2] B. Bonnard, O. Cots, J.-C. Faugère, A. Jacquemard, J. Rouot, M. Safey El Din, T. Verron. Algebraic-geometric techniques for the feedback classification and robustness of the optimal control of a pair of Bloch equations with application to magnetic resonance imaging. Soumis 2017, 63 pages.
http://jeremyrouot.github.io/homepage/file/mri2017.pdf

[3] P. Bettiol, B. Bonnard, A. Nolot and J. Rouot. Sub-Riemannian geometry and swimming at low Reynolds number: the Copepod case. Soumis 2017.
http://hal.archives-ouvertes.fr/hal-01442880v2

[4] J. Rouot, J.-B. Lasserre. *On inverse optimal control via polynomial optimization.* Submitted 2017.
http://hal.archives-ouvertes.fr/hal-01493034v1

[5] P. Bettiol, B. Bonnard, J. Rouot. *Optimal strokes at low Reynolds number: a geometric and numerical study of Copepod and Purcell swimmers.* Submitted 2016.
http://hal.inria.fr/hal-01326790

Accepted book papers with peer review

[6] B. Bonnard, H. Henninger, J. Rouot. *Lunar perturbation of the metric associated to the averaged orbital transfer.* Analysis and geometry in control theory and its applications, conference in June 2014, published in Springer InDam series, vol. 11, 2015.
http://hal.archives-ouvertes.fr/hal-01090977v3

[7] P. Bettiol, B. Bonnard, L. Giraldi, P. Martinon, J. Rouot. *The three links Purcell swimmer and some geometric problems related to periodic optimal controls.* Variational methods in Imaging and geometric control, conference in November 2015, published in Radon Series on Computational and Applied Math, vol. 18, de Gruyter, 2016.
http://hal.archives-ouvertes.fr/hal-01143763v3

Accepted conference papers with peer review

[8] J. Rouot, P. Bettiol, B. Bonnard, A. Nolot. *Optimal control theory and the efficiency of the swimming mechanism of the Copepod Zooplankton.* To appear in Proc. 20th IFAC World Congress, Toulouse 2017.
http://hal.archives-ouvertes.fr/hal-01387423v2

[9] B. Bonnard, M. Chyba, J. Rouot, D. Takagi. *A Numerical Approach to the Optimal Control and Efficiency of the Copepod Swimmer.* In Proceedings of the 55th "IEEE Conference on Decision and Control", Las Vegas, 2016.
http://hal.archives-ouvertes.fr/hal-01286602v3

[10] B. Bonnard, A. Jacquemard, J. Rouot. *Optimal Control of an Ensemble of Bloch Equations with Applications in MRI.* In Proceedings of the 55th "IEEE Conference on Decision and Control", Las Vegas, 2016.
http://hal.archives-ouvertes.fr/hal-01287290v4