William Swartworth

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EDUCATION

University of California Los Angeles — Los Angeles, CA
Ph.D. Applied Mathematics — June 2023
Advisor: Deanna Needell

M.S. Applied Mathematics — January 2020

University of Texas at Austin — Austin, TX
B.S. Computer Science, Dean's Scholars, Special Honors — May 2017

B.S. Mathematics, Dean's Scholars, Special Honors — May 2017

WORK & TEACHING EXPERIENCE

Carenegie Mellon University — Pittsburgh, PA
Postdoctoral Researcher in Computer Science — August 2023 - present
Supervisor: David Woodruff

- Conduct research to develop improved algorithms for fundamental problems in machine learning and numerical linear algebra

University of California Los Angeles — Los Angeles, CA
Graduate Student Instructor, Algorithms (M 182) — Spring 2023

- Independently taught a undergraduate course covering data structures and algorithms.

Teaching Assistant — 2017-2023

- Taught a variety of college-level mathematics and programming courses. Courses taught include:
  - PIC 10A: Introduction to programming in C++ (x11)
  - PIC 10B: Intermediate Programming in C++
  - M 164: Optimization
  - M 182: Algorithms (x3)
  - M 131A: Real Analysis (x3)

Assistant Mentor – Research Experience for Undergraduates — Summer 2022

- Mentored a team of undergraduates applying a variety of machine learning and data analysis techniques to a dataset provided by a company sponsor. Project utilized a hierarchical version of non-negative matrix factorization (NMF) to extract interpretable features from text data.

Art of Problem Solving 2016 - 2022

- As a summer intern in 2016 and 2017, developed math curriculum materials for top-performing middle and high school students which were subsequently utilized by thousands of students.

- From 2017-2022, taught a wide variety of online courses to top students, ranging from Python Programming to Counting and Probability.

SELECTED PUBLICATIONS

- *Improving the Communication Complexity of Convex Optimization*
  with Mehrdad Ghadiri, Yin Tat Lee, Swati Padmanabhan, David Woodruff and Guanghao Yi
  STOC 2024
- *Fast Sampling Based Sketches for Tensors*
  with David Woodruff
  ICML 2024
- *Nearly Optimal Bounds for Cyclic Forgetting*
  with Halyun Jeong, Mark Kong, Deanna Needell and Rachel Ward
  NeurIPS 2023
- *SP2: A Second Order Stochastic Polyak Method*
  with Deanna Needell, Robert Gower, Shuang Li and Martin Takac
  ICLR 2023
- *Testing Positive Semi-Definiteness with Linear Measurments*
  with Deanna Needell and David Woodruff
  FOCS 2023
- *Quantile-Based Iterative Methods for Corrupted Systems of Linear Equations*
  with Jamie Haddock, Deanna Needell and Elizaveta Rebrova
  SIMAX 2022

HONORS & AWARDS

Pacific Journal of Mathematics Dissertation Award (UCLA) 2023

- *Advisor: Deanna Needell*

Smoky Mountains Data Challenge, Best Solution Runner Up
(Oak Ridge National Laboratory) 2021

- *Proposed and implemented a novel sampling technique that improves data acquisition time for piezoelectric microscopy*

Best Undergraduate Thesis in Computer Science (UT Austin) 2017

- *Thesis advisor: Eric Price*

SKILLS

Python, NumPy, SciPy, Jupyter, PyTorch, C++, Git, Machine learning, Numerical linear algebra