

# Matthew Dutson

PhD Student in Computer Science at UW—Madison

mattdutson.net  
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## Research Interests

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Computer vision, computer graphics, machine learning

## Education

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- 2021—Present **PhD in Computer Science**, UW—Madison  
Advisor: Mohit Gupta
- 2018—2020 **MS in Computer Science**, UW—Madison  
Advisors: Jignesh Patel and Kevin Eliceiri (2018—2019), Mohit Gupta (2019—2020)
- 2013—2018 **Honors BS in Physics**, University of Utah  
Magnum cum laude  
Minors: computer science, mathematics  
Thesis: Reconstruction of Cosmic Ray Geometry Using Cherenkov Backscattering

## Publications

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- 2023 **Spike-Based Anytime Perception**  
Winter Conference on Applications of Computer Vision (WACV)  
Matthew Dutson, Yin Li, and Mohit Gupta
- 2022 **Event Neural Networks**  
European Conference on Computer Vision (ECCV)  
Matthew Dutson, Yin Li, and Mohit Gupta
- 2020 **Fibrillar Collagen Quantification with Curvelet Transform Based Computational Methods**  
Frontiers in Bioengineering and Biotechnology  
Yuming Liu, Adib Keikhosravi, Carolyn Pehlke, Jeremy Bredfeldt, Matthew Dutson, Haixiang Liu, Guneet Mehta, Robert Claus, Akhil Patel, Matthew Conklin, David Inman, Paolo Provenzano, Eftychios Sifakis, Jignesh Patel, and Kevin Eliceiri

## Technical Skills

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Experience level (most/medium/some) given in parentheses

- Languages **C++ (most), Python (most)**, Java (medium), C (some), C# (some), MATLAB (some), Perl (some), Rust (some)
- Frameworks **NumPy (most), PyTorch (most), TensorFlow (most)**, scikit-learn (medium), SciPy (medium), CUDA (some), MPI (some), OpenMP (some)
- Other **LaTeX (most), UNIX (most)**, Linux (medium), Git (medium)

## Industry Experience

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- 2019      **Map Exploration Software Intern, Esri**  
Implemented multithreaded and GPU-accelerated algorithms for visibility analysis.  
Built a machine learning application to detect building features in 3D urban scenes.
- 2017      **Process Software Intern, IM Flash Technologies**  
Improved the efficiency of wafer defect sourcing using Perl-based automation.  
Applied online statistical analysis to reduce errors in process time estimation by 97 percent.
- 2016      **Process Software Intern, IM Flash Technologies**  
Created a C++ OpenCV computer vision application to detect manufacturing equipment failures.

## Research Experience

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- 2020–Present      **Graduate Research Assistant, UW–Madison**  
Advisor: Mohit Gupta  
Creating algorithms to improve the efficiency of neural networks on video and other temporally repetitive data.  
Exploring the theory and applications of sparse, asynchronous neural networks.
- 2018–2019      **Graduate Research Assistant, UW–Madison**  
Advisors: Jignesh Patel and Kevin Eliceiri  
Designed and implemented core components of a Rust-based replacement for SQLite.  
Built a Java application for generating synthetic images of collagen fibers.
- 2016–2018      **Undergraduate Research Assistant, University of Utah**  
Advisor: Douglas Bergman  
Wrote C++ ray-tracing simulations of cosmic ray detection to test novel detection techniques.  
Operated the Telescope Array observatory in Delta, UT.

## Selected Coursework

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- CS and ECE      Computer vision, computer graphics, machine learning, high-performance computing, computer architecture, image processing, robotics, data visualization, data ethics, linear and nonlinear optimization, algorithms
- Mathematics      Calculus, linear algebra, probability and statistics, ordinary and partial differential equations, real analysis
- Physics      Classical physics, thermodynamics, special relativity, quantum mechanics, nuclear and particle physics

## Patents

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- 2022      **Systems, Methods, and Media for Generating and Using Neural Networks Having Improved Efficiency for Analyzing Video**  
Matthew Dutson and Mohit Gupta  
Pending (filed May 2022)
- 2022      **Systems, Methods, and Media for Generating Digital Images Using Low Bit Depth Image Sensor Data**  
Matthew Dutson and Mohit Gupta  
Pending (filed March 2022)
- 2021      **Systems, Methods, and Media for Generating and Using Spiking Neural Networks with Improved Efficiency**  
Matthew Dutson and Mohit Gupta  
Pending (filed April 2021)

## Teaching Experience

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- 2019 Fall      **Teaching Assistant, UW—Madison**  
CS 559 – Computer Graphics  
Instructor: Florian Heimerl
- 2017 Fall      **Teaching Assistant, University of Utah**  
CS 2100 – Discrete Mathematics  
Instructor: Bei Wang
- 2017 Spring      **Teaching Assistant, University of Utah**  
Physics 2020 – General Physics II  
Instructor: Ren Pankovich
- 2016 Fall      **Teaching Assistant, University of Utah**  
Physics 2010 – General Physics I  
Instructor: Orest Symko
- 2015–2016      **Private Physics Tutor, University of Utah**  
Courses: General Physics I and II, Physics for Scientists and Engineers I and II, Introduction to Quantum Theory and Relativity

## Volunteer Experience

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- 2019–2020      **Events Committee Chair, UW—Madison Student ACM Chapter**  
Responsible for overseeing department-wide, student-organized events.  
Coordinated with the CS department in planning and hosting the 2020 prospective graduate student welcome weekend event.
- 2019      **Events Committee Officer, UW—Madison Student ACM Chapter**
- 2018      **Scratch Club Leader, Lowell Elementary School**
- 2016, 2017      **Project Judge, Salt Lake Valley Science and Engineering Fair**