Matt Dutson

Computer Sciences PhD Candidate at UW-Madison
dutson@wisc.edu | mdutson.net

EDUCATION

University of Wisconsin-Madison **2021-Present**
Computer Sciences Doctor of Philosophy
- Expected graduation in 2025
- Advised by Mohit Gupta
- Minor in electrical and computer engineering
- Emphases: computational imaging, computer vision, computer graphics, machine learning
- Thesis: Augmenting Frame-Based Vision With Temporal Context

University of Wisconsin-Madison **2018-2020**
Computer Sciences Master of Science

University of Utah **2013-2018**
Physics Honors Bachelor of Science
- Magna cum laude
- Minors in computer science and mathematics
- Thesis: Reconstruction of Cosmic Ray Geometry Using Cherenkov Backscattering

WORK EXPERIENCE

Ubicept **2024-Present**
Research Intern, Consultant Boston, MA
- Developing a next-generation imaging pipeline
- Thriving in a fast-paced startup environment
- Laid the foundations of a company-wide research codebase
- Adhering to modern software development practices (agile development, scrum, code review, automated testing, continuous integration)

WISION Lab **2019-Present**
Research Assistant Madison, WI
- Developing compression and reconstruction algorithms for cutting-edge (single photon) image sensors
- Exploring sparsity-based approaches that achieve order-of-magnitude reductions in neural network inference costs
- Modifying state-of-the art CNN and Transformer models for efficient video processing
- Augmenting vision systems to improve performance under adverse conditions (poor weather, low light, compression artifacts, sensor noise)
- Managing large-scale machine learning experiments with an emphasis on scientific methodology and reproducibility

Esri **2019**
Software Intern Redlands, CA
- Implemented a novel algorithm for high-performance viewshed analysis, with support for multithreading and GPU acceleration
- Added new functionality to an industry-scale legacy codebase
- Developed an efficient solver for a challenging 3D optimization problem
- Built a deep learning application for identifying building features in 3D urban environments

IM Flash Technologies **2016, 2017**
Software Intern Lehi, UT
- Reduced process forecasting errors by 97 percent with improvements to online statistical modeling
- Created a system to automatically source defects in a complex manufacturing pipeline
- Developed computer vision software to detect equipment failures and notify technicians in real time

TECHNICAL SKILLS

Languages
Bash, C, C#, C++, Java, LaTeX, Perl, Python, Rust, SQL

Libraries
Boost (C++ libraries), C++ standard library, CUDA, GTK, MPI, NumPy, OpenCV, OpenMP, PyTorch, Scikit-Learn, SciPy, TensorFlow

Other
Agile development, automated software testing, Amazon EC2, containerization, Docker, Git, high-performance computing (HPC), Linux, reproducible computing, Slurm workload manager

PUBLICATIONS

Instant Video Models: Universal Adapters for Stabilizing Image-Based Networks 2025
Conference on Neural Information Processing Systems (NeurIPS)
Matthew Dutson, Nathan Labiosa, Yin Li, and Mohit Gupta

Streaming Quanta Sensors for Online, High-Performance Imaging and Vision 2024
Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
Tianyi Zhang, Matthew Dutson, Vivek Boominathan, Mohit Gupta, and Ashok Veeraraghavan

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

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

Spike-Based Anytime Perception 2023
Winter Conference on Applications of Computer Vision (WACV)
Matthew Dutson, Yin Li, and Mohit Gupta

Event Neural Networks 2022
European Conference on Computer Vision (ECCV)
Matthew Dutson, Yin Li, and Mohit Gupta

Fibrillar Collagen Quantification With Curvelet Transform Based Computational Methods 2020
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

COURSEWORK

Computer Science
Algorithms, computational modeling, computer architecture, computer graphics, computer vision, data science, data structures, data visualization, ethics in computer science, high-performance computing, image processing, linear optimization, machine learning, nonlinear optimization, object-oriented programming, operating systems, robotics, software engineering

Mathematics
Calculus, discrete mathematics, linear algebra, ordinary and partial differential equations, probability and statistics

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

REVIEWING EXPERIENCE

Conference on Neural Information Processing Systems (NeurIPS) 2025
Top reviewer

Conference on Computer Vision and Pattern Recognition (CVPR) 2025

Conference on Computer Vision and Pattern Recognition (CVPR) 2024

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) 2023

TEACHING EXPERIENCE

Teaching Assistant, Computer Graphics Fall 2019
University of Wisconsin-Madison Madison, WI
Instructor Florian Heimerl

Teaching Assistant, Discrete Mathematics Fall 2017
University of Utah Salt Lake City, UT
Instructor Bei Wang

Teaching Assistant, General Physics 2 Spring 2017
University of Utah Salt Lake City, UT
Instructor Ren Pankovich

Teaching Assistant, General Physics 1 Fall 2016
University of Utah Salt Lake City, UT
Instructor Orest Symko

Physics Tutor 2015-2016
University of Utah Salt Lake City, UT

VOLUNTEER EXPERIENCE

UW-Madison Student ACM Chapter 2019-2020
Events Committee Chair Madison, WI
- Coordinated volunteer efforts to organize department-wide student events
- Collaborated with department administrators to host a welcome event for prospective graduate students

UW-Madison Student ACM Chapter 2019
Events Committee Officer Madison, WI

Lowell Elementary School 2018
Computer Science Club Leader Madison, WI

Salt Lake Valley Science and Engineering Fair 2016, 2017
Project Judge Salt Lake City, UT

PATENTS

Systems, Methods, and Media for Generating Digital Images Using Low Bit Depth Image Sensor Data 2024
US 12,094,087 B2
Granted September 17, 2024
Matthew Dutson and Mohit Gupta

Generalized Event Cameras 2024
Pending, filed April 2024
Varun Sundar, Matthew Dutson, and Mohit Gupta

Vision Transformers Leveraging Temporal Redundancy 2023
Pending, filed September 2023
Matthew Dutson, Mohit Gupta, and Yin Li

Systems, Methods, and Media for Generating and Using Neural Networks Having Improved Efficiency for Analyzing Video 2022
Pending, filed May 2022
Matthew Dutson and Mohit Gupta

Systems, Methods, and Media for Generating and Using Spiking Neural Networks with Improved Efficiency 2021
Pending, filed April 2021
Matthew Dutson and Mohit Gupta