Fangyuan Lin

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EDUCATION

University of California, Berkeley Jun. 2020 – Aug. 2024
B.A. in Mathematics (Highest Honors) and B.A. in Computer Science (GPA: 3.953/4) Berkeley, CA

- ***Dorothea Klumpke Roberts Prize in Mathematics***: "awarded to seniors who have demonstrated truly exceptional scholarship in mathematics, with a cash prize." [link]
- ***Outstanding Undergraduate Student Instructor Award*** for exceptional teaching work. [link]

RESEARCH INTERESTS

- Probability Theory and Stochastic Processes, Information and Coding Theory

PUBLICATIONS & PREPRINTS

1. **Introducing Carrying Capacity Constraints to Mean-Field Interacting Multi-Type Birth-Death Processes**
   Steven Evans, Fangyuan Lin (in preparation).

2. **Revisiting the Unicity Distance through a Channel Transmission Perspective**
   Fangyuan Lin (2024). *Preprint. Under review in the PUMP Journal of Undergraduate Research.* (arXiv:2410.14816)

3. **From Local Interactions to Global Patterns: An Analysis of Silk Density in Spider Webs**
   Fangyuan Lin, Seewoo Lee, Jason Jiang, Grant Yang, Norman Sheu (in preparation).

4. **Applications of the Theory of Aggregated Markov Processes in Stochastic Learning Theory**
   Fangyuan Lin (2023). *arXiv Preprint.* (arXiv:2311.01476)

RESEARCH EXPERIENCE

Research Assistant (Optional Practical Training) Aug. 2024 – Present
Research Assistant to Professor Steven N. Evans (UC Berkeley) Berkeley, CA

- Developed programs to identify non-isomorphic simple edge-weighted trees with the same joint distribution of the random length vector, extending the work *Recovering a Tree from the Lengths of Subtrees Spanned by a Randomly Chosen Sequence of Leaves.*
- Contributing to ongoing theoretical research in stochastic processes, focusing on extending the assumptions of mean-field interacting multi-type birth-death processes.

Revisiting the Unicity Distance through a Channel Transmission Perspective May. 2024 – Oct. 2024
Independent project supervised by Professor Per-Olof Persson (UC Berkeley) Berkeley, CA

- Designed and implemented algorithms to break simple substitution ciphers using frequency analysis, Markov chain Monte Carlo, and machine learning, under the supervision of Professor Persson.[code]
- Studied the expected lower bound on message length required for feasible attacks from an information-theoretic approach and presented a novel proof of the unicity distance formula using reliable communication theory. [paper]

GeoDes (Geometry in Design) Lab, UC Berkeley May. 2024 – Present
Undergraduate Researcher supervised by Dr. Norman Sheu (UC Berkeley) Berkeley, CA

- Collaborating on interdisciplinary research exploring geometric properties of spider web structures, including surface reconstruction, cusp points, and silk density. Developed an original approach to formulating and computing the entropy of spider webs based on silk density distribution.
- Co-authoring a paper currently in preparation, presenting findings on silk density patterns and their role in inferring structural properties of spider webs.

When is a Function of a Markov Process Markov? May. 2023 – Aug. 2023
Summer Undergraduate Research Fellowship (UC Berkeley) Berkeley, CA

- Supervised by Professor Steven N. Evans on literature review of aggregated Markov processes and stochastic learning theory and received a stipend of $5000 as part of the Summer Undergraduate Research Fellowship. [official site]
- Presented novel applications of classical results on aggregated Markov processes to substantiate the Markovian properties of models within stochastic learning theory. [paper]

DIRECTED READING

Graduate-Level Differential Geometry May. 2024 – Present
Supervisor: Dr. Norman Sheu (UC Berkeley) Berkeley, CA

- Studied *Introduction to Manifolds* by Loring W. Tu and participated in weekly half-hour discussions with Dr. Sheu.
- Developed detailed notes. The source code is available here: [LaTeX Source Code]

Graduate-Level Information Theory May. 2024 – Aug. 2024
Supervisor: Professor Steven N. Evans (UC Berkeley) Berkeley, CA

- Studied the classical text *Elements of Information Theory* by Joy A. Thomas and Thomas M. Cover and participated in weekly one-hour discussions with Professor Evans.
- Produced comprehensive notes and problem set solutions. [LaTeX Source Code]

TEACHING EXPERIENCE

MATH 54: Linear Algebra & Differential Equations Jan. 2024 – May. 2024
Teaching Assistant for Professor Zvezdelina Stankova (UC Berkeley) Berkeley, CA

