Matthieu Darcy

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Education

Caltech — Pasadena, California
Ph.D. student in the Computing and Mathematical Sciences department. — 2021–present
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

Experience

Johnson & Johnson (Janssen Pharmaceuticals) - Machine learning consultant. — 05/23 - 03/24
Machine learning and mathematical modeling of disease progression.

- Developed a dynamical systems approach for the prediction and assimilation of Alzheimer's disease progression.
- Paper forthcoming.

French Commission for Atomic Energy (CEA) - Research intern, — 05/2021-08/2021
Thesis: *Deep learning for hexahedral meshing.*

- Applied a convolutional neural network approach to the automatic generation of high-quality meshes for the simulation of physical systems.

Imperial College London - Research project. — 05/2020-09/2020
Application of Kernel Flows to regression.

- Developed python code for the Kernel Flows algorithm and its applications.

Technical skills

- **Programming:** Python (proficient), Julia (intermediate), LaTex (proficient).
- **Packages:** Extensive experience in Numpy, Pytorch, Sklearn, Scipy, Jax, Pandas. Familiar with TensorFlow.
- **Statistical Tools:** Extensive experience in Gaussian Processes and Kernel methods, proficient in neural networks, statistics and machine learning.

Research Interests

I am broadly interested in scientific machine learning, specifically in the applications of Gaussian processes, kernel methods, and wavelets to the inference and predictions of stochastic (partial) differential equations and dynamical systems.

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

Publications and Preprints

[1] M. Darcy, E. Calvello, R. Baptista, H. Owhadi, A. M. Stuart, and X. Yang, *Solving roughly forced nonlinear pdes via misspecified kernel methods and neural networks*, 2025. arXiv: 2501.17110.

[2] 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, ISSN: 0021-9991.

[3] 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.

[4] 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*, Dec. 2021.

Teaching and Outreach

- **SIAM chapter - Vice-President** 2023
  Organization of student talks and seminars.
- **Teaching Assistant** for graduate-level courses at Caltech 2023
  ACM 118: Stochastic Processes and Regression, 2023.
- **Refresher course lecturer** for incoming graduate students at Caltech 2022
  Developed and taught a course reviewing linear algebra and functional analysis.

Languages

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