# David Wu

david_wu@berkeley.edu • davidxwu.github.io

## Education

**University of California, Berkeley** — **Berkeley, CA**
*Ph.D. in EECS, coadvised by Prasad Raghavendra and Anant Sahai* — *May 2027 (expected)*
Supported by an NSF GRFP

**Massachusetts Institute of Technology** — **Cambridge, MA**
*B.S. in Mathematics and Computer Science, GPA: 5.0/5.0* — *May 2022*

## Research Interests

Foundations of machine learning, deep learning theory, optimization, statistics, algorithms and complexity for statistical inference, Markov chains.

## Publications

1. David X. Wu and Anant Sahai. Precise asymptotic generalization for multiclass classification with overparameterized linear models. In *Neural Information Processing Systems*, 2023 **(Spotlight)**
2. David X. Wu, Chulhee Yun, and Suvrit Sra. On the training instability of shuffling SGD with batch normalization. In *Proceedings of the 40th International Conference on Machine Learning*, volume 202 of *Proceedings of Machine Learning Research*, pages 37787–37845. PMLR, 23–29 Jul 2023
3. David X. Wu and Anant Sahai. Lower bounds for multiclass classification with overparameterized linear models. In *2023 IEEE International Symposium on Information Theory (ISIT)*, pages 334–339, 2023
4. David X. Wu, David Palmer, and Daryl R DeFord. Maximum a posteriori inference of random dot product graphs via conic programming. *SIAM Journal on Optimization*, 32(4):2527–2551, 2022

## Invited Talks

1. Lower Bounds for Multiclass Classification with Overparameterized Linear Models, *ISIT 2023* — **Jun 2023**
2. Random Dot Product Graph Inference, Washington State University — **Dec 2020**

## Skills

Experienced with Python (PyTorch, Tensorflow, numpy, scikit-learn, CVXPY, pandas), Java, LaTeX, git.

## Awards

- NSF GRFP fellowship — Jul 2022
- Robert M. Fano UROP Award — Jul 2021
- Regneron Science Talent Search, 5th place finalist ($90,000 award) — Mar 2018

## Work Experience

**Hudson River Trading** — **New York, NY**
*Algorithm Developer Intern* — *Summer 2021*
Developed low level high frequency signals in C++ and Python for trading cryptocurrency perpetuals. Implemented completely automated trading bot with two teammates in C++ for live trading. Modeled market impact of cryptocurrency liquidations with rigorous statistical techniques. Developed data structure to predict liquidation events based on open interest and price data.

**Akuna Capital** — **Chicago, IL**
*Quantitative Trading Intern* — *Summer 2020*

Identified and developed signals in C++ for a futures trading algorithm. Improved insight generation for feature engineering by creating an interactive market book visualization and an order history dashboard in Python. Designed and implemented a Python package for order-specific feature generation from market book data, taking into account tradeoffs related to data storage formats and scalability.

**Akuna Capital** **Boston, MA**

*Quantitative Developer Intern* *Summer 2019*

Created a user-friendly API in Python for researchers to calculate option theoretical values and greeks. Calculated trade quality metrics for PNL feedback and risk characteristics on trades. Profiled and optimized to remove bottlenecks by batching expensive API calls and using vectorization.

## Projects

**High Probability Generalization for Weakly Stable Algorithms**

*18.408 Course Project, with Eshaan Nichani* *Spring 2021*

Proved new moment and generalization results that tighten the best known high probability generalization bounds for almost everywhere stable learning algorithms. Proposed and analyzed practical use cases for the generalization bound.

**Contrastive and Generative Representation Learning**

*MIT Vision Group UROP, with Tongzhou Wang* *Spring 2021*

Implemented and trained unsupervised contrastive encoders and bidirectional GANs in PyTorch. Compared representation quality via metrics such as alignment, unformity, and linear classification accuracy. Managed experiments on GPU clusters through logging and TensorBoard.

**Trippy Video Generation**

*AIM Labs, with Alice Chen, Milo Cress, and Vincent Huang* *Fall 2020*

Prototyped a web app using Flask and Tensorflow with a group of four other MIT undergraduate students that enables arbitrary neural style transfer for user uploaded images and videos. Experimented with different network architectures and pruning levels to balance quality of style transfer with inference speed.