Kevin Schmidt

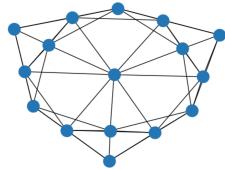📱 *+1 (650) 303 1165*
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⌨ *kevinschmidt24799*

I am a pure math graduate student interested in spectral graph theory, linear algebra, combinatorics and representation theory.

▬▬▬ Education

2024–2026   **M.A. in Mathematics**, *San Jose State University*, *GPA 3.9*
Thesis title: Upper Bounds on Third Eigenvalues of Graphs

2023–2024   **B.A. in Mathematics**, *San Jose State University*, *GPA 3.9*

2021–2023   **A.A. in Mathematics**, *Foothill Community College*, *GPA 3.6*

▬▬▬ Awards

2025   Franklin B. Fuller Scholarship

2025   Hearthstone Summer Championship Qualifier

2024–2025   SJSU President's Scholar

2023–2024   SJSU President's Scholar

2024   SJSU Magna Cum Laude, Latin Honor & Medallion

2023   SJSU Richard C. Dickmann Scholarship for Academic Excellence

▬▬▬ Research Experience

8/2025–present   **Master's Thesis with Professor Wasin So in spectral graph theory**, *SJSU*
- Working on bounding the third largest eigenvalue of graphs and characterizing extremal examples. A result of Powers claims that $\lambda_3(G) < |G|/3$ but this had an error and remains open.
- Found families of graphs which cannot serve as counterexamples.
- Proved eigenvalue bounds and structural properties that a counterexample graph must have, including restrictions on their automorphism groups.

1/2024–5/2024   **Research with Professor Bering in geometric group theory**, *SJSU*
- Successfully proved no finite cover of the fundamental group of the figure 8 knot complement $\pi_1(4_1)$ has a Dehn complex that is special. This was known only for covers of index greater than 10.
- Computationally evaluated cube complexes for osculation.
- Wrote an exhaustive search in Python using the low index module.

▬▬▬ Work Experience

8/2024–12/2024   **Graduate Teaching Associate for Discrete Mathematics**, *SJSU*
- I worked as a graduate teaching associate, designing and running workshops (support classes) for undergraduate discrete math students.
- This included compiling suitable practice problems that reinforced core concepts while developing students' proof and exposition skills.
- I received a 5/5 rating from my students; feedback included "He was very helpful and went deep into the concept he was explaining", "he would explain it – and make sure I understood", and "This instructor was frequently accessible on Discord".

8/2020–8/2024   **Private Mathematics Tutor**
- Independently, I worked as a private tutor for middle and high school students, teaching geometry, trigonometry, calculus, and competition math. I had both advanced and remedial students, so I had to diagnose students' specific capabilities and gaps to adjust my approach accordingly.

Other skills

Fluent in both English and Mandarin

Skilled with Python, C/C++, LaTeX, Git

Research-related software projects

Fast Graph Eigenvalue Search

○ This was a highly-optimized C++ search of all 165 billion 12-vertex graphs unique up to isomorphism. It took 33 hours to run on a Macbook Pro M2.

○ `https://github.com/kevinschmidt24799/12-vertices-large-third-eig/blob/main/RESULTS.md`

Blowup Search

○ This Python program searched graphs with a threefold or fivefold symmetry. More precisely, Graphs G such that $\text{Aut}(G)$ contained an element of order 3 or 5 respectively. For such graphs, it evaluated if the closed blowup of the graph $G^{[t]}$ could have large third eigenvalue.

○ `https://github.com/kevinschmidt24799/blowup-sym`

Covers of Figure-8 Knot Complement

○ With Professor Edgar Bering, I wrote a Python program which searched small covers of the fundamental group of the figure-8 knot complement. For covers of index at most 10, we checked the Dehn cell complex for different types of osculation and characterized whether the cover was special.

