SAWYER JACK ROBERTSON

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ABOUT ME

I am currently a mathematics Ph.D. student at UC San Diego. My research interests are generally in applied and computational graph theory, with a focus on spectral graph theory, graph-based data science, and discrete geometric analysis. Outside of research, I am passionate about teaching and mentoring students, and have served in a variety of roles, including as the lead teaching assistant for the Department of Mathematics at UC San Diego, as an associate instructor at the Halıcıoğlu Data Science Institute, and as the mentor for two undergraduate research projects. I also enjoy organizing seminars and workshops to foster collaboration within the mathematical community.

EDUCATION

Ph.D. in Mathematics University of California, San Diego — 2020 - 2026 *(expected)*
Advisors: Fan Chung and Alex Cloninger

M.A. in Applied Mathematics University of California, San Diego — 2020 - 2022

B.S. in Mathematics, *summa cum laude* University of Oklahoma — 2016 - 2020
Advisor: Javier Alejandro Chávez-Domínguez
Honors thesis: *Analysis on Magnetic Graphs*

ACADEMIC ROLES

Graduate Student Researcher — Various quarters, Jun 2021 - Present
Math Department, UC San Diego
Halıcıoğlu Data Science Institute, UC San Diego

Teaching Assistant — Various quarters, Oct 2020 - Present
Math Department, UC San Diego
Halıcıoğlu Data Science Institute, UC San Diego

- Selected for the Lead TA Team for the Department of Mathematics — Sep 2022
- Courses taught: theoretical data science, mathematical statistics, probability theory, graph theory and algorithms, calculus

Ph.D. Intern — Jun 2023 - Dec 2024
Pacific Northwest National Laboratory

Undergraduate Academic Assistant — Aug 2016 - May 2020
Math Department, University of Oklahoma

ACCOMPLISHMENTS

- Carol and George Lattimer Award for Graduate Excellence — Mar 2025
- Selected for the Summer Graduate Teaching Scholars Program — Dec 2024
- Financial Director, Mathematics Graduate Student Council — Jul 2024 - Jul 2025

- Chair, Mathematics Graduate Student Council — Jul 2023 - Jun 2024
- Founded the "Data, Optimization, Graphs, Signal Processing, Optimal Transport" seminar — Oct 2023
- Halıcıoğlu Data Science Institute Graduate Prize Fellowship — Oct 2020 - Present
- Samuel Watson Reaves Award for Outstanding Senior Math Major — May 2020
- Undergraduate Research Award, University of Oklahoma Libraries — May 2019

SELECTED RESEARCH

1. On Biharmonic Distance and Betweenness Centrality. — Nov 2025
   WITH M. BLACK, A. CLONINGER, C. HOLTZ, G. MISHNE, Y. WANG — In preparation.
2. Distance Exceptional Graphs and the Curvature Index. — Nov 2025
   WITH F. SOUTHERLAND, E. SURYA — In review. arxiv.org/abs/2511.03719
3. Stochastically Evolving Graphs via Edit Semigroups. — Sep 2025
   WITH F. CHUNG — To appear. Proc. Natl. Acad. Sci. USA.
4. Discrete Curvatures and Convex Polytopes. — Sep 2025
   WITH J. A. DE LOERA, J. EDDY, J. A. SAMPER — In review. arxiv.org/abs/2510.11894.
5. Robust Tangent Space Estimation via Laplacian Eigenvector Gradient Orthogonalization. — Sep 2025
   WITH D. KOHLI, G. MISHNE, A. CLONINGER — In review. arxiv.org/abs/2510.02308
6. Robust Graph-Based Semi-Supervised Learning via p-Conductances. — Jan 2025
   WITH C. HOLTZ, G. MISHNE, A. CLONINGER — In review. arxiv.org/abs/2502.08873
7. Matrix Concentration for Random Signed Graphs and Community Recovery in the Signed Stochastic Block Model. — Dec 2024
   In review. arxiv.org/abs/2412.20620
8. A Comparative Study of Curvature on Trees. — Oct 2025
   To appear. Bull. Inst. Combin. Appl.
9. All You Need is Resistance: On the Equivalence of Effective Resistance and Certain Optimal Transport Problems on Graphs. — Apr 2024
   WITH Z. WAN, A. CLONINGER — In review. arxiv.org/abs/2404.15261
10. On a Generalization of Wasserstein Distance and the Beckmann Problem to Connection Graphs. — Sep 2025
    WITH D. KOHLI, G. MISHNE, A. CLONINGER — SIAM J. Sci. Comput. 47 (5)
11. Random Walks, Conductance, and Resistance for the Connection Graph Laplacian. — Aug 2024

with A. Cloninger, G. Mishne, A. Oslandsbotn, Z. Wan, Y. Wang

SIAM J. Matrix Anal. Appl. 45 (3)

STUDENTS

Paola Campos — Undergraduate mentee, Summer 2024 - Summer 2025

Ph.D. Student, Applied mathematics, UC Davis

Huiwen Lu — Undergraduate mentee, Summer 2022

Ph.D. student, Applied mathematics, Caltech

SELECTED TALKS AND WORKSHOPS

NeurIPS New Perspectives in Advancing Graph Machine Learning	San Diego, CA Dec 2025
Learning on Graphs Conference	Phoenix, AZ Dec 2025
SIAM Pacific Northwest Biennial Meeting, Invited talk	Seattle, WA Oct 2025
Local Limits of Random Graphs Summer School	Orsay, France Jun 2025
Fourth annual Math-a-thon at UC San Diego (co-organizer)	San Diego, CA Feb 2025
UC Davis Math of Data and Decisions Seminar	Davis, CA Jun 2024
Networks Journal Club, UCLA	Los Angeles, CA Jun 2024
SIAM Discrete Mathematics, Beyond Graphs	Spokane, WA Jul 2024
Joint Math Meetings AMS Special Session on Graph Curvature	San Francisco, CA Jan 2024
Optimal Transport Summer School	Seattle, WA Jun 2022
Joint Math Meetings AMS Special Session on Combinatorics and Graph Theory III	Denver, CO Jan 2020
Joint Math Meetings AMS Session on Optics and Electromagnetism	Baltimore, MD Jan 2019
Presented poster Undergraduate Math Symposium at UIC	Chicago, IL Nov 2018
MAA MathFest	Denver, CO Aug 2018
CeSMUR Conference	Lincoln, NE Apr 2018