

# Benoît Bonnet-Weill

CRCN, Chargé de Recherche CNRS

Junior CNRS Researcher

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## Personal information

**Civil Status:** Born the 27th of April 1993 in Paris, XII<sup>ième</sup> arrondissement.

Married since the 25th of August 2018, no children.

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**Google Scholar:** <https://scholar.google.fr/citations?user=0w5eQawAAAAJ&hl=fr>

## Education

- ♦ **October 2016 – October 2019:** Ph.D. in Applied Mathematics. Specialisation in Control Theory.
  - **Title:** OPTIMAL CONTROL IN WASSERSTEIN SPACES
  - **Advisers:** [Francesco Rossi](#) (Director), *Università degli Studi di Padova*, Padova.  
[Maxime Hauray](#) (Codirector), *Aix-Marseille Université*, Marseille.
  - **Jury:** [Filippo Santambrogio](#) (President), *Université Claude Bernard*, Lyon.  
[Pierre Cardaliaguet](#) (Referee), *Université Paris-Dauphine*, Paris.  
[Nicola Gigli](#) (Referee), *Scuola Internazionale Superiore Degli Studi Avanzati*, Trieste.  
[José Antonio Carrillo](#) (Examinator), *Oxford University*, Oxford.  
[Hélène Frankowska](#) (Examinator), *CNRS & Institut de Mathématiques de Jussieu*, Paris.  
[Francesca Chittaro](#) (Examinator), *Laboratoire d'Informatique et Systèmes*, Toulon.  
[Francesco Rossi](#) (Director), *Università degli Studi di Padova*, Padova.  
[Maxime Hauray](#) (Codirector), *Aix-Marseille Université*, Marseille.  
[Jean-Paul Gauthier](#) (Invited), *Laboratoire d'Informatique et Systèmes*, Toulon.
- ♦ **September 2015 – August 2016:** M.Sc. in Applied Mathematics. Specialisation in Optimisation, Calculus of Variations and Geometric Control. *Université Paris-Saclay*, Orsay.
- ♦ **September 2013 – September 2016:** Engineering curriculum in Applied Mathematics. Specialisation in Optimisation, Control Theory and Operational Research. *École Nationale Supérieure de Techniques Avancées (ENSTA Paris)*, Palaiseau.
- ♦ **September 2011 – September 2013:** French “Classes Préparatoires aux Grandes Écoles” with Mathematics and Physics majors (MPSI - MP\*). *Lycée Blaise Pascal*, Orsay.
- ♦ **September 2008 – September 2011:** High School with Mathematics and Physics majors (1<sup>ère</sup> - Terminale S). *Lycée Descartes*, Antony.

## Academic positions

- ◇ **November 2021 – Now:** Junior CNRS Researcher in the team MÉTHODES ET ALGORITHMES DE COMMANDE (MAC), *Laboratoire d'Analyse et d'Architecture des Systèmes*, Toulouse.
- ◇ **February 2021 – October 2021:** INRIA Postdoctoral Fellow under the supervision of [Mario Sigalotti](#) and [Nastassia Pouradier Duteil](#), *Laboratoire Jacques-Louis Lions*, Paris.
- ◇ **November 2019 – February 2021:** CNRS Postdoctoral Fellow under the supervision of [Hélène Frankowska](#), *Institut de Mathématiques de Jussieu - Paris Rive Gauche*, Paris.
- ◇ **October 2016 – October 2019:** Ph.D. Student in Applied Mathematics under the supervision of [Francesco Rossi](#) and [Maxime Hauray](#), *Laboratoire d'Informatique et Systèmes*, Marseille & *Università degli Studi di Padova*, Padova.

## Grants

- ◇ **February 2021 – October 2021:** 15-month competitive Postdoctoral Fellowship from INRIA (interrupted to take my position at CNRS), *Université Pierre et Marie Curie*, Paris.
- ◇ **October 2016 – October 2019:** 3-year Ph.D. Funding from the ARCHIMÈDE French Excellence Laboratory, *Laboratoire d'Informatique et Systèmes*, Marseille.

