Ahmed H. Mahmoud

Curriculum Vitae

https://ahdhn.github.io
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Cambridge, MA 02139
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RESEARCH EXPERIENCE

Massachusetts Institute of Technology, CSAIL *September 2024 – present*
Postdoctoral Associate

- Advisor: Professor Justin Solomon & Professor Jonathan Ragan-Kelley

Autodesk Research, Toronto, Canada *November 2020 – May 2024*
Senior Research Scientist

University of California, Davis *March 2016 – October 2020*
Graduate Student Researcher

Autodesk Research, Toronto, Canada *June–December 2019, July – November 2020*
Intern, Numerical Analysis Research

Shenzhen University, China *June – September 2018*
Research intern at the Visual Computing Research Center

EDUCATION

University of California, Davis *June 2024*
Ph.D. in Electrical and Computer Engineering

- Advisor: Professor John D. Owens
- Dissertation: Unstructured Geometric Data Processing on the GPU: Data Structures & Programming Models

University of California, Davis *September 2020*
M.Sc. in Electrical and Computer Engineering

Alexandria University, Egypt *May 2013*
B.S. in Marine Engineering and Naval Architecture

- Very good with honors—ranked first

FUNDING

[1] OAC Core: OAC Core Projects: GPU Geometric Data Processing
National Science Foundation (Award # OAC-2403239)
PI. Jonathan Ragan-Kelley, co-PI. Justin Solomon
Amount: **$600,000**
July 1, 2024–June 30, 2027
Role: The primary author of the technical description

[2] Efficient GPU Sparse Automatic Differentiation for Scientific Computing
MIT Generative AI Impact Consortium (MGAIC)
PI. Justin Solomon, co-PI. Jonathan Ragan-Kelley
Amount: **$150,000**
June 1, 2025–May 31, 2026
Role: The primary author of the technical description

PUBLICATIONS

[1] *Locality-Aware Automatic Differentiation on the GPU for Mesh-Based Computations*
Ahmed H. Mahmoud, Rahul Goel, Jonathan Ragan-Kelley, and Justin Solomon.
ACM Transactions on Graphics (SIGGRAPH 2026).

[2] *Fast Sparse Matrix Permutation for Mesh-Based Direct Solvers*
Behrooz Zarebavani†, **Ahmed H. Mahmoud**†, Ana Dodik, Changcheng Yuan, Serban D. Porumbescu, John D. Owens, Maryam Mehri Dehnavi, and Justin Solomon.
SIGGRAPH 2026.
† joint first author

[3] *`iskra`: A System for Inverse Geometry Processing*
Ana Dodik, **Ahmed H. Mahmoud**, and Justin Solomon.
ACM Transactions on Graphics (SIGGRAPH 2026).

[4] *Low-Rank Adaptation of Neural Fields*
Anh Truong, **Ahmed H. Mahmoud**, Mina Konaković Luković, and Justin Solomon.
SIGGRAPH Asia 2025.

[5] *Dynamic Mesh Processing on the GPU*
Ahmed H. Mahmoud, Serban D. Porumbescu, and John D. Owens.
ACM Transactions on Graphics (SIGGRAPH 2025).

[6] *Disaggregated Design for GPU-Based Volumetric Data Structures*
Massimiliano Meneghin and **Ahmed H. Mahmoud**.
European Conference on Parallel and Distributed Computing (EuroPar 2025)

[7] *Optimized GPU implementation of grid refinement in lattice Boltzmann method*
Ahmed H. Mahmoud, Hesam Salehipour, and Massimiliano Meneghin
International Parallel and Distributed Processing Symposium (IPDPS 2024)
Open Source Contribution Award

[8] *Neon: A Multi-GPU Programming Model for Grid-based Computations*
Massimiliano Meneghin†, **Ahmed H. Mahmoud**†, Pradeep Kumar Jayaraman, and Nigel J. W. Morris.
International Parallel and Distributed Processing Symposium (IPDPS 2022)
† joint first author

[9] *RXMesh: A GPU Mesh Data Structure*
Ahmed H. Mahmoud, Serban D. Porumbescu, and John D. Owens
ACM Transactions on Graphics (SIGGRAPH 2021)

[10] *VoroCrust: Voronoi Meshing Without Clipping*
Ahmed Abdelkader, Chandrajit L. Bajaj, Mohamed S. Ebeida, **Ahmed H. Mahmoud**, Scott A. Mitchell, John D. Owens and Ahmad A. Rushdi
ACM Transactions on Graphics (SIGGRAPH 2020)

[11] *Sampling Conditions for Conforming Voronoi Meshing by the VoroCrust Algorithm*
Ahmed Abdelkader, Chandrajit L. Bajaj, Mohamed S. Ebeida, **Ahmed H. Mahmoud**, Scott A. Mitchell, John D. Owens and Ahmad A. Rushdi
International Symposium on Computational Geometry (SoCG 2018)

