Travis Askham

Curriculum Vitae

January 2023

Education and Qualifications

2016	Ph.D.	New York University
2010	M.A.	University of California Los Angeles
2010	B.Sc.	University of California Los Angeles

Professional Appointments

2019 – Assistant Professor, Department of Mathematical Sciences, New Jersey Institute of Technology

Publications

Journal Articles & Thesis

- [1] Ruqi Pei, Travis Askham, Leslie Greengard, and Shidong Jiang, A fast method for imposing periodic boundary conditions on arbitrarily-shaped lattices in two dimensions. *Journal of Computational Physics*, 474:111792, 2023.
- [2] Travis Askham, Peng Zheng, Aleksandr Aravkin, and J Nathan Kutz, Robust and scalable methods for the dynamic mode decomposition. *SIAM Journal on Applied Dynamical Systems*, 21(1):60–79, 2022.
- [3] Ludvig af Klinteberg, Travis Askham, and Mary Catherine Kropinski, A fast integral equation method for the two-dimensional navier-stokes equations. *Journal of Computational Physics*, 409:109353, 2020.
- [4] Travis Askham and Manas Rachh, A boundary integral equation approach to computing eigenvalues of the stokes operator. *Advances in Computational Mathematics*, 46(2):1–42, 2020.
- [5] Niall M Mangan, Travis Askham, Steven L Brunton, J Nathan Kutz, and Joshua L Proctor, Model selection for hybrid dynamical systems via sparse regression. *Proceedings of the Royal Society A*, 475(2223):20180534, 2019.
- [6] Peng Zheng, Travis Askham, Steven L Brunton, J Nathan Kutz, and Aleksandr Y Aravkin, A unified framework for sparse relaxed regularized regression: Sr3. *IEEE Access*, 7:1404–1423, 2019.
- [7] Travis Askham, A stabilized separation of variables method for the modified biharmonic equation. *Journal of Scientific Computing*, 76(3):1674–1697, 2018.
- [8] Travis Askham and J Nathan Kutz, Variable projection methods for an optimized dynamic mode decomposition. *SIAM Journal on Applied Dynamical Systems*, 17(1):380–416, 2018.
- [9] Emily Clark, Travis Askham, Steven L Brunton, and J Nathan Kutz, Greedy sensor placement with cost constraints. *IEEE Sensors Journal*, 19(7):2642–2656, 2018.
- [10] Manas Rachh and Travis Askham, Integral equation formulation of the biharmonic dirichlet problem. *Journal of Scientific Computing*, 75(2):762–781, 2018.
- [11] Chang Sun, Travis Askham, and J Nathan Kutz, Stability and dynamics of microring combs: elliptic function solutions of the lugiato–lefever equation. *JOSA B*, 35(6):1341–1353, 2018.
- [12] Travis Askham and Antoine J Cerfon, An adaptive fast multipole accelerated poisson solver for complex geometries. *Journal of Computational Physics*, 344:1–22, 2017.
- [13] Travis Askham, Integral-equation methods for inhomogeneous elliptic partial differential equations in complex geometry. Ph.D. thesis, New York University, 2016.
- [14] Travis Askham and Leslie Greengard, Norm-preserving discretization of integral equations for elliptic pdes with internal layers i: The one-dimensional case. *siam REVIEW*, 56(4):625–641, 2014.

Honors & Awards

2016	Wilhelm Magnus Memorial Prize, Courant Institute of Mathematical Sciences
2010	Daus Award in Mathematics, University of California Los Angeles

Grants & Fellowships

2015	Dean's Dissertation Fellowship, New York University
2010-2015	Henry M. MacCracken Fellowship, New York University

Teaching Experience

New Jersey Institute of Technology

Partial Differential Equations (MATH 333) Vector Analysis (MATH 335) Linear Algebra (MATH 337, 337H, 631) Fast Algorithms (MATH 767)

University of Washington

Scientific Computing (AMATH 481)

Research Experience

- 2019 Visiting Scholar, Flatiron Institute. Project: Fast algorithms for volume integral operators.
- 2016–2018 Research Associate, Department of Applied Mathematics, University of Washington. Principal Investigator: J. Nathan Kutz. Project: Sparse measurements and optimal sensor placement for classification and state estimation of complex systems
- 2012–2015 Research Assistant, Courant Institute of Mathematical Sciences, New York University. Principal Investigator: Leslie Greengard. Project: Novel methods for electromagnetic simulation and design

Invited Speaking

Department Seminars

- 2018 A Fredholm operator approach to clamped plate problems, Simon Fraser University. Burnaby, BC, Canada
- 2018 Tailored low-rank matrix approximation: two stories, NJIT. Newark, NJ, USA

