

Daniel F. Fortunato

(508) 776-7566
dfortunato@flatironinstitute.org
danfortunato.com

RESEARCH AREAS

Fast methods for partial differential and integral equations, spectral methods, *hp* element methods, fast direct solvers, computational fluid & solid mechanics, and multigrid methods

EDUCATION

Harvard University	2015–2020
Ph.D. in Applied Mathematics	
M.S. in Applied Mathematics	
Advisors: Alex Townsend, Chris Rycroft	
Tufts University	2009–2013
B.S. in Mathematics, Computer Science	
Honors: <i>summa cum laude</i> , Highest Honors in Thesis	
Advisor: Christoph Börgers	

PROFESSIONAL EXPERIENCE

Flatiron Institute	New York, NY
Associate Research Scientist	2023–present
Flatiron Research Fellow	2020–2023
Research Associate	Summer 2019
Lawrence Berkeley National Laboratory	Berkeley, CA
Research Affiliate	Summer 2017
Walt Disney Animation Studios	Burbank, CA
Graduate Associate	Summer 2016
Wolfram Research	Somerville, MA
Developer	2014–2015
Junior Developer	2013–2014
Apple Inc.	Cupertino, CA
Software Engineering Intern	Summer 2012

AWARDS & HONORS

Leslie Fox Prize for Numerical Analysis (Second Prize)	2019
Institute of Mathematics and its Applications	
Copper Mountain Student Paper Competition Winner	2019
19th Copper Mountain Conference on Multigrid Methods	
Certificate of Distinction in Teaching	2018
Derek Bok Center, Harvard University	
National Defense Science & Engineering Graduate Fellowship	2016–2019
U.S. Air Force Research Laboratory	

Phi Beta Kappa Society <i>Tufts University</i>	2013
Ralph S. Kaye Memorial Prize <i>Department of Mathematics, Tufts University</i>	2013
Benjamin G. Brown Scholarship <i>Tufts University</i>	2013

PUBLICATIONS

- [12] O. MELIA, D. FORTUNATO, J. HOSKINS, AND R. WILLETT, *jaxhps: An elliptic PDE solver built with machine learning in mind*, J. Open Source Softw., 10 (2025), pp. 8549, <https://doi.org/10.21105/joss.08549>.
- [11] O. MELIA, D. FORTUNATO, J. HOSKINS, AND R. WILLETT, *Hardware acceleration for HPS algorithms in two and three dimensions*, to appear in J. Comput. Phys.
- [10] D. FORTUNATO, D. B. STEIN, AND A. H. BARNETT, *A fully adaptive, high-order, fast Poisson solver for complex two-dimensional geometries*, submitted, <https://arxiv.org/abs/2501.17967>.
- [9] K. J. BURNS, D. FORTUNATO, K. JULIEN, AND G. M. VASIL, *Corner cases of the generalized tau method*, submitted, <https://arxiv.org/abs/2211.17259>.
- [8] R. OHANA, M. McCABE, L. MEYER, R. MOREL, F. J. AGOCS, M. BENEITEZ, M. BERGER, B. BURKHART, S. B. DALZIEL, D. B. FIELDING, D. FORTUNATO, J. A. GOLDBERG, K. HIRASHIMA, Y.-F. JIANG, R. R. KERSWELL, S. MADDU, J. MILLER, P. MUKHOPADHYAY, S. S. NIXON, J. SHEN, R. WATTEAUX, B. RÉGALDO-SAINT BLANCARD, F. ROZET, L. H. PARKER, M. CRANMER, AND S. HO, *The Well: a Large-Scale Collection of Diverse Physics Simulations for Machine Learning*, NeurIPS 2024, <https://openreview.net/forum?id=00Sx577BT3>.
- [7] D. FORTUNATO, *A high-order fast direct solver for surface PDEs*, SIAM J. Sci. Comput., 46 (2024), pp. A2582–A2606, <https://doi.org/10.1137/22M1525259>.
- [6] P. MILLER, D. FORTUNATO, M. NOVAGA, S. SHVARTSMAN, AND C. MURATOV, *Generation and motion of interfaces in a mass-conserving reaction-diffusion system*, SIAM J. Appl. Dyn. Syst., 22 (2023), pp. 2408–2431, <https://doi.org/10.1137/22M152548X>.
- [5] P. MILLER, D. FORTUNATO, C. MURATOV, L. GREENGARD, AND S. SHVARTSMAN, *Forced and spontaneous symmetry breaking in cell polarization*, Nat. Comput. Sci., 2 (2022), pp. 504–511, <https://doi.org/10.1038/s43588-022-00295-0>.
- [4] D. FORTUNATO, N. HALE, AND A. TOWNSEND, *The ultraspherical spectral element method*, J. Comput. Phys., 436 (2021), pp. 110087, <https://doi.org/10.1016/j.jcp.2020.110087>.
- [3] D. FORTUNATO AND A. TOWNSEND, *Fast Poisson solvers for spectral methods*, IMA J. Numer. Anal., 40 (2020), pp. 1994–2018, <https://doi.org/10.1093/imanum/drz034>.
- [2] D. FORTUNATO, C. RYCROFT, AND R. SAYE, *Efficient operator-coarsening multigrid schemes for local discontinuous Galerkin methods*, SIAM J. Sci. Comput., 41 (2019), pp. A3913–A3937, <https://doi.org/10.1137/18M1206357>.
- [1] A. MIJAILOVIC, B. QING, D. FORTUNATO, AND K. VAN VLIET, *Characterizing viscoelastic mechanical properties of highly compliant polymers and biological tissues using impact indentation*, Acta Biomater., 71 (2018), pp. 388–397, <https://doi.org/10.1016/j.actbio.2018.02.017>.

