

Diana Halikias

CONTACT

Malott Hall, Office 120
Department of Mathematics
Cornell University
Ithaca, NY 14853-4201

+1(240)-938-2639
dh736@cornell.edu
<https://e.math.cornell.edu/people/halikias>

RESEARCH INTERESTS

Numerical analysis, randomized linear algebra, theoretical aspects of PDE learning, matrix theory, approximation theory, probability theory

EDUCATION

August 2020 - Present Ph.D. in MATHEMATICS, **Cornell University**, Ithaca, NY
Advisor: Alex Townsend
NSF Graduate Research Fellow, 2021-present
M.S. in Mathematics awarded April 2023, expected graduation: May 2025

August 2016 - May 2020 B.A. (Intensive) in MATHEMATICS, **Yale University**, New Haven, CT
Graduated with distinction in the mathematics major
Thesis: *Determinantal Processes: Discrete and Continuous Cases*,
advised by Richard Kenyon

EXPERIENCE

May 2024 - August 2024 Summer Research Associate, **Flatiron Institute**, New York, NY
- Mentored by Lawrence Saul in the Center for Computational Mathematics
- Research on the connection between sparse and low-rank matrices

May 2023 - August 2023 Research Intern, **Lawrence Berkeley National Laboratory**, Berkeley, CA
- Worked in the Machine Learning and Analytics group led by Michael Mahoney
- Designed a PDE learning neural network architecture which exploits hierarchical structure and symmetry of Green's functions

May 2019 - August 2019 Summer Researcher, **Weizmann Institute**, Rehovot, Israel
- Conducted research in convex geometry as part of the Yale-Weizmann program

PUBLICATIONS AND PREPRINTS

B. ERICHSOHN, D. HALIKIAS, M. MAHONEY, AND D. MOROZOV. *Learning Green's functions with positional encoding*. In preparation.

T. CHEN, F. DUMAN KELES, D. HALIKIAS, C. MUSCO, C. MUSCO, AND D. PERSSON. *Near-optimal hierarchical matrix approximation from matrix-vector products*. Accepted to SODA 2025, (2024) [arXiv:2407.04686](https://arxiv.org/abs/2407.04686)

N. AMSEL, T. CHEN, F. DUMAN KELES, D. HALIKIAS, C. MUSCO, AND C. MUSCO. *Fixed-sparsity matrix approximation from matrix-vector products*. (2024) [arXiv:2402.09379](https://arxiv.org/abs/2402.09379)

N. BOULLÉ, D. HALIKIAS, S. OTTO, AND A. TOWNSEND. *Operator learning without the adjoint*. To appear in J. Mach. Learn. Res., (2024) [arXiv:2401.17739](https://arxiv.org/abs/2401.17739)

N. BOULLÉ, D. HALIKIAS, AND A. TOWNSEND. *Elliptic PDE learning is provably data-efficient*. PNAS Brief Report Vol. 120, no. 39, (2023) [doi:10.1073/pnas.2303904120](https://doi.org/10.1073/pnas.2303904120)

D. HALIKIAS AND A. TOWNSEND. *Structured matrix recovery from matrix-vector products*. Numer. Linear Algebra Appl. e2531, (2023). [doi:10.1002/nla.2531](https://doi.org/10.1002/nla.2531)

A. YU, C. BECQUEY, D. HALIKIAS, M. E. MALLORY, AND A. TOWNSEND. *Arbitrary depth universal approximation theorems for operator neural networks*. [arXiv:2109.11354](https://arxiv.org/abs/2109.11354), submitted to Neural Computations.

D. HALIKIAS, B. KLARTAG, AND B. SLOMKA. *Discrete variants of Brunn-Minkowski type inequalities*. Ann. Fac. Sci. Toulouse Math. (6), Vol. 30, no. 2, (2021), 267–279. doi:10.5802/afst.1674

E. GELERT, D. HALIKIAS, C. KENNEY, AND N. MARSHALL. *A Cheeger inequality for graphs based on a reflection principle*. Involve 13 no. 3, (2020) 475–486. doi:10.2140/involve.2020.13.475

