

# Hugo Lavenant

*PhD student in mathematics*

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## Education

- 2016 - present **PhD student in mathematics**, *Université Paris-Sud, Orsay, France.*  
PhD entitled *Variational problems in the Wasserstein space* under the supervision of Filippo Santambrogio.  
Research interests: calculus of variations and optimal transport; more precisely the study of harmonic mappings valued in the Wasserstein space, variational mean field games and incompressible Euler equations.
- 2012 - 2016 **École normale supérieure**, *Paris, France.*  
Courses taken included : Mathematics, Physics, History and Philosophy of science.
- (2015-2016) **Master 2 LOPHISS-SPH** in history and philosophy of science, *summa cum laude*. Master thesis entitled *L'introduction du calcul des probabilités et de la statistique en France : l'exemple du Calcul des probabilités à la portée de tous de Fréchet et Halbwachs* under the supervision of Laurent Mazliak.
- (2014-2015) **Master 2 EDP&CS** in mathematics, *summa cum laude*. Master thesis entitled *Espaces de Sobolev par rapport à des mesures quelconques et application au transport optimal* under the supervision of Filippo Santambrogio.
- (2013 - 2014) **Master 1** in Mathematics.
- (2012 - 2013) **Licence 3** (equivalent to a Bachelor's degree) in mathematics and physics, *summa cum laude*. Bachelor's thesis untitled *Quelques aspects de micromagnétisme*, under the supervision of Grégoire de Loubens, Radu Ignat and Éric Vincent.
- 2010 - 2012 **French classe préparatoire**, *Lycée Blaise Pascal, Orsay, France.*  
Admitted to *ENS*

## Experiences

### Internships

- February - April 2018 **Visiting Student**, *MIT, Cambridge, MA, USA.*  
Working on the numerical simulation of harmonic mappings valued in the Wasserstein space with Justin Solomon.
- February - July 2014 **Visiting Student Researcher**, *CalTech, Pasadena, CA, USA.*  
Study of the numerical instabilities due to the enforcement of boundary conditions in hyperbolic systems solvers, under the supervision of Oscar Bruno and Edwin Jimenez.
- July 2013 **Experimental study in Nanomagnetism**, *CEA, Saclay, France.*  
Experimental study of magnetization of small magnetic samples, under the supervision of Grégoire de Loubens. It lead to a publication [4].

### Talks

- April 2018 **UCLA, Los Angeles, USA**, *Analysis and PDE seminar.*  
Harmonic mappings valued in the Wasserstein space.
- March 2018 **NYU, New York, USA**, *MIC seminar.*  
Harmonic mappings valued in the Wasserstein space.
- May 2017 **INRIA, Paris, France**, *Mokameeting.*  
 $L^\infty$  bounds in optimal density evolution via flow interchange techniques.
- May 2017 **Université Pierre et Marie Curie, Paris, France**, *PhD student's seminar.*  
Courbes de mesures.
- May 2017 **Université Paris-Sud, Orsay, France**, *PhD student's seminar, Orsay, France.*  
Courbes de mesures.
- February 2017 **Université Pierre et Marie Curie, Paris, France**, *Physics PhD student's seminar.*  
Incompressible Euler equations and the least action principle.

### Teaching

- Septembre 2016 - present **Teaching assistant**, *IUT d'Orsay, Orsay, France.*  
IUT d'Orsay is an engineering school. Classes given to first year and second year students, including: computer science, statistics, calculus and linear algebra.

- September 2013 - **Oral examiner in classe préparatoire**, *Lycée Louis le Grand, Paris, France*.  
March 2016 Giving weekly oral examinations in Mathematics to students in *classe préparatoire*.
- September 2012 - **Mathematics and Physics teacher at Tremplin**, *Paris, France*.  
February 2014 The association *Tremplin* provides academic support to students coming from underprivileged areas.
- Diffusion of scientific culture**
- 2015 - present **Conferences in high schools**, *France*.  
December 2016 At *Lycée L'Essouriau, Les Ulis*, about the way computers play at chess.  
Avril 2015 At *Lycée Paul Eluard, Saint-Denis*, on fluid mechanics (to prepare the students to attend to a conference of Isabelle Gallagher).  
March 2015 At *Lycée Sainte Louise, Paris*, on group theory (to prepare the students to attend to a conference of Damien Gaboriau).  
March 2015 At *Institut Notre Dame, Bourg la Reine*, on group theory (to prepare the student to attend to a conference of Damien Gaboriau).
- July - August 2015 **Animation of a robotic workshop**, *Palais de la découverte, Paris, France*.  
The *Palais de la découverte* is a science museum.

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## Skills

### Languages

- French mother tongue.  
English fluent.

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## Publications

- [1] Hugo Lavenant (2017). Harmonic mappings valued in the Wasserstein space. *Submitted paper, arXiv preprint arXiv:1712.07528*.
- [2] Hugo Lavenant and Filippo Santambrogio (2017). Optimal density evolution with congestion:  $L^\infty$  bounds via flow interchange techniques and applications to variational Mean Field Games. *Accepted paper: Communications in Partial Differential Equations*.
- [3] Hugo Lavenant (2017). Time-convexity of the entropy in the multiphasic formulation of the incompressible Euler equation. *Published paper: Calculus of Variations and Partial Differential Equations*.
- [4] Hugo Lavenant, Vladimir Naletov, Olivier Klein, Grégoire De Loubens, Laura Casado, and José María De Teresa (2014). Mechanical magnetometry of Cobalt nanospheres deposited by focused electron beam at the tip of ultra-soft cantilevers. *Nanofabrication*, 1(1).