SOFTWARE

- **surfacefun**: A MATLAB package for numerically computing with functions on surfaces, <https://surfacefun.readthedocs.io>.
- **chunkie**: A MATLAB package for discretizing and solving boundary integral equations in 2D, <https://chunkie.readthedocs.io>.

- **ultraSEM**: The ultraspherical spectral element method, <https://ultraSEM.org>.
- **treefun**: A MATLAB package for numerically computing with piecewise polynomials on adaptive trees, <https://github.com/danfortunato/treefun>.
- **fully-adaptive-poisson**: A fully adaptive Poisson solver for complex geometries in 2D, <https://github.com/danfortunato/fully-adaptive-poisson>.
- **surface-diffusion**: Spectral methods for reaction-diffusion systems on axisymmetric surfaces, <https://github.com/danfortunato/surface-diffusion>.
- **spherical-harmonic-interfaces**: A unified MATLAB interface to spherical harmonic transform libraries, <https://github.com/danfortunato/spherical-harmonic-interfaces>.
- **multigrid-ldg**: Efficient multigrid methods for local discontinuous Galerkin discretizations in C++, <https://github.com/danfortunato/multigrid-ldg>.
- **fast-poisson-solvers**: Fast spectrally-accurate Poisson solvers on a variety of domains, <https://github.com/danfortunato/fast-poisson-solvers>.

PRESENTATIONS

Interfaces and Unfitted Discretization Methods, IML, Sweden	October 2025
SIAM PNW 2025, Seattle, WA	October 2025
Householder Symposium XXII, Ithaca, NY	June 2025
Colloquium, Department of Computer Science, Tufts University	March 2025
SIAM CSE 2025, Fort Worth, TX	March 2025
SciCADE 2024, Singapore	July 2024
Computation Tools for PDEs with Complicated Geometries, Flatiron Institute	June 2024
Mechanics of Life II, Flatiron Institute	December 2023
SIAM-NNP, NJIT	October 2023
Workshop on Numerical Differential Geometry, CASUS, Görlitz, Germany	September 2023
ICIAM 2023, Tokyo	August 2023
Numerical Analysis in the 21st Century, Oxford, UK	August 2023
Biophysical Modeling Software Summer School, Flatiron Institute	June 2023
SIAM Conference on Computational Science and Engineering, Amsterdam	February 2023
Faculty Candidate Seminar, UMass Lowell	February 2023
Faculty Candidate Seminar, NJIT	January 2023
Computational Mathematics and Scientific Computing Seminar, Courant Institute	January 2023
Computational Mathematics Seminar, CU Boulder	October 2022
Fluid Mechanics and Waves Seminar, NJIT	September 2022
SIAM Annual Meeting, Pittsburgh, PA	July 2022
Outstanding Challenges in Computational Methods for Integral Equations, Oaxaca	May 2022
Fast Direct Solvers, Purdue University	October 2021
Flatiron-wide Algorithms and Mathematics, Flatiron Institute	October 2021
ICOSAHOM 2020, Vienna, Austria	July 2021
Numerical Analysis and PDE Seminar, University of Delaware	May 2021
SIAM Conference on Computational Science and Engineering, Fort Worth, TX	March 2021
Canadian Mathematical Society Winter Meeting	December 2020
Sidney Fernbach Fellowship Seminar, Lawrence Livermore National Laboratory	February 2020
Numerical Methods for Partial Differential Equations Seminar, MIT	December 2019
Numerical Analysis Seminar, Flatiron Institute	July 2019
28th Biennial Numerical Analysis Conference, Glasgow, UK	June 2019
19th Copper Mountain Conference on Multigrid Methods, Copper, CO	March 2019
SIAM Conference on Computational Science and Engineering, Spokane, WA	February 2019
Scientific Computing and Numerical Analysis Seminar, Cornell University	November 2018
ICOSAHOM 2018, London, UK	July 2018

ORGANIZER ACTIVITIES

- Co-organizer of minisymposium “Advances in domain decomposition methods and fast solvers” at SIAM CSE (March 2025)
- Co-organizer of conference “Flatiron-Wide Autumn Meeting” at Flatiron Institute (October 2024)
- Co-organizer of conference “Computation Tools for PDEs with Complicated Geometries and Interfaces” at Flatiron Institute (June 2024)
- Lead organizer of conference “Flatiron-Wide Autumn Meeting” at Flatiron Institute (October 2023)
- Co-organizer of minisymposium “Boundary integral equations, boundary element methods, and applications” at SIAM CSE (February 2023)
- Co-organizer of the “Scientific Computing Seminar” in the Center for Computational Mathematics at Flatiron Institute (2022–present)

TEACHING EXPERIENCE

New York University, Guest Lecturer for Leslie Greengard

- MATH-UA.0394: Exploring ODEs Spring 2023

Harvard University, Teaching Fellow

- AM 205: Advanced Scientific Computing: Numerical Methods I Fall 2019
- AM 225: Advanced Scientific Computing: Numerical Methods II Spring 2018

Tufts University, Teaching Assistant

- COMP 170: Computation Theory Spring 2012
- COMP 15: Data Structures Spring 2011
- COMP 11: Introduction to Computer Science Fall 2010

SKILLS

Languages: C++11, C, MATLAB, Mathematica, Python, L^AT_EX

Technologies: BLAS, LAPACK, Git, OpenMP

PROFESSIONAL ACTIVITIES

Referee for: Journal of Computational Physics, Journal of Scientific Computing, Advances in Computational Mathematics, IMA Journal of Numerical Analysis, SIAM Journal on Matrix Analysis and Applications, Computers & Mathematics with Applications

Member of SIAM and AMS