PRESENTATIONS

- **SIAM-NY-NJ-PA section meeting, Rochester Institute of Technology (November 2023)**
Talk: Hierarchical matrix approximation and PDE learning
- **SIAM-Mathematics of Data Science, Atlanta, Georgia (October 2024)**
Poster: Adjoint-Free Operator Learning and Matrix Recovery
- **SIAM-Linear Algebra, Sorbonne University (May 2024)**
Talk in operator learning minisymposium: Elliptic PDE learning is data-efficient
- **SIAM NY-NJ-PA section meeting, New Jersey Institute of Technology (October 2023)**
Talk in query complexity minisymposium: Data-efficient matrix recovery and PDE learning
- **ICIAM at Waseda University, Tokyo, Japan (August 2023)**
Talk in randomized numerical linear algebra minisymposium: Matrix recovery from randomized matrix-vector products
- **Synergistic Interactions between Theory and Computation, MIT (July 2023)**
Poster: Data-efficient matrix recovery and PDE learning
- **Modern Applied and Computational Analysis at ICERM, Brown University (June 2023)**
Poster: Data-efficient matrix recovery and PDE learning
- **Latest trends and insights into matrix theory, iterative methods, and preconditioning at Temple University, Philadelphia, PA (March 2022)**
Talk: Hierarchical matrix recovery from matrix-vector products
- **Olivetti Club (Cornell University)**
 - Talk: Matrix recovery problems and their continuous analogues (November 2022)
 - Talk: Matrix recovery and PDE learning (March 2023)

TEACHING EXPERIENCE

Cornell University

Fall 2023 **Teaching Assistant**, Math 2210 (Linear Algebra)

Yale University

Spring 2020 **Undergraduate teaching assistant**, Math 231 (Vector Calculus and Linear Algebra II)
Fall 2019 **Undergraduate teaching assistant**, Math 230 (Vector Calculus and Linear Algebra I)
Spring 2019 **Undergraduate teaching assistant**, Math 244 (Discrete Mathematics)
Fall 2018 **Undergraduate teaching assistant**, Math 115 (Calculus II)

RESEARCH FELLOWSHIPS AND AWARDS

2024 **Cornell Graduate School Research Travel Grant** (\$1300)

2024 **SIAM Student Travel Grant** (\$800)

2023 **Cornell Graduate School Conference Grant** (\$700)

2021 **NSF Graduate Research Fellow** (\$138,000)

Awarded 5-year NSF-GRFP fellowship providing 3 years of financial support.

2020 **Cornell Mathematics First Year Fellowship** (\$32,000)

2019 **Yale-Weizmann Summer Science Fellowship**

Awarded travel funding to conduct math research at the Weizmann Institute in Rehovot, Israel.

ACTIVITIES

- 2022 **MSRI Summer Graduate School on Mathematics of Machine Learning (Courant Institute)**
Nominated by Cornell's math department to attend funded MSRI graduate school on machine learning theory.
- 2018 **Summer Undergraduate Research in Mathematics at Yale (SUMRY)**
Awarded funding to participate in Yale's Research Experience for Undergraduates in mathematics.

SERVICE AND OUTREACH

- 2024 - Present **Cornell Math department teaching seminar**, Organizer
- 2020 - Present **Association for Women in Mathematics Mentorship Program**, Mentor
Mentored three undergraduate women, provided support and guidance on early mathematical careers.
- 2024 **Olivetti seminar**, Organizer
- 2022 - 2024 **Directed Reading Program**, Mentor
Mentored two Cornell undergraduates in reading projects on spectral graph theory.
- 2021 **Cornell Mathematics Department REU**, Mentor
Mentored undergraduate research project in theoretical aspects of deep learning.
- 2021 - 2023 **Graduate Mentorship Program**, Mentor
Mentored incoming graduate students at Cornell on transitioning to graduate life.
- 2021 - 2023 **Little Math Circle**, Leader
Lead and teach weekly creative math circle for elementary school students in the Ithaca area.
- 2020 - 2021 **Cornell Association for Women in Mathematics Chapter**, Officer
Taught \LaTeX workshop for Cornell women in STEM.
- 2017 - 2020 **Yale Association for Women in Mathematics Student Chapter**, President

TECHNICAL SKILLS AND LANGUAGES

PROGRAMMING: Matlab, Python, \LaTeX
LANGUAGES: English, French, Modern Greek, Chinese (Mandarin)

MISCELLANEOUS

- Host of weekly Cornell graduate student trivia night at the Big Red Barn (2021-present)
- Awarded second place Montaigne Prize, Yale University Department of French (2020)
- Former student employee in the Numismatics Department of the Yale University Art Gallery (2017-2020)
- Silver Medalist in piano performance, AADGT International Competition; performed twice at Carnegie Hall (2014)