## Conference organisation

- [O1] Mini-course on the topic *Measure differential equations : modelling and numerical solutions* (with [D. Henrion](#), [S. Marx](#) and [F. Rossi](#)) – 22ND SYMPOSIUM ON MATHEMATICAL THEORY OF NETWORKS AND SYSTEMS (MTNS2022), Bayreuth (September 2022).

## Publications

The available preprints of my articles can be found on my [Homepage](#) or via my [Google Scholar](#) account.

### Submitted and under-revision

- [S2] B. Bonnet-Weill and H. Frankowska. Viability and Invariance of Proper Sets for Continuity Inclusions in Wasserstein Spaces. *Under review*, 2022.
- [S1] B. Bonnet-Weill and H. Frankowska. Carathéodory Theory and A Priori Estimates for Continuity Inclusions in the Space of Probability Measures. *Under review*, 2022.

### Published and accepted journal papers

- [J11] R. Bonalli and B. Bonnet. [First-Order Pontryagin Optimality Conditions for Risk-Averse Stochastic Optimal Control Problems](#). *To appear in SIAM Journal on Control and Optimization*, 2022.
- [J10] B. Bonnet, C. Cipriani, M. Fornasier and H. Huang. [A Measure Theoretical Approach to the Mean-Field Maximum Principle for Training NeurODEs](#). *Nonlinear Analysis*, 227:113161, 2023.
- [J9] B. Bonnet, N. Pouradier Duteil and M. Sigalotti. [Consensus Formation in First-Order Graphon Models with Time-Varying Topologies](#). *Published online in Mathematical Models and Methods in Applied Sciences*, 2022.
- [J8] B. Bonnet and H. Frankowska. [Semiconcavity and Sensitivity Analysis in Mean-Field Optimal Control and Applications](#). *Journal de Mathématiques Pures et Appliquées*, 157:282-345, 2022.

- [J7] B. Bonnet and H. Frankowska, [Necessary Optimality Conditions for Optimal Control Problems in Wasserstein Spaces](#). *Applied Mathematics and Optimization*, 84:1281-1330, 2021.
- [J6] B. Bonnet and F. Rossi. [Intrinsic Lipschitz Regularity of Mean-Field Optimal Controls](#). *SIAM Journal on Control and Optimization*, 59 (3):2011-2046, 2021.
- [J5] B. Bonnet and É. Flayac, [Consensus and Flocking Under Communication Failures for a Class of Cucker-Smale Systems](#). *Systems and Control Letters*, 152:104930, 2021.
- [J4] B. Bonnet and H. Frankowska. [Differential Inclusions in Wasserstein Spaces: The Cauchy-Lipschitz Framework](#). *Journal of Differential Equations*, 271:594-637, 2021.
- [J3] B. Bonnet. [A Pontryagin Maximum Principle in Wasserstein Spaces for Constrained Optimal Control Problems](#). *ESAIM COCV*, 25 (52), 2019.
- [J2] B. Bonnet, J.P. Gauthier and F. Rossi. [Generic Singularities of the 3D-Contact Conjugate Locus](#). *Comptes Rendus Mathématiques*, 357 (6):520-527, 2019.
- [J1] B. Bonnet and F. Rossi. [The Pontryagin Maximum Principle in the Wasserstein Space](#). *Calculus of Variations and Partial Differential Equations* 58:11, 2019.

### Conference proceedings

- [C5] B. Bonnet and H. Frankowska. Viability and Exponentially Stable Trajectories for Differential Inclusions in Wasserstein Spaces. *To appear in the proceedings of the 2022 IEEE Conference on Decision and Control (CDC)*, 2022.
- [C4] B. Bonnet and H. Frankowska. [On the Properties of the Value Function Associated to a Mean-Field Optimal Control Problem of Bolza Type](#). In *2021 IEEE Conference on Decision and Control (CDC)*, 4558-4563, 2021.
- [C3] B. Bonnet and F. Rossi. [Variance Optimization and Control Regularity for Mean-Field Dynamics](#). In *IFAC-PapersOnLine*, 54 (19):13-18, 2021.
- [C2] B. Bonnet and H. Frankowska. [Mean-Field Optimal Control of Continuity Equations and Differential Inclusions](#). In *2020 IEEE Conference on Decision and Control (CDC)*, 470-475, 2020.
- [C1] B. Bonnet and F. Rossi. [Sparse Control of Kinetic Cooperative Systems to Approximate Alignment](#). In *Proceedings of the 20th IFAC World Congress*, 2017.

