Frederick Law

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fredglaw.github.io

Professional Experience

2018–Present **Doctoral Researcher**, *Peherstorfer Group, Courant Institute of Mathematical Sciences, New York University*, New York, NY, USA.
- Co-advised by Dr. Benjamin Peherstorfer and Dr. Antoine Cerfon on developing multifidelity uncertainty quantification methods for nuclear fusion devices.
- Funded by NDSEG Fellowship
- Supported in part by the RTG in Modeling and Simulation funded by the NSF via grant RTG/DMS – 1646339

05/2017–08/2017 **Undergraduate Researcher**, *North Carolina State University*, Raleigh, NC, USA.
- Constructed a physiologically based pharmacokinetic (PBPK) model of 1,2,3-Trichloropropane.
- Developed models for metabolic parameter estimation, human scaling, and sensitivity analysis.
- Funded through NSF REU program.

05/2015–08/2015 **Undergraduate Intern**, *Orenstein Research Group, Lawrence Berkeley National Laboratory*, Berkeley, CA, USA.
- Assisted in building THz pump probe spectroscopy on ZnTe crystals.
- Prepared optical table for future implementation of Montana Instruments Cryostation.

Education

2018–Present **Courant Institute of Mathematical Sciences, New York University**.
Ph.D. Candidate in Mathematics

2014–2018 **University of California, Berkeley**.
B.A. in Applied Mathematics (Concentration: Mathematical Biology), Highest Honors
B.A. in Statistics

Honors & Awards

2022 Moses A. Greenfield Research Prize, *Courant Institute of Mathematical Sciences, New York University*.

2020 NDSEG Fellow, *US Department of Defense*.

2020 Honorable Mention NSF-GRFP, *National Science Foundation*.

2018-2020 Henry MacCracken Fellowship, *New York University*.

Research Interests

Uncertainty Quantification, Monte Carlo Methods, Optimization, Scientific Computing, Model Reduction, Applied Mathematics, Computational Statistics, Nuclear Fusion, Machine Learning, Numerical Analysis..

Publications

[1] F. Law, A. Cerfon, B. Peherstorfer, F. Wechsung (2022) Meta variance reduction for Monte Carlo estimation of energetic particle confinement during stellarator optimization, arXiv:2301.07280, *submitted to J. Comput. Phys.*

[2] F. Law, A. Cerfon, B. Peherstorfer (2022) Accelerating the estimation of collisionless energetic particle confinement statistics in stellarators using multifidelity Monte Carlo, *Nucl. Fusion* **62** 076019.

Talks and Presentations

02/2023 Boosting variance reduction with meta multifidelity estimators, *Multi-fidelity methods for uncertainty quantification and optimization minisymposium, SIAM CSE 2023*, Amsterdam, Netherlands, (invited talk, upcoming).

02/2023 Meta multifidelity estimators for uncertainty quantification within outer-loop applications, *Brown Bag Lunch Seminar Series, Electromagnetics Section, U.S. Naval Research Lab*, Virtual, (invited talk, upcoming).

01/2023 Meta variance reduction schemes for estimation of alpha particle confinement, *Simons Hour, Simons Collaboration on Hidden Symmetries and Fusion Energy*, Virtual, (invited talk).

07/2022 Multifidelity uncertainty quantification in nuclear fusion devices, *2022 DoD National NDSEG Fellows Conference*, Boston, MA, USA, (poster presentation).

09/2021 Multifidelity Monte Carlo estimation of energetic particle confinement in stellarators, *Simons Hour, Simons Collaboration on Hidden Symmetries and Fusion Energy*, Virtual, (invited talk).

08/2021 Multifidelity Monte Carlo estimation of energetic particle confinement in stellarators, *Sherwood Fusion Theory Conference 2021*, Virtual, (contributed talk).

03/2021 Learning data-fit models for multi-fidelity Monte Carlo estimation of energetic particle loss in fusion reactors, *MS352 Minisymposium Talk, SIAM CSE 2021*, Virtual, (invited talk).

01/2018 Physiologically Based Pharmacokinetic (PBPK) Modeling for a Persistent Chlorinated Water Contaminant: 1,2,3-Trichloropropane, *MAA Undergraduate Student Poster Session, Joint Mathematics Meeting 2018*, San Diego, CA, USA, (poster presentation).

Activities & Service

09/2019 – 12/2019 Mentor to a Masters student.

01/2018 – 05/2018 Berkeley Undergraduate Mathementoring Program (BUMP) Mentor.

10/2017 Facilitator at Julia Robinson Mathematics Festival, University of California, Berkeley.

08/2016 – 05/2017 Department of Mathematics Peer Adviser, University of California, Berkeley.

03/2016, 11/2016, 03/2017 Proctor at Berkeley Math Tournament.

Computing skills

Advanced: MATLAB, Python, LaTeX.

Proficient: R, Slurm, OpenMP.

Basic: C, CUDA, MPI.