

DAVID PALMER

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EDUCATION

Massachusetts Institute of Technology

Cambridge, MA

PhD in Computer Science

2023

- Thesis: *Relaxing Topological Barriers in Geometry Processing*. Supervisor: Justin M. Solomon.

University of Cambridge

Cambridge, UK

MASt with Merit in Pure Mathematics

2017

- Part III of the Mathematical Tripos, focusing on differential geometry and topology.

Harvard University

Cambridge, MA

AB magna cum laude with Highest Honors in Computer Science

2015

- Thesis: *Toward computing extremal quasiconformal maps via discrete harmonic measured foliations*. Supervisor: Steven J. Gortler.

RESEARCH EXPERIENCE

Soft Math Group, Harvard University

Sep 2023–

NSF Postdoctoral Fellow

Cambridge, MA

- Building models of interactions between topological defects in soft-matter physics and morphogenesis. PI: L. Mahadevan.

Geometric Data Processing Group, MIT

Sep 2017–Aug 2023

Graduate Research Fellow

Cambridge, MA

- Developed algorithms for geometry processing using convex relaxation to tackle topological barriers to optimization. Sum-of-squares and current relaxations unlock applications including field-based meshing, simulation, graph inference, surface representation and reconstruction. PI: Justin M. Solomon.

Harvard University

Jan–Nov 2015

Undergraduate Research Assistant

Cambridge, MA

- Co-developed a discrete theory of measured foliations and implemented optimization and visualization of harmonic foliations aimed at applications in quasiconformal surface mapping, leading to my undergraduate thesis. PI: Steven J. Gortler.

REFEREED PUBLICATIONS

D. Palmer, D. Smirnov, S. Wang, A. Chern, and J. Solomon. **DeepCurrents: Learning Implicit Representations of Shapes with Boundaries**. *CVPR 2022*.

D. Wu, D. Palmer, and D. DeFord. **Maximum A Posteriori Inference of Random Dot Product Graphs via Conic Programming** *SIOPT 2022*.

Z. Marschner, P. Zhang, D. Palmer, and J. Solomon. **Sum-of-Squares Geometry Processing**. *SIGGRAPH Asia 2021*.

D. Palmer, O. Stein, and J. Solomon. **Frame Field Operators**. *Symposium on Geometry Processing 2021*.

Z. Marschner, D. Palmer, P. Zhang, and J. Solomon. **Hexahedral Mesh Repair via Sum-of-Squares Relaxation**. *Symposium on Geometry Processing 2020*.

D. Palmer, D. Bommes, and J. Solomon. **Algebraic Representations for Volumetric Frame Fields**. *ACM Transactions on Graphics (TOG)*, 39 (2), 1-17.

FELLOWSHIPS AND AWARDS

NSF Mathematical Sciences Postdoctoral Research Fellowship (2023–2025).

Hertz Fellowship (2018–2023). One of ten fellows selected from nearly 700 applicants across the USA.

MathWorks Fellowship (2020–2021, 2021–2022). Received twice. Each award fully funds a year of PhD study at MIT.

Frederick C. Hennie III Teaching Award (2021). \$2200 top teaching award in the EECS department, given to one recipient each semester.

Merrill Lynch EECS Fellowship (2017). Fully funded my first year of doctoral study at MIT.

Herchel Smith Scholarship (2016). Fully funded my year of study at the University of Cambridge.

INVITED TALKS

Topological Defects in Computational Meshing. University of Pennsylvania Condensed Matter Colloquium. Philadelphia, PA. Feb 7, 2024.

Geometry Processing with Implicit Representations. Symposium on Geometry Processing Summer School. Genoa, Italy. July 2, 2023.

From DeepCurrents to Topological Defects. Princeton IDeAS Seminar. Princeton, NJ. May 1, 2023.

From DeepCurrents to Topological Defects. UT Austin Graphics Seminar. Austin, TX. Mar 27, 2023.

Applied Geometric Measure Theory from DeepCurrents to Topological Defects. Dartmouth Applied and Computational Mathematics Seminar. Hanover, NH. Feb 7, 2023.

From Neural Implicit Surfaces to DeepCurrents and Beyond. University of Chicago 3DL Seminar. Chicago, IL. Nov 28, 2022.

From Neural Implicit Surfaces to DeepCurrents and Beyond. Boston University Graphics Seminar. Boston, MA. Oct 13, 2022.

Convex Relaxations in Geometry Processing. Slavov Lab, Northeastern University. Boston, MA. Oct 12, 2022.

From Neural Implicit Surfaces to DeepCurrents and Beyond. UCSD Pixel Cafe. San Diego, CA. May 13, 2022.

DeepCurrents: Learning Implicit Representations of Shapes with Boundaries. SIAM IS21 Minisymposium on Geometry, Computing and Learning for Science and Engineering. Online. March 23, 2022.

Riemannian Optimization of Volumetric Frame Fields. SIAM LA21 Minisymposium on Linear Algebra and Differential Geometry. Online. May 21, 2021.

Frames and Gauge for Hexahedral Meshing. Carnegie Mellon Graphics Seminar. Online. July 1, 2020.

Volumetric Frame Fields. Geometry Workshop. Strobl, Austria. September 2019.

Representing Volumetric Frame Fields for Hexahedral Meshing. Computer Science Colloquium, University of Bern. Bern, Switzerland. July 2019.

Representing Volumetric Frame Fields for Hexahedral Meshing. FRAMES 2019, UC Louvain. Louvain-la-Neuve, Belgium. July 2019.

Volumetric Frame Fields for Hexahedral Meshing. CGGC Seminar, Technion. Haifa, Israel. March 2019.

Volumetric Frame Fields for Hexahedral Meshing. Applied Math Colloquium, Tel Aviv University. Tel Aviv, Israel. March 2019.

Discrete Measured Foliations and Applications. DGP Graphics Seminar, University of Toronto. Toronto, Canada. Sep 2016.

WORK EXPERIENCE

Flagship Pioneering Jun–Aug 2022
AI Fellow Cambridge, MA

- Developed venture hypotheses at the intersection of machine learning, biochemistry, and materials science.

Pixar Animation Studios Feb–Jul 2016
Research Intern Emeryville, CA

- Implemented a system for manipulating vector fields on surfaces using low-rank factorization update to enable real-time global field design.
- Implemented a fluid simulator based on power diagrams and optimized it for performance and modularity.

TEACHING, LEADERSHIP & SERVICE

6.838: Shape Analysis Head TA. Responsibilities included writing and grading problem sets and hosting office hours (Spring 2021).

MIT Undergraduate Research Opportunities Program. Mentored six undergraduate students, two of whom have written three papers between them. My students have won the top awards for undergraduate research in EECS and the entire School of Engineering.

Summer Geometry Initiative. Mentor for two projects as part of a program to introduce students from non-traditional backgrounds to research in applied geometry (2021).

MIT EECS Graduate Students' Association. President (2020); Vice President for Academics and Diversity (2019).

MIT EECS Visiting Committee. Led graduate student advocacy in MIT corporation's biennial review of the EECS department. Co-chair (2022), committee member (2019).

MIT EECS Graduate Application Assistance Program. Mentor to PhD program applicants (2020).

Peer Review ACM Transactions on Graphics; SIGGRAPH Asia, NeurIPS; ICML; ICLR; AISTATS; Eurographics; International Meshing Roundtable; TPAMI; ESAIM: Control, Optimization, and Calculus of Variations.