○ `https://github.com/ebering/figure-8-covers`

Math coursework

Spring 2026	Higher Algebra II (Math 221B), *Edgar Bering*	Planned
Spring 2026	Advanced Complex Variables (Math 238), *Jordan Schettler*	Planned
Spring 2026	Research Seminar (Math 281), *Jordan Schettler*	Planned
Spring 2026	Master's Thesis (Math 299), *Wasin So*	Planned
Fall 2025	Higher Algebra I (Math 221A), *Edgar Bering*	In progress
Fall 2025	Topology (Math 275A), *Yan Zhang*	In progress
Fall 2025	Master's Thesis (Math 299), *Wasin So*	In progress
Spring 2025	Functional Analysis (Math 231B), *Slobodan Simic*	A+
Spring 2025	Theory of Numbers (Math 226), *Jordan Schettler*	A+
Spring 2025	Guided Graduate Individual Studies (Math 280), *Wasin So*	P
Spring 2025	Advanced Topics in Mathematics (Math 285M), *Wasin So*	A
Fall 2024	Graph Theory (Math 279A), *Yan Zhang*	A+
Fall 2024	Real Analysis (Math 231A), *Slobodan Simic*	A
Fall 2024	Advanced Matrix Theory (Math 229), *Wasin So*	A-
Spring 2024	Theory of Numbers (Math 126), *Jordan Schettler*	A+
Spring 2024	Abstract Algebra II (Math 128B), *Edgar Bering*	A
Spring 2024	Introduction to Analysis (Math 131A), *Timothy Hsu*	A
Spring 2024	Linear Algebra II (Math 129B), *Wasin So*	A-
Spring 2024	Undergraduate Research (Math 180R), *Edgar Bering*	P
Fall 2023	Introduction to Graph Theory (Math 179), *Wasin So*	A
Fall 2023	Applied Probability and Statistics (Math 161A), *Cristina Tortora*	A
Fall 2023	Introduction to Combinatorics (Math 142), *Wasin So*	A
Fall 2023	Abstract Algebra I (Math 128A), *Edgar Bering*	A
Spring 2023	Intro to Abstract Math and Proofs (Math 108), *Kyle Hambrook*	A-
Fall 2022	Complex Variables (Math 138), *Giang Le*	A

Math coursework (with textbook and descriptions)

Spring 2026   **Higher Algebra II (Math 221B)**, *Edgar Bering*   Planned
- Text: Algebra: Chapter 0, Paolo Aluffi Description: Hilbert spaces, Banach algebras, operator theory, spectral theory of operators.

Spring 2026   **Advanced Complex Variables (Math 238)**, *Jordan Schettler*   Planned
- Description: A course specializing in one or more of the advanced branches of the theory of complex functions.

Spring 2026   **Research Seminar (Math 281)**, *Jordan Schettler*   Planned
- Description: Weekly participation in the department research seminar. Topics will focus on recent developments in mathematics and emphasis will be placed on written and oral presentations.

Spring 2026   **Master's Thesis (Math 299)**, *Wasin So*   Planned
- Continuation of Master's thesis.

Fall 2025   **Higher Algebra I (Math 221A)**, *Edgar Bering*   In progress
- Text: Algebra: Chapter 0, Paolo Aluffi
- Description: Category theoretical approach to groups, rings, integral domains, modules, fields, vector spaces. Products, coproducts, kernels, cokernels, quotients as universal properties, exact sequences, split sequences, the snake lemma.

Fall 2025   **Topology (Math 275A)**, *Yan Zhang*   In progress
- Text: Topology without Tears, Sidney A. Morris
- Description: Topological spaces and associated concepts (e.g., subspaces, product spaces, quotient spaces); continuous functions; compactness, connectedness (including path connectedness) and their local versions; countability and separation axioms; compactifications and Tychonoff's Theorem; paracompactness and metrization theorems.

Fall 2025   **Master's Thesis (Math 299)**, *Wasin So*   In progress
- Description: Spectral graph theory, working on bounding the third largest eigenvalue of graphs and characterizing extremal examples. A result of Powers claims that this eigenvalue is at most a third of the graph order, but this had an error. Found new families of graphs which cannot serve as counterexamples, and eigenvalue bounds that a theoretical counterexample graph must have.

Spring 2025   **Functional Analysis (Math 231B)**, *Slobodan Simic*   A+
- Text: Introduction To Hilbert Spaces with Applications, Lokenath Debnath
- Description: Function spaces and their duals, operators on function spaces, Hilbert spaces, Banach algebras, operator theory, spectral theory of operators

Spring 2025   **Theory of Numbers (Math 226)**, *Jordan Schettler*   A+
- Text: Introduction to Analytic Number Theory, Tom M. Apostol
- Description: Prime number theorem, Mobius inversion, Riemann zeta function, Dirichlet series, L function, Circle method, projective plane, partitions.

Spring 2025   **Guided Graduate Individual Studies (Math 280)**, *Wasin So*   P
- Text: The Probabilistic Method, Spencer & Alon. Additive Combinatorics, Tao & Vu
- Description: Individual study in a specific field. The probabilistic method, extremal graph theory, Ramsey theory, additive combinatorics, discrete isoperimetric problems.

Spring 2025   **Advanced Topics in Mathematics (Math 285M)**, *Wasin So*   A
- Topic: Nonnegative Matrix Theory and Applications
- Text: Matrix Analysis, Horn and Johnson
- Description: Perron Frobenius theory of positive, primitive, irreducible, and non-negative matrices, M matrices, eigenvalue bounds, spectral graph theory, spectral moments.

