Matthew Dutson

PhD Student in Computer Science at UW—Madison

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Research Interests

Computational imaging, computer vision, computer graphics, machine learning

Education

2021—Present **PhD in Computer Science**, UW—Madison
Advisor: Mohit Gupta

2018—2020 **MS in Computer Science**, UW—Madison

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

2024 **Generalized Event Cameras**
Conference on Computer Vision and Pattern Recognition (CVPR)
Varun Sundar*, Matthew Dutson*, Andrei Ardelean, Claudio Bruschini, Edoardo Charbon, Mohit Gupta

2023 **Eventful Transformers: Leveraging Temporal Redundancy in Vision Transformers**
International Conference on Computer Vision (ICCV)
Matthew Dutson, Yin Li, and Mohit Gupta

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

Bold indicates more experience.

Languages	**C++, Python**, Java, C
Frameworks	**NumPy, PyTorch, TensorFlow**, scikit-learn, SciPy, CUDA, MPI, OpenMP
Other	**LaTeX, Linux/UNIX**, Git

Industry Experience

2024—Present **Consultant**, Ubicept

2024 **Research Intern**, Ubicept

2019 **Software Intern**, Esri
Implemented multi-threaded and GPU-accelerated algorithms for visibility analysis.
Created a deep learning application to detect building features in 3D urban scenes.

2017 **Software Intern**, IM Flash Technologies
Built an automated wafer defect sourcing pipeline.
Applied online statistical analysis to reduce process forecasting errors by 97 percent.

2016 **Software Intern**, IM Flash Technologies
Designed a C++ OpenCV computer vision application to detect equipment failures.

Research Experience

2020—Present **Graduate Research Assistant**, UW—Madison
Advisor: Mohit Gupta
Topics: sparse and asynchronous neural networks, efficient inference on temporally redundant data, algorithms for single-photon sensors

2018—2019 **Graduate Research Assistant**, UW—Madison
Advisors: Jignesh Patel and Kevin Eliceiri
Topics: embedded databases (SQLite), medical image analysis

2016—2018 **Undergraduate Research Assistant**, University of Utah
Advisor: Douglas Bergman
Topics: reconstruction of cosmic ray geometry, simulation of cosmic ray detection

Selected Coursework

CS and ECE	Computer vision, computer graphics, machine learning, high-performance computing, computer architecture, image processing, robotics, data visualization, ethics in computer science, linear and nonlinear optimization, algorithms
Mathematics	Calculus, linear algebra, probability and statistics, ordinary and partial differential equations

Physics	Classical physics, thermodynamics, special relativity, quantum mechanics, nuclear and particle physics

Patents

2024 **Generalized Event Cameras**
Varun Sundar, Matthew Dutson, and Mohit Gupta
Filed April 2024 (pending)

2023 **Vision Transformers Leveraging Temporal Redundancy**
Matthew Dutson, Mohit Gupta, and Yin Li
Filed September 2023 (pending)

2022 **Systems, Methods, and Media for Generating and Using Neural Networks Having Improved Efficiency for Analyzing Video**
Matthew Dutson and Mohit Gupta
Filed May 2022 (pending)

2022 **Systems, Methods, and Media for Generating Digital Images Using Low Bit Depth Image Sensor Data**
Matthew Dutson and Mohit Gupta
Filed March 2022 (pending)

2021 **Systems, Methods, and Media for Generating and Using Spiking Neural Networks with Improved Efficiency**
Matthew Dutson and Mohit Gupta
Filed April 2021 (pending)

Teaching Experience

2019 Fall **Teaching Assistant**, UW—Madison
Course: CS 559 — Computer Graphics
Instructor: Florian Heimerl

2017 Fall **Teaching Assistant**, University of Utah
Course: CS 2100 — Discrete Mathematics
Instructor: Bei Wang

2017 Spring **Teaching Assistant**, University of Utah
Course: Physics 2020 — General Physics II
Instructor: Ren Pankovich

2016 Fall **Teaching Assistant**, University of Utah
Course: 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

2019—2020	**Events Committee Chair**, UW—Madison Student ACM Chapter Organized student-led events for the CS department. Coordinated with the department administrators to plan and host a welcome event for prospective graduate students.
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

Reviewing Experience

2024	Conference on Computer Vision and Pattern Recognition (CVPR)
2023	Conference on Neural Information Processing Systems (NeurIPS)
2023	International Conference on Computational Photography (ICCP)
2023	International Conference on Computer Vision (ICCV)
2023	Conference on Computer Vision and Pattern Recognition (CVPR)