### Presentations at conferences and seminars

#### Invited talks at conferences, seminars and workshops

- [I16] *Pontryagin Optimality Conditions in Wasserstein Spaces and their Application to the Training of NeurODEs* – SÉMINAIRE D’ANALYSE NON LINÉAIRE ET D’OPTIMISATION, Avignon Université, Avignon (October 2022).
- [I15] *Some Results Related to Consensus Formation in Graphon Dynamics* – CONFERENCE “ROUND MEANFIELD: CROWDS, OPINIONS, CELLS”, LYSM, Roma (September 2022).
- [I14] *When HJB Meets Pontryagin in Mean-Field Control* – INVITED SESSION “OPTIMAL CONTROL AND CALCULUS OF VARIATIONS ON METRIC SPACES”, 15th Viennese Conference on Optimal Control and Dynamics Games, Vienna (July 2022)
- [I13] *A Mean-Field Optimal Control Approach to Deep Learning* – INVITED SESSION “CONTRÔLE ET JEUX À CHAMP-MOYEN”, Journées SMAI MODE, Limoges (June 2022).

- [I12] *Consensus Formation, Macroscopic Approximations, and their Interactions in the context of Multi-Agent Dynamics* – DO SEMINAR, LAAS-CNRS, Toulouse (May 2022).
- [I11] *Set-Valued Dynamics in the Space of Probability Measures* – JOURNÉE RENCONTRE DE L'ÉQUIPE COMBINATOIRE ET OPTIMISATION, IMJ-PRG, Paris (April 2022).
- [I10] *A Mean-Field Optimal Control Approach to the Training of NeurODEs* – BRAINPOP SEMINAR, LAAS-CNRS, Toulouse (January 2022).
- [I9] *Fine Properties of the Value Function in Mean-Field Optimal Control* – INVITED SESSION “MEAN-FIELD GAMES AND APPLICATIONS”, PGMO Days, Palaiseau (December 2021).
- [I8] *Nonsmooth and Set-Valued Analysis in Wasserstein Spaces with Applications in Mean-Field Control* – SÉMINAIRE PARISIEN D’OPTIMISATION, IHP, Paris (November 2021).
- [I7] *Sufficient Conditions for the Lipschitz Regularity of Mean-Field Optimal Controls* – GROUPE DE TRAVAIL DE CALCUL DES VARIATIONS, Remote talk (March 2021).
- [I6] *Exponential Flocking under Communication Failures for some Cucker-Smale Models* – SEMINAR OF THE INRIA TEAM MAMBA, LJLL, Remote talk (March 2021).
- [I5] *Continuity Inclusions and Applications in Mean-Field Optimal Control* – SEMINAR OF ANALYSIS AND APPLICATIONS, Université de Bretagne Occidentale, Remote talk (February 2021).
- [I4] *Flocking for the Cucker-Smale Systems under Communication Failures* – SEMINAR OF INRIA TEAM CAGE, LJLL, Remote talk (May 2020).
- [I3] *Intrinsic Lipschitz Regularity in Mean-Field Optimal Control Problems* – SEMINAR OF PROBABILITY, STATISTICS AND CONTROL THEORY, ENSTA Paris, Palaiseau (October 2019).
- [I2] *Topics in Analysis and Optimal Control of Multi-Agent Systems* – SEMINARIO DI EQUAZIONI DIFFERENZIALE, Università degli Studi di Padova, Padova (March 2019).
- [I1] *Optimal Control Problems in Wasserstein Spaces* – INVITED SESSION “VARIATIONAL ANALYSIS AND OPTIMAL CONTROL”, 14th Viennese Conference on Optimal Control and Dynamics Games, Vienna (August 2018).

