Matthieu Darcy

Website: www.matthieudarcy.com
Email: matthieu@basis.ai
GitHub: github.com/MatthieuDarcy
LinkedIn: matthieu-darcy-88290a18a

Experience

Basis Research Institute - Machine learning researcher II. New York City
Simulation, inference and control of dynamical systems; reduced order models for mechanics. 07/26-present

- Co-developer of Dynestyx, an open-source probabilistic programming library for dynamical systems.

Johnson & Johnson (Janssen Pharmaceuticals) - Machine learning consultant. 05/23 - 03/24
Machine learning and mathematical modeling of disease progression. Consultant for Alpha Lambda Iota.

- Developed a dynamical systems and data assimilation approach for the prediction of Alzheimer's disease progression (paper accepted).

French Commission for Atomic Energy (CEA) - Research intern. 05/21-08/21
Thesis: *Deep learning for hexahedral meshing.*

- Developed a generative model using convolutional neural networks for the generation of high-quality meshes.

Education

Caltech Pasadena, California
Ph.D. student in the Computing and Mathematical Sciences department. 2021–2026
Advisor: Prof. Houman Owhadi.
External affiliation: NASA Jet Propulsion Lab - Research Affiliate.

ENS Paris-Saclay - Institut Polytechnique de Paris Paris, France
Mathématiques Vision et Apprentissage, with Highest Honors. 2020–2021

Imperial College London London, United Kingdom
MSc Applied Mathematics, with Distinction. 2019–2020

King's College London London, United Kingdom
BA Mathematics and Philosophy, first class. 2016–2019

Publications and Preprints

[1] A. Bacho, A. G. Sorokin, X. Yang, T. Bourdais, E. Calvello, **M. Darcy**, A. Hsu, B. Hosseini, and H. Owhadi, "Operator learning at machine precision", *Journal of Computational Physics*, vol. 566, p. 115 240, 2026. arXiv: 2511.19980.

[2] R. Baptista, E. Calvello, **M. Darcy**, H. Owhadi, A. M. Stuart, and X. Yang, "Solving roughly forced nonlinear PDEs via misspecified kernel methods and neural networks", *Mathematics of Computation*, 2026. arXiv: 2501.17110.

[3] X. Yang, **M. Darcy**, M. Hudes, F. J. Alexander, G. Eyink, and H. Owhadi, "Solving functional PDEs with Gaussian processes and applications to functional renormalization group equations", *Journal of Computational Physics*, vol. 563, p. 115 085, 2026. arXiv: 2512.20956 [cs.LG].

[4] P. Batlle, **M. Darcy**, M. Levine, B. Hamzi, H. Owhadi, M. Bastani, Y. Zhang, K. Sarsour, and F. Talamas, "Benchmarking Gaussian processes for prediction and data assimilation of Alzheimer's disease progression", *Journal of Alzheimer's Disease*, vol. 109, pp. 1137–1141, 2025.

[5] **M. Darcy**, B. Hamzi, J. Susiluoto, A. Braverman, and H. Owhadi, "Learning dynamical systems from data: A simple cross-validation perspective, part II: Nonparametric kernel flows", *Physica D: Nonlinear Phenomena*, vol. 476, p. 134 641, 2025.

[6] P. Batlle, **M. Darcy**, B. Hosseini, and H. Owhadi, "Kernel methods are competitive for operator learning", *Journal of Computational Physics*, vol. 496, p. 112 549, 2024.

[7] **M. Darcy**, B. Hamzi, G. Livieri, H. Owhadi, and P. Tavallali, "One-shot learning of stochastic differential equations with data adapted kernels", *Physica D: Nonlinear Phenomena*, vol. 444, p. 133 583, 2023.

Research Interests

I am broadly interested in scientific and physics informed machine learning, specifically in probabilistic methods to the prediction of stochastic (partial) differential equations and dynamical systems.

- **Stochastic (Partial) Differential Equations**: inference and prediction of stochastic (partial) differential equations with Gaussian processes and neural networks.
- **Operator Learning**: learning non-linear operators using kernel methods, with applications to PDEs, model reduction, and integro-functional equations.
- **Dynamical Systems**: learning and predicting dynamical systems from data.
- **Generative modeling**: generative models for scientific applications.

Technical skills

- **Programming:** Python (proficient), Julia (intermediate), LaTex (proficient). Basic experience with HPC workload management (SLURM job submission and monitoring).
- **Packages:** Extensive experience in Jax, Numpy, Pytorch, Sklearn, Scipy, Pytorch Lightning, Pandas. Familiar with TensorFlow. Experienced with Weights and Biases.
- **Statistical Tools:** Extensive experience in Gaussian Processes, neural networks, uncertainty quantification, statistics and machine learning.

Invited conferences and talks

- Early Career Pioneers in Uncertainty Quantification and AI for Science, Isaac Newton Institute, University of Cambridge - August 2025.
- Mathematical foundations of digital twins, Centre International de Rencontres Mathématiques, Marseille - August 2025.
- Workshop on Kernel Methods in Uncertainty Quantification and Experimental Design at the Institute for Mathematical and Statistical Innovation (IMSI) - April 2025.
- SIAM Mathematics of Data Science - October, 2024.
- Digital Twins for inverse problems in Earth sciences Centre International de Rencontres Mathématiques, Marseille - July 2024.
- SIAM Material sciences - May 2024.
- One World Mathematics of Machine Learning Seminar, October 2023.
- 2nd IACM Mechanistic Machine Learning and Digital Engineering for Computational Science Engineering and Technology, University of El Paso, Texas - September 2023.
- Argonne National Lab LANS Seminar - August 2023.
- DataSig Rough Path Interest Group - May 2023.
- SIAM conference on the Application of Dynamical Systems - May 2023.
- Third Symposium on Dynamical Systems and Machine Learning 2022, Fields Institute - June 2022.
- Second Symposium on Dynamical Systems and Machine Learning - 2020.

Organized talks and seminars

- Minisymposium: SIAM Conference on Computational Science and Engineering 2025.
- Minisymposium: SIAM Uncertainty Quantification 2024.
- Minisymposium: 10th International Congress on Industrial and Applied Mathematics - August 2023.
- Minisymposium: SIAM Computational Sciences and Engineering 2023.

Teaching and Outreach

- **Teaching Assistant** for graduate-level courses at Caltech
  ACM 118: Stochastic Processes and Regression.
  ACM 270: Partial Differential Equations and Computational Mean Field Games.
- **SIAM chapter - Vice-President** 2023
  Organization of student talks and seminars.
- **Refresher course lecturer** for incoming graduate students at Caltech 2022
  Developed and taught a course reviewing linear algebra and functional analysis.
- **LearnSTEM** 2024-2025
  Math and computer science teacher for high-school students.

Languages

- **English:** native.
- **French:** native.