ALAIN BLAUSTEIN

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RESEARCH EXPERIENCE

Postdoctoral Scholar/Research Assistant *September 2023 - present*
Department of Mathematics, Pennsylvania State University, USA

Ph.D. program with Prof. Francis Filbet *September 2020 - September 2023*
Institut de Mathématiques de Toulouse, France

Subject : "Theoretical and numerical analysis of mean-field models arising in Physics and Biology".
Defense date: 26/06/2023

Internship with Prof. Francis Filbet *April-July 2020*
Institut de Mathématiques de Toulouse, France

Subject : "Mean-field limit for a spatially extended FitzHugh-Nagumo neural network".

Master thesis with Prof. Roger Lewandowski *November 2018-January 2019*
Université Rennes 1, France

Subject : "Well posedness of the incompressible Navier-Stokes equations on short times".

Internship with Prof. Guillaume Bal *April - June 2018*
University of Chicago, USA

Subject : "Stochastic Homogenization of the Poisson equation with degenerated diffusion coefficients".

Internship with M.d.C. Pierre Dehornoy *May - June 2017*
Institut Fourier, Grenoble, France

Subject : "Birkhoff sections of the geodesic flow in the torus".

EDUCATION AND DEGREES

Graduated the French Agregation *September 2018 - June 2019*
École Normale Supérieure, Rennes, France

Major : "Scientific Computing".

BSc and MSc in Fundamental Mathematics *September 2016 - June 2020*
École Normale Supérieure, Rennes, France

Graduated with high Honors.

Post-Secondary prepatory classes *September 2014 - June 2016*
Lycée Charlemagne, Paris, France

University-level courses required in preparation for competitive entrance exams into top engineering and graduate schools (France's "Grandes Écoles").

RESEARCH INTERESTS

My research interests lie in the **asymptotic** and **numerical analysis** of **partial differential equations** for interacting agents in models with application in **kinetic theory** and **neuroscience**.
I focus on establishing links between the multiple scales inherent to these systems. Specifically, I have worked on longtime behaviors and hydrodynamic limits of these systems. I aimed, on the one hand, at proving theoretical results quantitatively bridging these regimes and, on the other hand, at designing numerical methods which preserve these connections.

LIST OF PUBLICATIONS

(1) **Concentration phenomena in FitzHugh-Nagumo's equations: a mesoscopic approach** *2023*
SIAM J. Math. Anal. 55 (2023), no. 1, p. 367-404, with F. Filbet.

(2) **On a discrete framework of hypocoercivity for kinetic equations** *2023*
to appear in AMS Math. Comp. (2023), with F. Filbet.

(3) **Diffusive limit of the Vlasov-Poisson-Fokker-Planck model: quantitative and strong convergence results** *2023*
SIAM J. Math. Anal. 55 (2023), no. 5, p. 5464-5482.

(4) **Large coupling in a FitzHugh-Nagumo neural network: quantitative and strong convergence results** *2023*
J. Differential Equations 374 (2023), 218–266.

(5) **Concentration profiles in FitzHugh-Nagumo neural networks: A Hopf-Cole approach** *2023*
to appear in Discrete and Continuous Dynamical Systems Series B, with E. Bouin.

(6) **A structure and asymptotic preserving scheme for the Vlasov-Poisson-Fokker-Planck model** *2023*
submitted to the Journal of Computational Physics, with F. Filbet.

INVITATIONS TO WORKSHOP AND CONFERENCES

Webinar of the French-Korean IRL in Mathematics *06/2023*
Happening virtually.

PDE seminar *03/2023*
IRMAR, Rennes, France.

SIAM Conference on Computational Science and Engineering *03/2023*
RAI Congress Centre, Netherland.

Seminario de Ecuaciones Diferenciales *02/2023*
Universidad de Granada, Spain.

RSME 2023 LEON *02/2023*
Universidad de Leon, Spain.

Kinetic and hyperbolic equations analysis, modeling and numerics *12/2022*
Insitut de Mathématiques de Toulouse, France.

2022 International Conference on Mathematical Neuroscience *07/2022*
Happening virtually.

Workshop ANR ChaMaNe *06/2022*
Île Rousse, France.

Frontiers in kinetic theory: connecting microscopic to macroscopic scales *05/2022*
Isaac Newton Institute, Cambridge, UK.

SIAM 2022 Conference on Analysis of Partial Differential Equations *03/2022*
Happening Virtually.

Asymptotic Behaviors of systems of PDEs arising in physics and biology *11/2020*
Polytech Lille, Villeneuve-d'Ascq, France.

Models and Methods for kinetic equations *10/2020*
Institut de Mathématiques de Bordeaux, Talence, France.

ORGANIZING RESPONSABILITIES

Co-organizer of the PDE doctoral seminar *09/2022 - Present*
Institut de Mathématiques de Toulouse.

PROGRAMMING SKILLS

C++, Python, Matlab, Caml, Latex

SKILLS

Language French (Native speaker), English (fluent)