[12] *A Constrained Resampling Strategy for Mesh Improvement*
Ahmed Abdelkader†, **Ahmed H. Mahmoud**† Ahmad A. Rushdi, Scott A. Mitchell, John D. Owens, and Mohamed S. Ebeida
Computer Graphics Forum (presented at Symposium on Geometry Processing (SGP) 2017)
† joint first author

[13] *All-Quad Meshing without Cleanup*
Ahmad A. Rushdi, Scott A. Mitchell, **Ahmed H. Mahmoud**, Chandrajit L. Bajaj, and Mohamed S. Ebeida
Computer-Aided Design (CAD 2017)

[14] *Disk Density Tuning of a Maximal Random Packing*
Mohamed S. Ebeida, Ahmad A. Rushdi, Muhammad A. Awad, **Ahmed H. Mahmoud**, Dongming Yan, Shawn English, John D. Owens, Chandrajit L. Bajaj, and Scott A. Mitchell
Computer Graphics Forum (presented at Symposium on Geometry Processing (SGP) 2016)

[15] *Exercises in High-Dimensional Sampling: Maximal Poisson-disk Sampling and k-d Darts*
Mohamed S. Ebeida, Scott A. Mitchell, Anjul Patney, Andrew A. Davidson, Stanley Tzeng, Muhammad A. Awad, **Ahmed H. Mahmoud**, and John D. Owens
Book chapter in Topological and Statistical Methods for Complex Data: Tackling Large-Scale, High-Dimensional, and Multivariate Data Spaces (2014)

[16] *Delaunay Quadrangulation by Two-coloring Vertices*
Scott A. Mitchell, Mohammed A. Mohammed, **Ahmed H. Mahmoud** and Mohamed S. Ebeida
International Meshing Roundtable (IMR 2014)

[17] *Improving Spatial Coverage while Preserving the Blue Noise of Point Sets*
Mohamed S. Ebeida, Muhammad A. Awad, Xiaoyin Ge, **Ahmed H. Mahmoud**, Scott A. Mitchell, Patrick M. Knupp, and Li-Yi Wei
SIAM Conference on Geometric and Physical Modeling (SIAM GD/SPM13)

[18] *Sifted Disks*
Mohamed S. Ebeida, **Ahmed H. Mahmoud**, Muhammad A. Awad, Mohammed A. Mohammed, Scott A. Mitchell, Alex Rand, and John D. Owens
Eurographics 2013.

AWARDS

[1] Symposium on Geometry Processing (SGP) 2026 Software Award
Ahmed H. Mahmoud, Serban D. Porumbescu, and John D. Owens
SGP Software Award recognizes "the authors of an open-source software project that has greatly influenced the field."

[2] IPDPS 2024 Open Source Contribution Award
Ahmed H. Mahmoud, Hesam Salehipour, and Massimiliano Meneghin
For the Optimized GPU Implementation of Grid Refinement in the Lattice Boltzmann Method

PATENTS

[1] *Optimized GPU Implementation of Grid Refinement in the Lattice Boltzmann Method*
Ahmed H. Mahmoud, Hesam Salehipour, and Massimiliano Meneghin
Filed on January 29, 2025 by Autodesk, Inc. US20250307504A1

SELECTED TALKS

Accelerating Geometric Optimization on GPUs
Summer Geometry Initiative (August 2026 - Virtual)

Locality-Aware Automatic Differentiation on the GPU for Mesh-Based Computations
SIGGRAPH 2026 (August 2026 - CA, USA)

Fast Sparse Matrix Permutation for Mesh-Based Direct Solvers
SIGGRAPH 2026 (August 2026 - CA, USA)

Accelerating Irregular Computation
Queen's University (May 2026 - Kingston, Canada)
University of Toronto (April 2026 - Toronto, Canada)
University of Waterloo (March 2026 - Waterloo, Canada)
University of California, Berkeley (February 2026 - CA, USA)
University of Victoria (November 2025 - Victoria, Canada)

Dynamic Mesh Processing on the GPU
SIGGRAPH (August 2025 - Vancouver, Canada)
Highlights of Parallel Computing (July 2025 - Portland, Oregon)
Brown Visual Computing Seminar (October 2024 - Brown University)
Adobe (November 2023 - Virtual))

RXMesh: A High-performance Mesh Data Structure and Programming Model on the GPU
NVIDIA GTC (March 2022 - Virtual)

Neon: A Multi-GPU Programming Model for Grid-based Computations
NVIDIA GTC (March 2022 - Virtual)

RXMesh: A GPU Mesh Data Structure
SIGGRAPH (August 2021 - Virtual)

