LOUIS-PIERRE CHAINTRON

Teaching and research fellow at ENS-DMA Paris

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EXPERIENCES AND TEACHING

Research experiences

(01/2025 - 04/2025) **Research visit** at Columbia University New York, in the team of Prof. Lacker.
(09/2022 - 12/2024) **PhD thesis** supervised by Julien Reygner and Philippe Moireau, *Finite-dimensional and measure-valued constrained dynamics, through the lens of large deviation and control theory.*
(12/2023) **Research visit** at the ASHBi institute in Kyoto, for collaborating with Antoine Diez.
(03/2022 - 08/2022) **Internship** at Inria Saclay, team MΞDISIM, on non-linear filtering and control of constrained dynamics, under the supervision of Philippe Moireau.
(10/2021 - 02/2022) **Internship** at CERMICS Ecole des Ponts Paris on metastability for mean-field particle systems, under the supervision of Tony Lelièvre and Julien Reygner.
(05/2021 - 08/2021) **Internship** at Inria Saclay, team MΞDISIM, on stochastic modelling for cardiac muscle, under the supervision of Dominique Chapelle and Philippe Moireau.
(02/2020 - 05/2020) **Internship** on persistent random walks for cells at Imperial College, London, under the supervision of Pierre Degond.

Teaching and outreach

(2024-) Organisation member of the **seminar sessions** *Les Probabilités de Demain*, at IHP Paris.
(2023-2024) Organisation member of the Maths **PhD seminars** at ENS Paris.
(2023) In charge of **schedule organisation** for entrance contests at ENS-DMA.
(2023) Supervision of the undergraduate internship of Honoré Boïarsky (60 hours).
(09/2022- 08/2025) **Teaching and research fellow** at ENS-DMA (*caïman*, $\simeq$ 100 hours per year): in charge of M1 exercise sessions, reading groups, mentoring, and projects with industrial partners (Artelys, EP Tender, Qair, IFPEN, Quobly, Callyope).
(2021-2022) In charge of **exercise sessions** in Mathematics at CPES (bachelor students, 32 hours).
(2018-2019) **Oral examiner** in MPSI at Lycée Sainte-Geneviève (undergraduate students, 64 hours).

EDUCATION

PhD thesis, *École des Ponts et Chaussées,* supervised by J. Reygner and P. Moireau.	*2022 - 2024*
Master's degree from ENS Paris, *Applied Mathematics, with a minor in Physics.*	*2021 - 2022*
M2 Sorbonne Universités, *Partial differential equations and numerical analysis.*	*2020 - 2021*
M1 ENS Paris, *Applied Mathematics.*	*2019 - 2020*
L3 ENS Paris, *Bachelor of Fundamental Mathematics.*	*2018 - 2019*
Classes Préparatoires aux Grandes Ecoles, MPSI/MP* at Lycée Sainte Geneviève.	*2016 - 2018*
Baccalauréat Général S at Lycée Janson de Sailly.	*2016*

PUBLICATIONS

[9] **Regularity and stability for the Gibbs conditioning principle on path space via McKean-Vlasov control**, L. Chaintron, G. Conforti, *arXiv:2410.23016*, October 2024.

[8] **Gibbs principle with infinitely many constraints: optimality conditions and stability**, L. Chaintron, G. Conforti, J. Reygner, *arXiv:2410.20858*, October 2024.

[7] **Quasi-continuity method for mean-field diffusions: large deviations and central limit theorem**, L. Chaintron, *arXiv:2410.04935*, October 2024.

[6] **Existence and global Lipschitz estimates for unbounded classical solutions of a Hamilton-Jacobi equation**, L. Chaintron, accepted in *Annales de la Faculté des Sciences de Toulouse*, July 2024.

[5] **A jump-diffusion stochastic formalism for muscle contraction models at multiple timescales**, L. Chaintron, F. Kimmig, M. Caruel, P. Moireau, *Journal of Applied Physics*, 2023, vol. 134, no 19.

[4] **Modeling actin-myosin interaction: beyond the Huxley-Hill framework**, L. Chaintron, M. Caruel, F. Kimmig, *MathematicS In Action*, Tome 12 (2023) no. 1, pp. 191-226.

[3] **Mortensen Observer for a class of variational inequalities - Lost equivalence with stochastic filtering approaches**, L. Chaintron, A. González, L. Mertz, P. Moireau, *ESAIM: Proceedings and Surveys*, September 2023, vol. 73, p. 130-157.

[2] **Propagation of chaos: a review of models, methods and applications. II. Applications**, L. Chaintron, A. Diez, *Kinetic and Related Models*, 2022, 15(6): 1017-1173.

[1] **Propagation of chaos: a review of models, methods and applications. I. Models and methods**, L. Chaintron, A. Diez, *Kinetic and Related Models*, 2022, 15(6): 895-1015.

INVITED TALKS

Groupe de travail (CMAP, January 2025): Continuity method for mean-field systems
Informal seminar (LaMME Évry, January 2025): How to constrain a Fokker-Planck equation? A stochastic control approach
Control seminar (LMI Rouen, December 2024): How to constrain a Fokker-Planck equation?
Probability and statistics seminar (Angers, December 2024): How to change the statistical properties of a diffusion process?
Analysis seminar (EPFL, Switzerland, November 2024): Quasi-continuity methods for mean-field systems.
On Systems of Interacting Particles (IHES Saclay, May 2024): Constrained dynamics on measures.
Seminar "Actualités des Maths" (Neuchâtel, Switzerland, April 2024): Deterministic estimation and stochastic filtering.
Quantitative Analysis of Metastable Processes (Nantes, January 2024): Mean-field limit for conditioned system.
Inria seminar IDEFIX-MΞDISIM-POEMS (Saclay, December 2023): Mortensen observer for sub-differential dynamics.
Informal seminar (Tokyo university, Japan, December 2023): Constrained non-linear estimation.
Kansai probability seminar (RIMS, Kyoto university, Japan, December 2023): How to correct the statistical properties of a stochastic evolution? An answer based on the Gibbs principle.
Development across scales (ASHBi, Kyoto, Japan, December 2023): Stochastic model for actin-myosin interaction.
EDP, commande et observation des systèmes (LAAS, Toulouse, October 2023): Mortensen observer for sub-differential dynamics.
Analysis and simulations of metastable systems (CIRM, Marseille, April 2023): Large mean-field systems conditioned by rare events.
Les probabilités de demain (IHP, Paris, November 2022): Gibbs principle on path space and link with stochastic control.
CEMRACS 2021 (CIRM, Marseille, August 2021): Deterministic filtering for non-smooth dynamical systems.