Matthew Dutson

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PhD Student in Computer Science at UW—Madison

# Research Interests

Broad Computer vision, machine learning, computer graphics

Specific Efficient video processing, sparse neural networks, single-photon sensing

# Education

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

2021 **Event Neural Networks**

arXiv.org (pending formal review)

**Matthew Dutson**, M. Gupta

2020 **Fibrillar Collagen Quantification with Curvelet Transform Based Computational Methods**

Frontiers in Bioengineering and Biotechnology

Y. Liu, A. Keikhosravi, C. Pehlke, J. Bredfeldt, **Matthew Dutson**, H. Liu, G. Mehta, R. Claus, A. Patel, M. Conklin, D. Inman, P. Provenzano, E. Sifakis, J. Patel, and K. Eliceiri

# Technical Skills

Languages **C++, Java, Python**, C, C#, MATLAB, Perl, Rust

Frameworks **NumPy, TensorFlow**, CUDA, MPI, OpenMP, PyTorch, scikit-learn, SciPy

Other **Git, LaTeX, UNIX**

# Research Experience

2020—Present **Research Assistant**, UW—Madison, Mohit Gupta

Designing algorithms to improve the efficiency of neural networks on video and other temporally repetitive data.

Exploring the theory and applications of sparse, asynchronous neural computation.

2018—2019 **Research Assistant**, UW—Madison, Jignesh Patel and Kevin Eliceiri

Contributed to the design and development of Hustle, a scalable replacement for SQLite written in Rust.

Built a Java application for generating synthetic images of biological fiber networks.

2016—2018 **Research Assistant**, University of Utah, Douglas Bergman

Wrote C++ simulations of cosmic ray propagation and detection to test novel detection techniques.

Operated the Telescope Array observatory in Delta, UT.

# Industry Experience

2019 **Map Exploration Software Intern**, Esri

Built an integrated machine learning application for automatically detecting building features in 3D urban scenes.

Designed and implemented algorithms for high-performance viewshed analysis.

2017 **Process Software Intern**, IM Flash Technologies

Improved the efficiency of wafer defect sourcing using an automated Perl pipeline.

Reduced errors in process time estimation by 97 percent via online statistical analysis of historical data.

2016 **Process Software Intern**, IM Flash Technologies

Created a C++ OpenCV computer vision application which successfully detected manufacturing equipment failures.

# Select Coursework

CS Computer vision, computer graphics, machine learning, high performance computing, computer architecture, data visualization, nonlinear optimization, algorithms

Mathematics Real analysis, statistics, partial differential equations, ordinary differential equations, linear algebra, calculus

Physics Nuclear and particle physics, quantum mechanics, special relativity, thermodynamics, classical physics

# Teaching Experience

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

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

2017 **Project Judge**, Salt Lake Valley Science and Engineering Fair

2016 **Project Judge**, Salt Lake Valley Science and Engineering Fair