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# Armand Bernou

## Education

- 2023– **Maitre de Conférences (Associate Professor)**, *LSAF, Université Claude Bernard Lyon 1*
- 2022–2023 **CIVIS3i Postdoctoral Fellow**, *Dipartimento di Matematica Guido Castelnuovo, Sapienza Università di Roma*  
Part of the MSCA Action of the European Union. Supervised by **Alessandra Faggionato** (Sapienza Università di Roma).
- 2021–2022 **Postdoctoral Researcher**, *LJLL, Sorbonne Université*  
Supervised by **Mitia Duerinckx** (Université Paris-Saclay) and **Antoine Gloria** (Sorbonne Université and Université Libre de Bruxelles).
- 2017–2020 **Ph.D. in Applied Mathematics**, *LPSM, Sorbonne Université*  
Long-Time Behavior of Kinetic Equations with Boundary Effects.  
Supervised by **Nicolas Fournier** (Sorbonne Université) and **Stéphane Mischler** (Université Paris Dauphine-PSL).
- 2016–2017 **Master in Advanced Studies in Mathematics**, *University of Cambridge*  
Distinction. Master Thesis: Free Molecular Flow and Boundary Effects, supervised by **Clément Mouhot** (University of Cambridge).
- 2015–2017 **Engineering degree in Statistics and Economics**, *ENSAE ParisTech*  
Final year in 2016–2017 in a double-degree program with the University of Cambridge.

## Research interests

My research focuses mostly on:

- Kinetic theory with boundary effects, Harris theorem, spectral methods for studying the long-time behavior of evolution equations, hypocoercivity.
- Mean-field models and their simulations, propagation of chaos, study of correlations and fluctuations.
- Coupling methods, Meyn-Tweedie theory and asymptotic behavior of Markov processes.
- Stochastic homogenization for both continuous models: Stokes flow with a suspension of particles, diffusions in random environment, and discrete models.

## Publications

1. A. Bernou. A Semigroup Approach to the Convergence Rate of a Collisionless Gas. *Kinetic & Related Models*, 13, 1071-1106, 2020.
2. A. Bernou & N. Fournier. A Coupling Approach for the Convergence to Equilibrium for a Collisionless Gas. *Annals of Applied Probability*, 32(2), 2022.
3. A. Bernou. On Subexponential Convergence to Equilibrium of Markov Processes. *Séminaire de Probabilités LI*, 2022.
4. A. Bernou, K. Carrapatoso, S. Mischler & I. Tristani. Hypocoercivity for Kinetic Linear Equations in Bounded Domains With General Maxwell Boundary Condition. *Ann. Inst. H. Poincaré, Anal. Non Linéaire*, 40, 2022.
5. A. Bernou. Convergence Towards the Steady State of a Collisionless Gas With Cercignani-Lampis Boundary Condition. *Communication in Partial Differential Equations*, 47(4), 2022.

## Preprints

6. A. Bernou & Y. Liu. Particle method for the numerical simulation of the path-dependent McKean-Vlasov equation, arXiv: 2211.03869, 2022.
7. A. Bernou, M. Duerinckx & A. Gloria. Superfluidity of a Stokes Fluid with Active Suspensions, arXiv: 2301.00166, 2023.
8. A. Bernou. Asymptotic Behavior of Degenerate Linear Kinetic Equations with Non-Isothermal Boundary Conditions, arXiv: 2308.01694, 2023.
9. A. Bernou & M. Duerinckx. Uniform-in-time estimates on the size of chaos for interacting Brownian particles, arXiv: 2405.19306, 2024.

## Talks

- June 2024 *Beyond propagation of chaos : correlations control in mean-field systems*, 4th Italian Meeting in Probability and Statistics, Rome.
- Feb. 2024 *Théorie de Harris déterministe et applications à la cinétique avec effets de bord*, Séminaire EDPs et Modélisation, ENS Lyon.
- Jan. 2024 *Modèles de champ moyen: corrélations et dépendance en la trajectoire passée*, Séminaire SAF, ISFA, Lyon.
- Nov. 2023 *Beyond propagation of chaos : correlations control in mean-field systems*, Séminaire de Probabilités, Institut Camille Jordan - UMPA, Lyon.
- Sep. 2023 *Harris theorems for kinetic models with physical boundary conditions*, Seminario di Fisica Matematica e Probabilità , Sapienza Università di Roma, Rome.
- Aug. 2023 *How to simulate path-dependent McKean-Vlasov equations ?*, 43rd Conference on Stochastic Processes and their Applications, Lisbon.

