Kirin P. Danek

✉ kirin@useunix.com ⚲ Kirin2D2.github.io 🔗 kirindanek

Education

Princeton University, Princeton, NJ — *Expected Graduation: May 2026*

GPA: 3.76 — **Departmental**: 3.93

- B.S.E. in Computer Science
- Minor in Statistics and Machine Learning
- Relevant Coursework: Machine Learning, Computer Vision, Statistics, Data Analysis, Data Structures, Algorithms, Linear Algebra, Multivariable Calculus, Discrete Mathematics

Danish Institute for Study Abroad, Copenhagen, DK — *Jan 2025 - May 2025*

- Relevant Coursework: Artificial Intelligence, Complex Networks, Analysis of Big Data **GPA**: 4.0

Skills

Programming Languages: Python (Pandas, PyTorch, TensorFlow), Java, C/C++, Golang, Rust, R, SQL

Tools: Git/GitHub, Unix/Linux (bash scripting), LaTeX, Stata, VScode, JetBrains, Emacs

Interests: AI Efficiency, Neural Network Compression, Explainable AI, Computer Vision, Computational Social Science, Missing Data, Optimization, Algorithms, Probability, Statistics

Research

Network Concept Pruning — *Dec 2024 - Present*

- Create and develop novel Network Concept Pruning framework for compression of Deep Neural Networks (DNNs).
- Modify eXplainable Artificial Intelligence (XAI) techniques to compress DNNs by identifying semantically distinct components of a model's decision strategy, and deleting those which are not relevant to the model's output.
- Results pending.
- Advised by Drs. Vikram Ramaswamy and Pedro Paredes.

ProxyFinder: Proxy Selection in Divergent Data Sets — *Jul 2024 - Present*

- Create and develop novel ProxyFinder algorithm: a ML method for social science researchers to identify proxies for entirely unobserved variables in survey data.
- Introduce "correlation reduction" to existing neural network-based imputation methods to empirically identify a proxy for a missing essential variable by ameliorating model shortcut learning.
- Test performance on naturally occurring political science data. Achieve average of 5.5% more variance explained by proxy variables selected with ProxyFinder versus current state-of-the-art methods.
- Presented at Midwest Political Science Association 2025 and Princeton Research Day 2025.
- Advised by Dr. Howard Lavine.

Research Funding Awards

- Princeton University School of Engineering and Applied Science Project X (2025) - *Network Concept Pruning*
- Princeton Undergraduate Fund for Academic Conferences (2025) - *ProxyFinder*
- Office of Undergraduate Research Student Initiated Internship Program (2024) - *ProxyFinder*

Employment

Undergraduate Researcher, Princeton University, Princeton, NJ — *Jun - Present*

- On-campus Computer Vision research in Princeton University Ramaswamy Lab under Dr. Vikram Ramaswamy.
- Project: Concept-based eXplainable AI for efficient deep learning.
- Design, build, and evaluate more efficient variants of existing Convolutional Neural Network image classifiers in Python (Pytorch, TorchVision).

Undergraduate Course Assistant, Princeton University, Princeton, NJ — *Sep - Dec 2024*

- UCA for professors Jia Deng and Adji Bousso Dieng for COS324: Introduction to Machine Learning.
- Grade students' written work and programming assignments (Python).
- Hold weekly office hours to assist students with concepts, written work, and programming in fields

of machine learning, statistics, and probability theory.

Data Science Research Intern, University of Minnesota, Minneapolis, MN *May - Aug 2024*
- Interned for political science professor Howard Lavine, adapting ML models for survey data analysis.
- Performed imputation analyses on missing data in survey dataset (Python, Stata); tested low-rank representations; built and fine-tuned neural network (PyTorch) to approximate Bayesian sampling of survey respondents.
- Used clustering analyses to identify and visualize distinct high-dimensional classes of survey respondents, creating empirical cutoffs to meaningfully determine who should be considered "status threatened."
- Project: *Status Threat: The Core of Reactionary Politics*, Drs. Howard Lavine and Christopher Parker.

Projects (see GitHub)

Blocky - A Helpful Blockchain AI Assistant. *Winter 2024-25*
- Assist professor Pramod Viswanath to create AI teaching assistant for Princeton's ECE470: Principles of Blockchains. Allow students to receive instant expert-level responses to coding and conceptual course queries.
- Fine-tune LLM (adjust hyperparameters, optimizers, templates adapted from Llama-3) to optimize performance to blockchain-specific tasks (Python, LLaMA-Factory).
- Demonstrate superior relevance and accuracy for specific blockchain theoretical and practical queries versus existing models (GPT-4o, LLaMA-3).

Bitcoin Client - From-scratch implementation of Bitcoin client. *Fall 2024*
- Worked in group of 3 undergradute students to build fully functional Bitcoin client (including transactions) for Princeton University's ECE470.
- Implemented in Rust.

LoRMA - Low Rank Matrix Approximation algorithm. *Spring 2024*
- Implement algorithmic LoRMA (Python, Pandas) via gradient descent to approximate complex datasets as two low-rank matrices.
- Build and test movie recommendation model, predicting user ratings from MovieLens dataset. Maintain accurate and meaningful low-rank (40) matrix representations of large dataset (600x10000).

multiClassCnn - Computer Vision image classifier. *Spring 2024*
- CNN-based image classifier (Python, PyTorch).
- Trained model achieved 98% test accuracy in classifying images of hand-drawn numbers from the MNIST dataset.

Fraud Detection - ML model for classifying credit card fraud. *Fall 2023*
- Develop a fraud detection model (Java) for Princeton University's COS226.
- Use clustering, decision stumps, and boosting (AdaBoost) to achieve $> 80\%$ test accuracy for detecting fraudulent transactions.
- Model physical space as graph, use graph algorithms for dimensionality reduction of real-world data.