

Samuel Wilson

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Ph.D. research mathematician and data scientist with a focus on modular categories, representation theory, and other areas of abstract algebra and category theory. Extensive experience in teaching, analysis, and software development, especially for applications in mathematics.

Skills

Areas of Mathematics

Modular categories and associated topics such as topological quantum field theories and quantum information, category theory, abstract algebra, representation and character theory, graph theory, matroid theory, knot theory, algebraic topology, algebraic and analytic number theory, real and complex analysis.

Programming Languages and Tools

C++, Lua, Rust, Python, Pandas, Scikit-learn, GAP, SageMath, machine learning, data analysis, quantum computing with Q#, \LaTeX and associated packages such as TikZ and Beamer, Git, GitHub, Slack, Linux, collaborative software development, command-line interfaces, high-performance computing interfaces, Zoom and other teleconferencing programs, vector and raster graphics programs such as Inkscape and Photoshop.

Languages

Japanese (intermediate) and German (intermediate to advanced).

Publications and Presentations

Publications

(2023). Symmetric representations of $SL_2(\mathbb{Z})$. *Proceedings of the American Mathematical Society*, 151(4), 1415–1431.

(2019). Power Domination on Permutation Graphs. *Discrete Applied Mathematics*, 262, 169–178.

Presentations

(April 2022). Representations of $SL_2(\mathbb{Z})$ and applications for modular tensor categories. *Joint Mathematics Meeting AMS Special Session on Hopf Algebras and Tensor Categories*.

(March 2021). Symmetrization of representations of $SL_2(\mathbb{Z})$. *LSU Algebra and Number Theory Seminar*.

(March 2021). Representations of $SL_2(\mathbb{Z})$ and Applications to Modular Categories. *AMS Spring Eastern Sectional Meeting*.

Other Work

(2022). SL2Reps: Constructing symmetric representations of $SL(2, \mathbb{Z})$, Version 1.1. GAP Package.

<https://snw-0.github.io/sl2-reps>.

Education

May 2023 **Louisiana State University**, Baton Rouge, LA

Doctorate of Philosophy in Mathematics

Advisor: Dr. Siu-Hung “Richard” Ng

Dissertation: $SL_2(\mathbb{Z})$ -Representations and 2-Semiregular Modular Categories

May 2013 **Texas State University**, San Marcos, TX

Master of Science in Mathematics

Advisor: Dr. Daniela Ferrero

Thesis: Power Domination on Permutation Graphs

December 2010 **University of Oklahoma**, Norman, OK

Bachelor of Arts in Mathematics (with Honors); Minor in Japanese

Studied abroad at Karl Franzens Universität, Graz, Austria & University College Cork, Cork, Ireland

Employment

August 2017–current

Graduate Assistant, Full-time, Louisiana State University Mathematics Department, Baton Rouge, LA

Supervisor: Dr. Stephen Shipman · shipman@math.lsu.edu · (225) 578-1674

Researched modular categories and related areas, such as quantum information, in the service of an NSF grant (DMS 1664418).

Conducted research sessions with an international collaborator over Zoom. Implemented a GAP package, `SL2Reps`, which constructs symmetric bases for congruence representations of $SL_2(\mathbb{Z})$, a construction useful in the study and classification of modular categories. Applied this package, in conjunction with LSU's high-performance computing resources, to perform analysis of representations with dimensions in the hundreds as part of the research for my dissertation. Generated explicit data for all irreducible congruence representations of $SL_2(\mathbb{Z})$ of degree 12 and below; this data was requested by researchers working to classify modular categories. Translated two math papers from German. Produced numerous documents, papers, notes, and presentations in \LaTeX , including extensive graphical diagrams created with TikZ and presentation slides created with Beamer.

Taught thirteen college-level mathematics classes, including Calculus I, Plane Trigonometry, and College Algebra, with class sizes up to ninety students. These included classes designated for students requiring additional academic support. Provided tutoring and assistance for students. Translated class, activity, and presentation designs to formats suitable for online conferencing, and then used those designs in teaching two courses via Zoom. Served as an instructional assistant for a graduate-level algebra course, providing feedback and tutoring for junior PhD candidates.

Organized a two-week orientation program, including lectures and activities, for roughly twenty incoming mathematics graduate students, for three years (2019–2021); served as committee chair in 2020, when the program was conducted online, requiring an innovative structure. Created and presented introductory talks on abstract algebra, academic planning, and teaching. Individually mentored three junior PhD candidates, providing support and advice on teaching and academics. Helped organize the LSU High School Mathematics contest (2018–2019), a competition involving hundreds of high school seniors.

December 2014–current

Art Contractor, Contract, Freehold Games, LLC., Walkerton, IN.

Supervisor: Brian Bucklew · questions@freeholdgames.com · (574) 656-9031

Authored thousands of art assets in a variety of formats, including both raster and vector graphics, as the primary artist for the game *Caves of Qud*. Collaborated remotely with a team of roughly a dozen contributors via Slack.

September 2013–May 2017

Lecturer, Full-time, Texas State University Mathematics Department, San Marcos, TX.

Supervisor: Dr. Susan Morey · (512) 245-2551

Taught dozens of college-level mathematics classes, including Calculus I and II, Plane Trigonometry, College Algebra, Elementary Statistics, Contemporary Mathematics, Pre-Calculus, and Mathematics for Business and Economics, with class sizes up to eighty students.

January 2011–December 2012

Instructional Assistant, Full-time, Texas State University Mathematics Department, San Marcos, TX.

Supervisor: Dr. Susan Morey · (512) 245-2551

Researched topics in graph and knot theory, with particular focus on graph domination.

Taught several college-level mathematics classes, including College Algebra and Elementary and Intermediate Algebra (classes for students requiring additional academic support), with class sizes up to forty students. Served as an instructional assistant for several courses, including Plane Trigonometry.

Awards and Honors

Spring 2019 David Oxley Graduate Student Teaching Award

Fall 2018 Certificate of Teaching Excellence

Spring 2012 Outstanding Graduate Academic Achievement Award

References

Dr. Siu-Hung “Richard” Ng

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Dr. James Oxley

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