

# Ahmed H. Mahmoud

*Curriculum Vitae*

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## RESEARCH EXPERIENCE

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**Massachusetts Institute of Technology, CSAIL**  
Postdoctoral Associate

September 2024 – present

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

**Autodesk Research, Toronto, Canada**  
Senior Research Scientist

November 2020 – May 2024

**University of California, Davis**  
Graduate Student Researcher

March 2016 – October 2020

**Autodesk Research, Toronto, Canada**  
Intern, Numerical Analysis Research

June–December 2019, July – November 2020

**Shenzhen University, China**  
Research intern at the Visual Computing Research Center

June – September 2018

## EDUCATION

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**University of California, Davis**  
Ph.D. in Electrical and Computer Engineering  
– Advisor: Professor John D. Owens  
– Dissertation: Unstructured Geometric Data Processing on the GPU: Data Structures & Programming Models

June 2024

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

September 2020

**Alexandria University, Egypt**  
B.S. in Marine Engineering and Naval Architecture  
– Very good with honors—ranked first

May 2013

## FUNDING

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- [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

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- [1] *Locality-Aware Automatic Differentiation on the GPU for Mesh-Based Computations*  
**Ahmed H. Mahmoud**, Rahul Goel, Jonathan Ragan-Kelley, and Justin Solomon.  
In submission (arXiv: 2509.00406).
- [2] *Fast Sparse Matrix Permutation for Mesh-Based Direct Solvers*  
Behrooz Zarebavami<sup>†</sup>, **Ahmed H. Mahmoud**<sup>†</sup>, Ana Dodik, Changcheng Yuan, Serban D. Porumbescu, John D. Owens, Maryam Mehri Dehnava, and Justin Solomon.  
In submission (arXiv: 2602.00898).  
<sup>†</sup> joint first author
- [3] *iskra: A System for Inverse Geometry Processing*  
Ana Dodik, **Ahmed H. Mahmoud**, and Justin Solomon.  
In submission (arXiv: 2602.12105).
- [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<sup>†</sup>, **Ahmed H. Mahmoud**<sup>†</sup>, Pradeep Kumar Jayaraman, and Nigel J. W. Morris.  
International Parallel and Distributed Processing Symposium (IPDPS 2022)  
<sup>†</sup> 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<sup>†</sup>, **Ahmed H. Mahmoud**<sup>†</sup> Ahmad A. Rushdi, Scott A. Mitchell, John D. Owens, and Mohamed S. Ebeida  
Computer Graphics Forum (presented at ACM/Eurographics Symposium on Geometry Processing SGP 2017)  
<sup>†</sup> 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 ACM/Eurographics 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.

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## PATENTS

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- [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.

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## SELECTED TALKS

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**Accelerating Irregular Computation by Exploiting Hidden Structures**  
University of Victoria (November 2025 - Victoria, BC, 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**  
ACM/Eurographics Symposium on Geometry Processing (July 2017 - London, UK)

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## MENTEES

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**Behrooz Zarebavani (Ph.D. Student, University of Toronto)**  
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 (SGI Fellow)** → 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

## TEACHING

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<b>Accelerated Computing (6.S894)</b> MIT Guest Lecturer	<i>Fall 2024, Fall 2025</i>
<b>Control Systems I (EEC 157A)</b> University of California, Davis Teaching Assistant	<i>Fall 2017</i>
<b>Computer Programming (CS224)</b> Alexandria University, Egypt Assistant Lecturer	<i>Fall 2015</i>
<b>Ships and Machines Drawing (MR111)</b> Alexandria University, Egypt Assistant Lecturer	<i>Fall 2015</i>
<b>Fluid Mechanics (MR231)</b> Alexandria University, Egypt Assistant Lecturer	<i>Fall 2015</i>
<b>Fluid Mechanics and Hydraulic Machines (MR232)</b> Alexandria University, Egypt Assistant Lecturer	<i>Spring 2014</i>
<b>Marine Hydro-dynamics (OCE323)</b> Alexandria University, Egypt Assistant Lecturer	<i>Spring 2014</i>
<b>Theory of Machines (ME145)</b> Alexandria University, Egypt Assistant Lecturer	<i>Spring 2014</i>
<b>Material Technology (MR242)</b> Alexandria University, Egypt Assistant Lecturer	<i>Fall 2013</i>
<b>Marine Power Plants (MR352)</b> Alexandria University, Egypt Assistant Lecturer	<i>Fall 2013</i>

## ACADEMIC SERVICE

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<b>SIGGRAPH Technical Papers</b> Committee Member	<i>2026</i>
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<b>SIGGRAPH Posters</b>	2025, 2026
Juror	
<b>MIT Summer Geometry Initiative</b>	2025
Admission Committee and mentor	
<b>New England Symposium on Graphics</b>	2025, 2026
Organizing Committee	
<b>ACM/Eurographics Symposium on Geometry Processing</b>	2024, 2025
Technical Papers Committee	
<b>MIT Summer Geometry Initiative</b>	2024
Mentor	
<b>High Performance Graphics</b>	2024
International Paper Committee	
<b>International Conference on Geometric Modeling and Processing</b>	2023, 2024
Technical Program Committee	
<b>ECE Peer Mentoring Program at UC Davis</b>	2021, 2023
Mentor	
<b>UC Davis SACNAS's Mentor Match Program</b>	2023
Mentor	

## REFeree SERVICE

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<b>ACM Transactions on Parallel Computing</b>	2026
<b>SIGGRAPH</b>	2024, 2025
<b>SIGGRAPH Asia</b>	2024
<b>Computers &amp; Graphics</b>	2024
<b>Transactions on Visualization and Computer Graphics</b>	2023
<b>Eurographics</b>	2023
<b>Computer Aided Geometric Design</b>	2022
<b>The SIAM International Meshing Roundtable Workshop</b>	2022, 2023, 2024
<b>International Meshing Roundtable</b>	2019, 2021
<b>Computer-Aided Design</b>	2019

## MEDIA COVERAGE

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<b>Sandia LabNews</b>	<i>April 2020</i>
Automating complex 3D modeling ( <a href="#">webpage</a> , <a href="#">pdf</a> )	

## REFERENCES

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### 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*

**Mohamed S. Ebeida**

Founder and CEO – Discretize. Previously, a Principal Member Of Technical Staff – Sandia National Laboratories

*msebeida@gmail.com*