

# Gabriel Provencher Langlois

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## EDUCATION

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- 2022 Ph.D., Applied Mathematics, Brown University.  
2015 M.Sc., Applied Mathematics, ETH Zürich.  
2013 B.Sc., Applied Mathematics and Physics, McGill University.

## PROFESSIONAL APPOINTMENTS

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- 2023 **Visiting Assistant Professor/Faculty Fellow**, New York University, Courant Institute of Mathematical Sciences (January - ).  
2022 **Postdoctoral Research Associate**, Brown University, Division of Applied Mathematics (June - December).

## PUBLICATIONS

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### REFEREED JOURNAL ARTICLES

- 2021 Jérôme Darbon and **Gabriel P. Langlois**. On Bayesian posterior mean estimators in imaging sciences and Hamilton–Jacobi partial differential equations. *Journal of Mathematical Imaging and Vision* 33: 1-34. DOI: 10.1007/s10851-021-01036-0.
- 2020 Jérôme Darbon, **Gabriel P. Langlois**, and Tingwei Meng. Overcoming the curse of dimensionality for some Hamilton–Jacobi partial differential equations via neural network architectures. *Research in the Mathematical Sciences* 7, no. 3: 1-50. DOI: 10.1007/s40687-020-00215-6.
- 2020 Tiemo Pedergnana, David Oettinger, **Gabriel P. Langlois**, and George Haller. Explicit unsteady Navier–Stokes solutions and their analysis via local vortex criteria. *Physics of Fluids* 32, no 4: 046603. DOI: 10.1007/s40687-020-00215-6.
- 2018 **Gabriel P. Langlois**, Donald M. Arnold, Jayson Potts, Brian Leber, David C. Dale, and Michael C. Mackey. Cyclic thrombocytopenia with statistically significant neutrophil oscillations. *Clinical Case Reports* 6: 1347-1352. DOI: 10.1002/ccr3.1611.
- 2017 **Gabriel P. Langlois**, Morgan Craig, Antony Humphries, Michael C. Mackey, Joseph M. Mahaffy, Jacques Bélair, Thibault Moulin, Sean R. Sinclair, and Liangliang Wang. Normal and pathological dynamics of platelets in humans. *Journal of Mathematical Biology* 75: 1-52. DOI: 10.1007/s00285-017-1125-6.
- 2015 **Gabriel P. Langlois**, Mohammad Farazmand, and George Haller. Asymptotic dynamics of inertial particles with memory. *Journal of Nonlinear Science* 25, no. 6: 1225-1255. DOI: 10.1007/s00332-015-9250-0.
- 2012 Grace Brooks, **Gabriel P. Langlois**, Jinzhi Lee, and Michael C. Mackey. Neutrophil dynamics after chemotherapy and G-CSF: The role of pharmacokinetics in shaping the response. *Journal of Theoretical Biology* 315: 97-109. DOI: 10.1016/j.jtbi.2012.08.028.

## BOOK CHAPTERS

- 2021 Jérôme Darbon, **Gabriel P. Langlois**, and Tingwei Meng. Connecting Hamilton-Jacobi Partial Differential Equations with Maximum a Posteriori and Posterior Mean Estimators for Some Non-convex Priors. *Handbook of Mathematical Models and Algorithms in Computer Vision and Imaging: Mathematical Imaging and Vision* 1-25. DOI: 10.1007/978-3-030-03009-4\_56-1.

## MANUSCRIPT IN SUBMISSION

Jérôme Darbon and **Gabriel P. Langlois**. Accelerated nonlinear primal-dual hybrid gradient algorithms with applications to machine learning. A preprint is available on arXiv (<https://arxiv.org/abs/2109.12222>).

## MANUSCRIPTS IN PREPARATION

Jérôme Darbon and **Gabriel P. Langlois**. Efficient and robust high-dimensional maximum entropy estimation via nonlinear primal-dual hybrid gradient algorithms. Submitted.

## PRIZES AND HONORS

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- 2022 Simon Ostrach Fellowship, Division of Applied Mathematics, Brown University.  
2013 Dean's Multidisciplinary Undergraduate Research List, McGill University.  
2013 First class honors in Applied Mathematics, McGill University.  
2013 First class honors in Physics, McGill University.

