

# Ahmed H. Mahmoud

*Curriculum Vitae*

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## RESEARCH EXPERIENCE

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**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

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**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

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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] *Low-Rank Adaptation of Neural Fields*  
Anh Truong, **Ahmed H. Mahmoud**, Mina Konaković Luković, and Justin Solomon.  
SIGGRAPH Asia 2025.
- [2] *Locality-Aware Automatic Differentiation on the GPU for Mesh-Based Computations*  
**Ahmed H. Mahmoud**, Jonathan Ragan-Kelley, and Justin Solomon.  
In submission (arXiv: 2509.00406).
- [3] *Dynamic Mesh Processing on the GPU*  
**Ahmed H. Mahmoud**, Serban D. Porumbescu, and John D. Owens.  
ACM Transactions on Graphics (SIGGRAPH 2025).
- [4] *Disaggregated Design for GPU-Based Volumetric Data Structures*  
Massimiliano Meneghin and **Ahmed H. Mahmoud**.  
European Conference on Parallel and Distributed Computing (EuroPar 2025)
- [5] *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
- [6] *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
- [7] *RXMesh: A GPU Mesh Data Structure*  
**Ahmed H. Mahmoud**, Serban D. Porumbescu, and John D. Owens  
ACM Transactions on Graphics (SIGGRAPH 2021)
- [8] *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)
- [9] *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)
- [10] *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
- [11] *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)
- [12] *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)
- [13] *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 Multi-variate Data Spaces (2014)

- [14] *Delaunay Quadrangulation by Two-coloring Vertices*  
Scott A. Mitchell, Mohammed A. Mohammed, **Ahmed H. Mahmoud** and Mohamed S. Ebeida  
International Meshing Roundtable (IMR 2014)
- [15] *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)
- [16] *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.

## 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.

## 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)

## MENTEES

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**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: Fast Sparse Matrix Reordering on GPU for Cholesky Based Solvers

**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 Posters</b> Juror	<i>2025</i>
<b>MIT Summer Geometry Initiative</b> Admission Committee and mentor	<i>2025</i>
<b>New England Symposium on Graphics</b> Organizing Committee	<i>2025</i>
<b>ACM/Eurographics Symposium on Geometry Processing</b> Technical Papers Committee	<i>2024, 2025</i>
<b>MIT Summer Geometry Initiative</b> Mentor	<i>2024</i>
<b>High Performance Graphics</b> International Paper Committee	<i>2024</i>

<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>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>	April 2020
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 – Discreetize. Previously, a Principal Member Of Technical Staff – Sandia National Laboratories  
*msebeida@gmail.com*