### **Presentations at international conferences and research schools**

- [P8] *Set-Valued Koopman Theory for Control Systems* – 2022 INTERNATIONAL SYMPOSIUM ON NON-LINEAR THEORY AND ITS APPLICATIONS, Remote talk (December 2022).
- [P7] *Macroscopic Approximations of Multi-Agent Systems: An Introduction to Continuity Equations* – MINICOURSE ON MEASURE DIFFERENTIAL EQUATIONS, 25th International Symposium on Mathematical Theory of Networks and Systems, Bayreuth (September 2022).
- [P6] *Variance Optimization and Control Regularity in Mean-Fields Dynamics* – 7TH IFAC WORKSHOP ON LAGRANGIAN AND HAMILTONIAN METHODS FOR NONLINEAR CONTROL, Remote talk (October 2021).
- [P5] *Mean-Field Control and Continuity Inclusions* – 59TH CONFERENCE ON DECISION AND CONTROL, Remote talk (December 2020).
- [P4] *Some Problems in Modelling and Optimal Control of Multi-Agent Systems* – Poster session at the conference CROWDS: MODELS AND CONTROL, CIRM, Marseille (June 2019).
- [P3] *Optimal Control of Multi-Agent Systems: A Pontryagin Approach* – TOULOUSE WINTER SCHOOL IN CALCULUS OF VARIATIONS AND PROBABILITY THEORY, IMT, Toulouse (February 2019).

- [P2] *Optimal Control Problems in Wasserstein Spaces* – 12TH INTERNATIONAL YOUNG RESEARCHER WORKSHOP ON GEOMETRY, MECHANICS AND CONTROL, Università degli Studi di Padova, Padova (January 2018).
- [P1] *Sparse Alignment of Kinetic Cooperative Systems* – 20TH IFAC WORLD CONGRESS, Toulouse (July 2017).

## Editorial activities

Reviewer for the journals *Probability Theory and Related Fields*, *SIAM Journal on Control and Optimization*, *Journal of Differential Equations*, *Mathematics of Computations*, *IEEE Transactions on Automatic Control*, *Journal of Mathematical Analysis and Applications*, *Journal of Dynamical and Control Systems*, as well as for the proceedings of the *IEEE Conference on Decision and Control*, *American Control Conference* and *IFAC World Congress*.

## Teaching activities

- ◇ **2019 – 2023:** Exercises sessions for the course DIFFERENTIABLE OPTIMISATION I.  
Master 1 level, 15-hour teaching, *ENSTA Paris* & *UPSAY*, Palaiseau.
- ◇ **2020 – 2021:** Exercises sessions for the course DIFFERENTIABLE OPTIMISATION II.  
Master 1 level, 15-hour teaching, *ENSTA Paris* & *UPSAY*, Palaiseau.
- ◇ **2020 – 2021:** Exercises sessions for the course OPTIMISATION.  
Bachelor 3 level, 18-hour teaching, *UPP1*, Paris.
- ◇ **2019 – 2020:** Exercises sessions for the course QUADRATIC OPTIMISATION.  
Bachelor 3 level, 15-hour teaching, *ENSTA Paris*, Palaiseau.
- ◇ **2017 – 2019:** Lectures for the course INTRODUCTION TO LEBESGUE INTEGRATION.  
Bachelor 3 level, 4-hour teaching, *ECM*, Marseille.
- ◇ **2017 – 2019:** Lectures for the course INTRODUCTION TO OPTIMISATION THEORY.  
Bachelor 3 level, 2-hour teaching, *ECM*, Marseille.
- ◇ **2017 – 2018:** Exercises sessions for the course PRELIMINARIES AND RECALLS IN OPTIMISATION.  
Master 2 level, 14-hour teaching, *ECM* & *AMU*, Marseille.

## Miscellaneous Skills, Hobbies and Interests

- ◇ **Languages:**
  - French (Mother tongue)
  - Italian (Basic, lived in Italy for a while)
  - English (Fluent, C2-level CEFR)
  - German & Chinese (Small remnants)
- ◇ **Hobbies:**
  - Drums (10-year regular practice)
  - Billiard (6-year regular practice)
  - Chess (1-year somewhat practice)
  - Bodhran (celtic traditional drums) & Guitar
  - Bouldering (indoor climbing) & bike travels
  - Video, board & card games
- ◇ **Interests:**
  - Epistemology of mathematics & physics
  - Sociology, history & political philosophy
  - Science fiction & fantasy novels
  - Climate sciences (MyCO2 ambassador)
  - Music in general
  - “Bandes dessinées” and mangas