- Taught 6 discussion sections per week and held 2 office hours, managing grading, proctoring, and administrative duties for a class of 56 students.
- Received exceptional feedback in official course evaluations and recognized as an **Outstanding Undergraduate Student Instructor**. [Teaching Evaluation]

MATH 1B: Calculus Aug. 2023 – Dec. 2023
Teaching Assistant for Dr. Norman Sheu (UC Berkeley) Berkeley, CA

- Taught 6 discussion sections per week and held 2 office hours, managing grading, proctoring, and worksheet creation for a class of 48 students.
- Received exceptional feedback in official course evaluations and recognized as an **Outstanding Undergraduate Student Instructor**. [Teaching Evaluation]

OTHER EMPLOYMENT HISTORY

MATH 104: Introduction to Analysis Jun. 2023 – Aug. 2023
Reader for Dr. Norman Sheu (UC Berkeley) Berkeley, CA

- Composed detailed grading rubrics and prepared comprehensive exam solutions.
- Graded homework assignments and exams with a focus on consistency and fairness.

MATH 160: History of Mathematics Jan. 2023 – May. 2023
Reader for Professor Ole H. Hald (UC Berkeley) Berkeley, CA

- Assisted with grading assignments and supported administrative tasks for the course.

Mathematics & Statistics Tutor Jun. 2021 – Aug. 2022
Student Learning Center, UC Berkeley Berkeley, CA

- Provided tutoring and academic advising for courses including MATH 1A&B Calculus, MATH 54 Linear Algebra & Differential Equations, and MATH 55 Discrete Mathematics.
- Conducted 7 hours of tutoring per week, helping students grasp complex mathematical concepts, solve problems, and prepare for exams.

ACADEMIC AWARDS AND SCHOLARSHIPS

Dorothea Klumpke Roberts Prize in Mathematics [official site]; *Department of Mathematics, UC Berkeley*
Outstanding Undergraduate Student Instructor Award [official site]; *The Graduate Division, UC Berkeley*
Highest Honors in Mathematics, 2023-24; *Department of Mathematics, UC Berkeley*
Summer Undergraduate Research Fellowship ($5,000 USD), 2023 [official site]; *UC Berkeley*
Phi Beta Kappa Honor Society
High Distinction in General Scholarship 2023-24; *College of Letters and Science, UC Berkeley*
High Distinction in General Scholarship 2023-24; *College of Computing, Data Sci, & Society, UC Berkeley*

TECHNICAL COURSEWORK (Undergraduate Studies at UC Berkeley, 2020–2024)

Mathematics:
MATH 53 *Multivariable Calculus* (**A**), MATH 54 *Linear Algebra & ODE* (**A+**), MATH 55 *Discrete Math* (**A**), MATH 74 *Intro to Upper-Div Math* (**A+**)
MATH 104 *Real Analysis* (**A**), MATH 106 *Measure-Theoretic Probability* (**A+**), MATH 110 *Abstract Linear Algebra* (**A+**), MATH 113 *Abstract Algebra* (**A**), MATH 115 *Number Theory* (**A**-), MATH 124 *Programming in Math* (**A+**), MATH 128A *Numerical Analysis* (**A+**), MATH 135 *Set Theory* (**A**), MATH 141 *Differential Topology* (**A**-), MATH 142 *Algebraic Topology* (**A**), MATH 160 *Math History* (**A**), MATH 185 *Complex Analysis* (**A+**), MATH 196 *Honors Thesis* (**A**), MATH 199 *Independent Study*
MATH 202A *Graduate Analysis* (**A**-), MATH 205 *Graduate Complex Analysis* (**A**)
Statistics:
STAT 150 *Stochastic Processes* (**A**)
Computer Science:
CS 61A *Program Structures* (**A**), CS 61B *Data Structures* (**A**), CS 161 *Computer Security* (**A**), CS 171 *Cryptography* (**A**), CS 188 *Artificial Intelligence* (**A+**)
EECS 126 *Probability & Random Processes* (**A**), EECS 127 *Convex Optimization* (**A**)
Physics:
PHYSICS 7A *Mechanics* (**A+**), PHYSICS 7B *Heat & Electricity* (**A**)

SKILLS & MISC.

- *Programming* C, Golang, Java, Matlab, Julia, Mathematica, Python, Scheme, SQL
- *Tools* LaTeX, Anaconda, Git, Abode Illustrator.
- *Hobbies* Violin, piano, running, bodybuilding.