Fall 2024   **Graph Theory (Math 279A)** , *Yan Zhang*   A+
- Text: Introduction to Graph Theory, Douglas B. West
- Description: Graphs, digraphs, trees, graph embeddings, matchings, spanning trees, topological sorts, factorizations, colorings, Ramsey theory, spectral graph theory, adjacency and Laplacian matrices

Fall 2024   **Real Analysis (Math 231A)**, *Slobodan Simic*   A

- ○ Text: Real Analysis: Measure Theory, Integration, and Hilbert Spaces (Princeton Lectures in Analysis), Stein and Shakarchi
- ○ Description: Sigma algebras, construction of measures, Lebesgue measure, measurable functions, differentiation, integration theory, convergence theorems, Riesz representation theorem, probability theory.

Fall 2024   **Advanced Matrix Theory (Math 229)**, *Wasin So*   A-

- ○ Text: Matrix Analysis, Horn and Johnson
- ○ Description: Eigenvalues, unitary equivalence and Schur's theorem. Normal, Hermitian and symmetric real matrices. Positive definite matrices, polar and singular value factorizations, and selected topics at the discretion of the instructor.

Spring 2024   **Theory of Numbers (Math 126)**, *Jordan Schettler*   A+

- ○ Text: Elementary Number Theory, David M. Burton
- ○ Description: Divisibility, prime numbers, congruences of first and higher degrees, theorems of Fermat, Euler and Wilson. Quadratic residues.

Spring 2024   **Abstract Algebra II (Math 128B)**, *Edgar Bering*   A

- ○ Text: Discovering Abstract Algebra, John K. Osoinach Jr.
- ○ Description: Emphasis on rings, integral domains, fields, field extensions, Galois theory.

Spring 2024   **Introduction to Analysis (Math 131A)**, *Timothy Hsu*   A

- ○ Text: Elementary Analysis: The Theory of Calculus, Kenneth A. Ross
- ○ Description: Properties of real numbers including completeness and compactness. Continuous functions, uniform continuity, the derivative.

Spring 2024   **Linear Algebra II (Math 129B)**, *Wasin So*   A-

- ○ Text: Linear Algebra, Friedberg, Insel, and Spence
- ○ Description: Continuation of MATH 39. Abstract vector spaces and linear transformations, diagonalization, Cayley-Hamilton theorem, minimal polynomials, Jordan canonical form. Selected topics from inner product and adjoint, duality, rational canonical form and applications.

Spring 2024   **Undergraduate Research (Math 180R)**, *Edgar Bering*   P

- ○ Text: The Symmetries of Things, John H. Conway. Office Hours with a Geometric Group Theorist, Clay and Margalit
- ○ Description: Met weekly with the professor. Explored group theory, fundamental groups, knots, Dehn complexes, flag complexes, special covers. Wrote a Python program to successfully prove a novel result via computation.

Fall 2023   **Introduction to Graph Theory (Math 179)**, *Wasin So*   A

- ○ Text: Introduction to Graph Theory, Robin Wilson
- ○ Description: Hamiltonian and Eulerian properties, matching, trees, connectivity, coloring problems and planarity. Emphasis on algorithms and applications, including optimal network flows.

Fall 2023   **Applied Probability and Statistics (Math 161A)**, *Cristina Tortora*   A

- ○ Text: Professor's slides and notes
- ○ Description: Descriptive and inferential statistics. Collection and analysis of data, discrete and continuous probability models, random variables, Central Limit Theorem, confidence intervals, hypothesis testing.

Fall 2023   **Introduction to Combinatorics (Math 142)**, *Wasin So*   A

- ○ Text: Applied Combinatorics, Alan Tucker
- ○ Description: Sets, permutations, combinations, probability, mathematical induction, counting techniques, generating functions, partitions, recurrence relations, inclusion-exclusion. Polya's theorem and applications to computer science, mathematics, engineering and physical sciences.

Fall 2023   **Abstract Algebra I (Math 128A)**, *Edgar Bering*   A

- ○ Text: Discovering Abstract Algebra, John K. Osoinach Jr.
- ○ Description: Group theory: permutation groups, abelian groups, morphism theorems, finite groups. Introduction to rings and fields.

Spring 2023 **Intro to Abstract Math and Proofs (Math 108)**, *Kyle Hambrook*   A-
- o Text: Assorted materials assembled by professor
- o Description: Develop students' mathematical maturity and skill with proofs.
- o Material includes logic; set theory including functions, relations, and cardinality; the real number system, including the completeness axiom; and selected topics.

Fall 2022 **Complex Variables (Math 138)**, *Giang Le*   A
- o Text: Fundamentals of Complex Analysis, Saff and Snider
- o Description: Analytic functions, complex integration, residues and power series.