## GRANTS AND FUNDING

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- 2022- ONR N00014-22-1-2667: Nonlinear primal-dual hybrid algorithms to perform variable selection with logistic regression efficiently on big data sets. Co-PI, \$300,000.

## TRAVEL AWARDS AND FELLOWSHIPS

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- 2020 IPAM Travel Award for the three-months long program "High Dimensional Hamilton-Jacobi PDEs", UCLA.  
2020 Doctoral Research Travel Grant, Brown University.

## INVITED TALKS

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- 2022 On Bayesian Posterior Mean Estimators in Imaging Sciences and Hamilton-Jacobi Partial Differential Equations. Invited talk for the Sparse Optimization in Image and Signal Processing Minisymposium (MS99), SIAM Conference on Imaging Science (IS22), March 21-25.

## CONTRIBUTED TALKS AND SEMINARS

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- 2023 Robust sparse regression using Hamilton-Jacobi equations, gradient inclusions and screening rules. Contributed poster for the ML and Causal Inference workshop organized by the Office of Naval Research at Stanford University, March 5-7.  
2022 Efficient and Robust Nonlinear High-Dimensional Maximum Entropy Estimation via Nonlinear Primal-Dual Algorithms. Contributed lecture for the SIAM Conference on Mathematics of Data Science (MDS22), September 26-30.

- 2022 Efficient sparse logistic regression via nonlinear primal-dual hybrid gradient algorithms. Contributed talk for the Hamilton-Jacobi PDEs Reunion Conference I at the IPAM, UCLA, January 5-21.
- 2021 Nonlinear Primal-Dual Algorithms for Solving Sparse Logistic Regression Problems. Contributed lecture for the SIAM Conference on Optimization (OP21), July 20-23.
- 2020 On Bayesian posterior mean estimators in imaging sciences and Hamilton-Jacobi partial differential equations. Contributed talk for the program "High Dimensional Hamilton-Jacobi PDEs" at the IPAM, UCLA, April 19.
- 2017 Asymptotic dynamics of inertial particles with memory. Contributed department talk to Prof. Karniadakis' CRUNCH group, Brown University, March 7.

## TEACHING

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### EXPERIENCE

- Instructor** Applied Ordinary Differential Equations, Summer 2019.
- Teaching assistant** Introduction to modelling, Fall 2021.  
 Statistical inference I, Fall 2020.  
 An introduction to numerical optimization, Fall and Spring 2019.  
 Theory of probability I, Fall 2018.  
 Recent applications of probability and statistics, Spring 2018 and 2021.  
 Applied ordinary differential equations, Fall 2017.

### PEDAGOGY TRAINING

- 2018 **Graduate certificate in reflective teaching.** Sheridan Center, Brown University. Developed and refined fundamental teaching and assessment strategies and communication skills using a student-centered, evidence-based approach.

### MENTORING

- 2018 **Directed Reading Program.** Division of Applied Mathematics, Brown University. Shoshana Simons (undergraduate): Supervised an independent reading project on writing systems and the mathematics of formal languages. Shoshana is now pursuing a Ph.D. in mathematical logic at the University of California, Berkeley.

## RESEARCH EXPERIENCE

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- 2017-2022 Graduate Research Assistant, Brown University. Conducted research in optimization, imaging science and machine learning under the supervision of Prof. Jérôme Darbon.
- 2015-2016 Research Assistant, McGill University. Conducted research in mathematical physiology under the supervision of Prof. Michael C. Mackey.
- 2013-2015 Graduate Research Assistant, ETH Zürich. Conducted research in nonlinear dynamics and fluid mechanics under the supervision of Prof. George Haller.
- 2011-2013 Undergraduate Research Assistant, McGill University. Conducted research in mathematical physiology under the supervision of Prof. Michael C. Mackey.

## SERVICE

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- 2019-2020 Vice president, Brown University SIAM student chapter.
- 2018-2019 Treasurer, Brown University SIAM student chapter.

## **TECHNICAL SKILLS**

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Python, MATLAB, R, LaTeX.

## **LANGUAGES**

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Native or bilingual proficiency: French and English.

Elementary proficiency: German.