- Apr. 2023 *Beyond the mean-field limit : uniform in time estimates for the cumulants*, Seminario de Probabilidades de Chile, Centro de Modelamiento Matemático, Santiago.
- Mar. 2023 *Au-delà des limites de champ moyen : estimations uniformes en temps des cumulants pour le système de McKean-Vlasov*, Journées Jeunes EDPistes, Tours.
- Nov. 2022 *On the Cercignani-Lampis boundary condition in kinetic theory*, Workshop du projet ANR EFI, Lyon.
- Oct. 2022 *The Kipnis-Varadhan argument for the random walk in random environment*, Arbeitsgemeinschaft: Quantitative Stochastic Homogenization, Oberwolfach. A detailed abstract was included to the Arbeitsgemeinschaft Report (48).
- Aug. 2022 *Uniform in time estimates for the cumulants of the McKean-Vlasov equation*, Journées MAS, Rouen.
- May 2022 *Beyond the mean-field limit for the McKean-Vlasov particle system : Uniform in time estimates for the cumulants*, Workshop Metastability, mean-field particle systems and non linear processes, Université Jean Monnet, Saint-Etienne.
- Jan. 2022 *Superfluidity of active fluids: an homogenization approach*, Probability Seminar, Institut de Mathématiques de Marseille.
- Nov. 2021 *The free-transport equation with physical boundary conditions*, Séminaire Analyse et Probabilités, PSL-Université Paris Dauphine, Paris.
- Nov. 2021 *Homogenization of a Stokes fluid with active suspensions: the linear case*, Asymptotic behavior in PDEs, 4th edition, Lille.
- June 2021 *Asymptotique du transport libre cinétique avec condition de Maxwell*, Journées de Probabilités 2021, Guidel Plages.
- Apr. 2021 *Comportement asymptotique du transport libre cinétique avec conditions de bord*, Groupe de Travail "Les Probas du Vendredi", LPSM, Sorbonne Université.
- Feb. 2021 *Free-Transport Equation With Boundary Effects and Sub-Geometric Convergence to Equilibrium of Markov Processes*, Séminaire Gaussbusters, IRMAR Rennes.
- Jan. 2021 *Asymptotic Behavior of Markov Processes: A Dive Into the Subgeometric Case*, Groupe de travail des thésards du LPSM, Sorbonne Université.
- Mar. 2020 *Schauder Estimates and Integration Against Singular Kernels, Parts 1 and 2*, Groupe de travail "Structures de régularité", LPSM, Sorbonne Université.
- Jan. 2020 *Coupling Methods for the Convergence Rate of Markov Processes*, Groupe de travail des thésards du LPSM, Sorbonne Université.
- Dec. 2019 *Harris' Theorem and an Application to the Asymptotic Behavior of a Collisionless Gas*, Groupe de travail des thésards du LJLL, Sorbonne Université.
- Dec. 2019 *Rate of Convergence of a Collisionless Gas*, 12th Oxford-Berlin Young Researchers Meeting on Applied Stochastic Analysis, Oxford.

Nov. 2019 *Rate of Convergence Towards Equilibrium for a Collisionless Gas : A Coupling Approach*, Young Researchers Seminar, CERMICS, ENPC.

## Poster Presentations

Oct. 2021 *Convergence towards the steady state of a collisionless gas with Cercignani-Lampis boundary condition*, workshop Japan-France on Kinetic and Fluid Dynamics, online.

May 2019 *A Semigroup Approach to the Convergence Rate of a Collisionless Gas*, Summer School "Trails in kinetic theory: foundational aspects and numerical methods", Hausdorff Research Institute for Mathematics, Bonn.

## Funding

2017-2020 Laureate, DIM MathInnov Ph.D. program, grant from the Région Île-de-France: three years of funding for my doctoral studies.

2022-2023 CIVIS 3i Post-doctoral Fellowship, 2 years of funding for my post-doc at La Sapienza Università di Roma, additional research funds of 15k€.

2024 Laureate, Project "Accueil" from Université Claude Bernard Lyon 1, 14k€.

## Teaching Activities

2023 At ISFA, Université Claude Bernard Lyon 1:

- Numerical techniques in Finance and Insurance, 2nd year of Master's degree in actuarial sciences (21h): lectures and practical classes;
- Econometrics, 1st year of Master's degree in actuarial sciences (36h): lectures and exercise classes;
- SAS programming, 1st year of Master's degree in actuarial sciences (18h) and in economics and statistics (18h): practical classes.

2022 In charge of the practical classes for the course "Machine Learning" given by Dr. Y. Liu for 1st year Master's degree students (two groups of 30 students) at the Université Paris-Dauphine (40h).

2021 In charge of the practical classes for the course "Monte-Carlo methods" given by Dr. J. Stoehr for 1st year Master's degree students (one group of 30 students) at the Université Paris-Dauphine (20h).

2018-2020 In charge of the course *Introduction to Probability* for 3rd year students in Earth Sciences at Polytech Sorbonne. I gave the lectures, prepare all the material, including videos and content during the Covid crisis, and gave the exercise classes for three consecutive years (40h each).

2018-2019 In charge of the exercise classes of the course "Series" of Dr. L. Boudin, for 2nd year students at Sorbonne Université, for two consecutive years (18h each).

2018 In charge of the exercise classes of the course "Elementary Probabilities" of Prof. A. Lambert, for third year students at Sorbonne Université (36h).

## Other Activities

- 2021- Referee for the Journal of Evolution Equations, the Journal of Mathematical Physics, Discrete and Continuous Dynamical Systems B, La Matematica, the Journal of Statistical Physics, Acta Applicandae Mathematicae. I also wrote several reviews for the MathSciNet network.
- 2024- Coordination between ISFA and the Institut International des Assurances, Yaoundé (Cameroon).
- 2021-2022 Participation to the "Fête de la Science", going to a primary school to work with kids on math problems.