

Brandon Knutson

PhD Candidate — ML & Applied Mathematics

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EDUCATION

Colorado School of Mines **Golden, CO**
PhD Computational & Applied Mathematics *2022–Dec. 2026 (expected)*
Advisors: [Dr. Daniel McKenzie](#) & [Dr. Samy Wu Fung](#)

University of Colorado Boulder **Boulder, CO**
BA Mathematics & Physics (with Distinction) *2014–2018*

EXPERIENCE

Oak Ridge National Laboratory **Oak Ridge, TN**
Machine Learning Intern *2023*
○ Trained XGBoost model on 898k buildings to predict heights from satellite imagery (0.70m MAE). Built data-processing pipeline for vector/raster geospatial data using PostGIS, QGIS, and Docker for scalable height estimation across urban, suburban, and rural environments.

Colorado School of Mines **Golden, CO**
Instructor & Teaching Assistant (Differential Equations) *2022–Present*
○ Instructor of Record (2024) with course design responsibilities, after leading recitations and office hours as TA (2022–2023).

US Navy **Norfolk, VA**
Operations Research Analyst (GS-11) *2019–2022*
○ Developed data-intensive cost models to evaluate acquisition proposals up to \$4.1B. Communicated mathematical analyses to senior decision-makers, securing hundreds of millions in savings. Secret clearance.

RESEARCH

- **Faster Implicit Network Training via Random Truncation** *Manuscript in preparation*
Theoretical and empirical analysis of a new class of training methods for implicit networks. Random truncation reduces computational cost while preserving convergence.
- **Logical Extrapolation in Neural Networks** *AAAI 2026 (Oral presentation)*
First-author paper benchmarking how implicit and recurrent neural networks generalize to harder, out-of-distribution mazes. Error analysis revealed models learning algorithmic shortcuts that failed on harder inputs. Slight training-data diversification dramatically improved accuracy. [On Logical Extrapolation for Mazes with Recurrent and Implicit Networks](#).
- **Open-Source Maze Generation Package** *Journal of Open Source Software*
Co-developed peer-reviewed Python package with 80+ GitHub stars, used by research community to generate datasets for studying neural network reasoning. [maze-dataset: Maze Generation with Algorithmic Variety and Representational Flexibility](#).

SKILLS

Programming & Tools: Python, SQL, PyTorch, Pandas, Scikit-learn, MATLAB, Mathematica, $\text{\LaTeX}$, Jupyter Notebooks, Git, Docker, AWS, Google Cloud, Linux, HPC, Multi-GPU Systems, AI Coding Assistants (Claude Code, GitHub Copilot)

Core Competencies: Deep Learning, Implicit & Recurrent Neural Networks, Bi-level Optimization, Stochastic Methods, Linear Algebra, Topological Data Analysis, Data Visualization

AWARDS & HONORS

2014–2018: GPA: 3.99, Dean's List, Phi Beta Kappa, Pi Mu Epsilon

2018: Marlene Massaro Pratto and David Pratto Scholarship (Mathematics)