A Constrained Resampling Strategy for Mesh Improvement
Symposium on Geometry Processing (July 2017 - London, UK)

MENTEES

Jinyuan Wu (Undergrad Student, MIT)
Project: Accelerated Differentiable Elastic Simulation

Behrooz Zarebavani (Ph.D. Student, University of Toronto) → SIGGRAPH paper
Project: Fast Sparse Matrix Permutation for Mesh-Based Direct Solvers

Anh Truong (Ph.D. Student, MIT) → First SIGGRAPH Asia paper
Project: Parameter-efficient Updates of Neural Fields using LoRA

Sachin Kishan (Undergrad Student, Vellore Institute of Technology) → Ph.D. Student at New York University
Project: GPU Geometric Multigrid on Triangle Mesh

Changcheng (Eric) Yuan (M.Sc. Student, UC Davis) → Ph.D. Student, Texas A&M University
Project: GPU Sparse Matrix Reordering

Brooke Dolny (Autodesk Research intern) → M.Sc. Student, University of Waterloo
Project: GPU-accelerated Lattice-Boltzmann Fluid Simulation

Gokul Adithya and Yufan Hu (Summer Geometry Initiative 2026)
Project: Inverse Geodesic Distance with Iskra

Renan Bomtempo, Adan Javier Ortiz, Daryna Hrybchuk, and Francisco Vigil (Summer Geometry Initiative 2025)
Project: Localized Remeshing for Cloth Simulation

Aniket Rajnish, Charuka Bandara, Diany Pressato, Kenia Nova, and Sachin Kishan (Summer Geometry Initiative 2024)
Project: GPU-accelerated Geometry Processing Applications

TEACHING

Differentiable Geometry Processing in Python (YouTube) *2026*
Symposium of Geometry Processing course

Accelerated Computing (6.S894) *Fall 2024, Fall 2025*
MIT
Guest Lecturer

Control Systems I (EEC 157A) *Fall 2017*
University of California, Davis
Teaching Assistant

Computer Programming (CS224) *Fall 2015*
Alexandria University, Egypt
Assistant Lecturer

Ships and Machines Drawing (MR111) *Fall 2015*
Alexandria University, Egypt
Assistant Lecturer

Fluid Mechanics (MR231) *Fall 2015*
Alexandria University, Egypt
Assistant Lecturer

Fluid Mechanics and Hydraulic Machines (MR232) *Spring 2014*
Alexandria University, Egypt
Assistant Lecturer

Marine Hydro-dynamics (OCE323) *Spring 2014*
Alexandria University, Egypt
Assistant Lecturer

Theory of Machines (ME145) *Spring 2014*
Alexandria University, Egypt
Assistant Lecturer

Material Technology (MR242) *Fall 2013*
Alexandria University, Egypt
Assistant Lecturer

Marine Power Plants (MR352) *Fall 2013*
Alexandria University, Egypt
Assistant Lecturer

ACADEMIC SERVICE

SIGGRAPH Technical Papers *2026, 2027*
Committee Member

Symposium on Geometry Processing Graduate School *2027*
Co-chair

Symposium on Geometry Processing *2024, 2025, 2027*
Technical Papers Committee

SIGGRAPH Posters *2025, 2026*
Juror

MIT Summer Geometry Initiative *2025, 2026*
Admission Committee and mentor

New England Symposium on Graphics *2025, 2026*
Organizing Committee

MIT Summer Geometry Initiative *2024*
Mentor

High Performance Graphics *2024*
International Paper Committee

International Conference on Geometric Modeling and Processing *2023, 2024*
Technical Program Committee

ECE Peer Mentoring Program at UC Davis *2021, 2023*
Mentor

UC Davis SACNAS's Mentor Match Program *2023*
Mentor

REFEREE SERVICE

ACM Transactions on Architecture and Code Optimization *2026*

ACM Transactions on Parallel Computing *2026*

ACM Transactions on Graphics *2024, 2026*

SIGGRAPH *2024, 2025*

SIGGRAPH Asia *2024*

Computers & Graphics *2024*

Transactions on Visualization and Computer Graphics *2023*

Eurographics *2023*

Computer Aided Geometric Design *2022*

The SIAM International Meshing Roundtable Workshop *2022, 2023, 2024*

International Meshing Roundtable *2019, 2021*

Computer-Aided Design *2019*

REFERENCES

John D. Owens
Child Family Professor of Engineering and Entrepreneurship – University of California, Davis
jowens@ece.ucdavis.edu

Justin Solomon
Associate Professor – Massachusetts Institute of Technology
jsolomon@mit.edu

Jonathan Ragan-Kelley
Associate Professor – Massachusetts Institute of Technology
jrk@mit.edu