

Christian Lee Cooper

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Education

• University of Arizona

Bachelor of Arts in Mathematics
Masters of Science in Applied Mathematics
PhD in Applied Mathematics, CS Minor

Tucson, AZ

August 2018 - May 2020

August 2022 - December 2023

August 2022 - Present

Employment

• University of Arizona

• *Teaching Assistant: College of Information*

Tucson, AZ

August 2025 - Present

- Developed all course materials for and taught CYBV300 and CYBV376, 15 week adapted versions of BASV300 & BASV376 taught in-person on campus and with expanded content.
- Developing a FA26 course to meet NSA requirements on cryptography referencing *Introduction to Modern Cryptography* by Jonathan Katz and Yehuda Lindell.

Teaching Assistant : Center for Applied Science & Technology August 2024 - August 2025

- Developed all course materials for and taught BASV300 and BASV376, two seven week online courses with live lectures introducing students studying cybersecurity to core concepts in mathematics such as cryptography, the theory of computation, probability, and algorithmic complexity.

TIMESTEP Graduate Mentor January 2024 - August 2024

- Mentored four students throughout the SP24 semester and SU25 as they experienced professional internships with local businesses in Tucson & provided weekly check ins to facilitate communication with supervisors.
- Communicated with students' businesses supervisors to establish a set of goals for incoming interns including a presentation and report of their internship experience at the end of the program.

Teaching Assistant : Department of Applied Mathematics August 2022 - May 2024

- Instructor of record for MATH107 an introduction to statistics that serves as a terminal course for non-math oriented degrees in FA23 and SP24. A new set of course material was developed this semester to implement inquiry based learning strategies in the course.
- Instructor of record for the NEWSTART summer program in SUM23 and SUM24; a program designed to help incoming freshman by starting their incoming semester earlier & facilitate strong peer connection to improve retention.
- Developed inquiry based learning content centered on vector calculus for Project Adelante, a summer program designed to introduce instructors to the instructional method and to encourage community development among minority voices at the U of A with an anti-deficit approach.

• Alta Vista High School

• *Title I Mathematics Teacher*

Tucson, AZ

August 2020 - May 2022

- Taught and developed courses on the introduction to statistics, pre-algebra, and algebra I to mixed courses of 30+ students at different grade levels.

• University of Arizona Think Tank

• *Mathematics Content Tutor*

Tucson, AZ

January 2020 - May 2020

- Worked as a content area tutor for courses from precalculus to calculus II with an emphasis on educational frameworks such as Blooms' Taxonomy to structure assistance.

• University of Arizona Mathematics Department

• *Undergraduate Teaching Assistant*

Tucson, AZ

January 2019 - December 2019

- Worked as a teaching assistant for both MATH223 (Vector Calculus) and MATH313 (Linear Algebra) assisting students by hosting individual office hours, grading their assignments, and providing in class assistance.

Research Interests

I am interested in the study of *regularity theory* of partial differential equations, in particular in the context of kinetic equations with general transport coefficients dependent solely on the velocity variable which exhibit some form of nondegeneracy condition. Such nondegeneracy conditions permit solutions to these PDE to exhibit a gain of regularity in the spatial and temporal variables even if the regularizing operation occurs only in their velocity. I am also particularly interested in the role of integro-differential operators and how sufficient understanding of their skew-symmetric components can permit a gain of regularity.

I am also interested in the study of *numerical analysis of PDE*. In particular, how we develop methods for simulating partial differential equations that are computationally efficient, can be parallelized easily, and show desired properties such as numerical stability in spite of their comparatively rough coefficients / initial datum. I also most interested in the computation of the values of *nonlocal* operators such as those that occur in my research on kinetic equations.

Teaching Statement

As an instructor I believe the most influential thing I can do for students is to motivate them to care about the topics of study in their courses by introducing them to the problems that content is meant to solve. I believe that students, and people in general, have a natural drive to be curious about the world around them and that the proper structure and guidance needed to utilize that curiosity is by hanging interesting concepts in nearby places for them to take interest in. As such, I am a fan of inquiry based learning methods & forming strong rapport with student populations. I opt to take an anti-deficit approach in my work with students, emphasizing their individual strengths over their weaknesses, and ideally encourage students to collaborate to achieve their goals. I also take a radical 'at-fault' stance to student success, as I believe that as an instructor the best way to improve is to assume professional responsibility for the shortcomings of any aspect of their classroom, even if a logical lens might shift blame on outside circumstances.

Skills

Languages: C,C++ (pthreads, GLFW, GLEW, MPI, GMP), Rust, Python (numpy, pandas), L^AT_EX(TiKz, pgfplots, tcolorbox, BibTeX, Beamer), Verilog, GLSL, CUDA, HTML

Software/OS: Linux, Windows, Docker, Git, MariaDB, Microsoft Excel / Google Sheets, Microsoft Word / Google Docs, Autodesk Fusion, GIMP

Numerical Methods: Approximation of ODE, PDE with finite differences, finite element methods. Markov chain Monte Carlo methods (e.g. Metropolis-Hastings). Optimization with gradient descent, BFGS, and barrier methods. Numerical integration with quadratures, runge-kutta methods (in context of ode). Function approximation by polynomials (Lagrange, Chebyshev). Numerical harmonic analysis (implementation of DFT, FFT).

Extracurriculars / Outreach

- **Association for Women in Mathematics (AWM)**
Student Chapter Secretary

University of Arizona
August 2024 - Present

- Develop meeting summaries and action items for executive members of the student chapter for upcoming events
- Communicate with university services to ensure outreach activities meet university policy and legal requirements for interaction with minors
- Design and plan outreach events for AWM such as the FA25 Sonia Kovalevsky day where local Tucson highschool students have an opportunity to hear from a guest speaker, interact with mathematics activities, and learn math history

Awards

• **Grogan Award**

University of Arizona
AY2024-2025

- The Grogan Award is a need-based scholarship awarded to graduate & undergraduate students who donors believe have the capability and desire to pursue their education but may be facing otherwise debilitating life-events putting a strain on their finances