Conference Activity

Participation

2022	Talk. A Periodic Fast Multipole Method. SIAM Imaging Sciences. Online.
2021	Talk. A Periodic Fast Multipole Method. SIAM Annual. Online.
2021	Talk. Fast multipole methods for continuous charge densities. SIAM CSE. Online.
2020	Talk. Fast multipole methods for continuous charge densities. Canadian Mathematical
	Society (CMS) Winter Meeting. Online.
2020	Fast multipole methods for continuous charge densities. SIAM Conference on Imag-
	ing Science (IS20). Online.
2020	Talk. Fredholm determinants: A robust approach to computing Stokes eigenvalues,
	ICIAM (unofficial, late registration). Valencia, ESP
2019	Talk. Fredholm determinants: A robust approach to computing Stokes eigenvalues,
	ICIAM (unofficial, late registration). Valencia, ESP
2019	Talk. Fredholm determinants: A robust approach to computing Stokes eigenvalues,
	CAIMS Annual Meeting. Whistler, BC, Canada
2019	Talk. Fredholm determinants: A robust approach to computing Stokes eigenvalues,
	SIAM CSE. Spokane, WA, USA

2018	Talk. A stable, kernel dependent FMM for fluid flow, ICOSAHOM, London, Greater London, UK
2018	Talk. Robust and scalable methods for the dynamic mode decomposition, SIAM Un- certainty Quantification conference, Garden Grove, CA, USA
2018	Talk. Adaptive grids for embedded integral equation based solvers, ICERM Workshop on Point Configurations. Providence, RI, USA
2017	Talk. Robust and scalable methods for the dynamic mode decomposition, SIAM Pa- cific Northwest Regional Meeting. Corvallis, OR, USA
2017	Talk. A stabilized FMM for fluid flow, BIRS-CMO Workshop on Creeping Flows. Oaxaca, OAX, Mexico
2017	Talk. Variable projection for Generalizing the Dynamic Mode Decomposition, SIAM CSE. Atlanta, GA, USA
2017	Talk. An algorithm for the DMD with unevenly spaced time samples, BIRS Workshop on Data-Driven Methods, Banff, Alberta, Canada
2016	Talk. Integral-Equation Methods for Inhomogeneous Elliptic PDEs (and applications), SIAM Annual Conference, Boston, MA, USA
2014	Poster. Volume Integrals in Complex Geometry: A Case Study of Poisson's Equation, CBMS-NSF Conference: Fast-Direct Solvers for Elliptic PDEs, Dartmouth College. Hanover, NH, USA
2013	Poster. On the discretization of integral equations for divergence-form PDEs with internal layers, Integral Equations Methods: Fast Algorithms and Applications (BIRS Workshop), Banff International Research Station. Banff, Alberta, Canada
2013	Talk. On the discretization of integral equations for elliptic PDEs with internal layers, Mid-Atlantic Numerical Analysis Day, Temple University. Philadelphia, PA, USA

Organization

- 2018 Mini symposium. High-Order Integral Equation Methods in Fluid Dynamics, ICOSA-HOM. London, Greater London, UK
- 2018 Mini symposium. Data-driven discovery for dynamical systems, SIAM UQ. Garden Grove, CA, USA
- 2017 Mini symposium. Data-driven characterization, control, and uncertainty quantification of dynamical systems, SIAM CSE. Atlanta, GA, USA

Service to Profession

Referee

Elsevier	Journal of Computational Physics
SIAM	Scientific Computing (SISC), Applied Dynamical Systems (SIADS)
Springer	Advances in Computational Mathematics, Journal of Scientific Computing
Wiley	Complexity (Hindawi)
IEEE	Transactions on Automatic Control (IEEE-TAC)

Member

SIAM (since 2011)

Software

Maintainer	
chunkie	A MATLAB package for solving boundary integral equations (available under the 3 clause BSD license, github com/fastalgorithms/chunkie)
optdmd	A MATLAB package for computing the optimized dynamic mode decomposition (avail- able under the MIT license, github.com/dugbo/optdmd)
RobustDMD	A julia package for fitting exponential functions to data with robust penalties (avail- able under the MIT license, github.com/UW-AMO/RobustDMD.jl)
mbh2dfmm	A Fortran package for stably computing fast sums of the modified biharmonic Green's function and modified Stokes kernels (available under a modified freeBSD license, github.com/duqbo/mbh2dfmm)
Contributor	
fmm2d, FMM3D	Fortran packages for fast particle sums, with wrappers in high-level languages (I con- tributed new kernels and julia wrappers; available under the 3 clause BSD license, github.com/flatironinstitute/FMM3D)
fmm3dbie	Fortran package for high order integral equation methods in three dimen- sions (I contributed new kernels; available under the 3 clause BSD license, github.com/fastalgorithms/fmm3dbie)
ios2d	inverse-obstacle-scattering2d; a MATLAB package for inverse obstacle scatter- ing in two dimensions (I contributed new options for the optimization routines and methods for impedance models; available at github.com/flatironinstitute/inverse- obstacle-scattering2d)

Skills

Coding

MasteryFortran (77-95), MATLABProficiencyC99/C++, LATEX, Python, juliaFamiliarityOpenMP, OpenCL (in C99), PHP, HTML

Speaking & Reading

English (native) Spanish (elementary proficiency)

Biographical

Born	1987. Walnut Creek, CA, USA
Citizen	United States