Brooke Logan Ogrodnik, Ph.D.

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EDUCATION

Doctorate of Philosophy, Mathematics   Sept. 2015 - May 2021
Rutgers University *New Brunswick, NJ*
Admittance to Candidacy November 2018

Bachelor of Science, Mathematics   Sept. 2012 - May 2015
Minor in Computer Science
Concentration in Applied Mathematics and Honors
Rowan University *Glassboro, NJ*
Magna Cum Laude

RESEACH INTERESTS

Number Theory, Group Theory, and Hyperbolic Geometry

TEACHING EXPERIENCE

Teaching Assistant for Linear Algebra at Rutgers University	Spring 2020
Head TA for the Summer Session classes at Rutgers University	Summer 2019
Instructor for Theory of Numbers at Rutgers University	Summer 2019
Instructor for Calculus II at Rutgers University	Summer 2018
Teaching Assistant for Calculus I at Rutgers University	Spring 2018
Teaching Assistant for Calculus II at Rutgers University	Fall 2017, Spring 2021
Tutor at Rowan University	May 2013 - May 2015

HONORS

- Janice Pattwell Annual Mathematics Fellowship Award, Fall 2020
- AMS Rutgers Student Chapter Award for Leadership, Spring 2020
- Rowan University Award for Excellence in Undergraduate Research, Spring 2015
- James M. Shafer Excellence in Mathematics Award, Spring 2015
- Dean's Outstanding Senior Award, Spring 2015
- Outstanding Junior Math Major, Spring 2014
- Pi Mu Epsilon, AMS, AWM Member

TECHNICAL SKILLS

C++, Python (Pandas, NumPy, BeautifulSoup, Streamlit), LaTeX, Mathematica, Microsoft Office
and basics in HTML, SQL, and Linux

LEADERSHIP

- Graduate Number Theory Seminar/ Learning Seminar *Organizer* (Fall 2019 - May 2021)
- The Erdos Institute's Invitation to Industry Seminar Series *Organizer* at Rutgers (Spring 2018 - May 2021)
- Rutgers Graduate/Faculty Liaison Committee *Member* (Fall 2016 - present)
  - Organize yearly open house for prospective graduate students (Spring 2017, 2018, 2019, 2020)
- Graduate Chapter of The American Mathematics Society (President 2015 - 2016, 2018 - 2021; Vice-President 2016 - 2017; Treasurer 2017 - 2018)
  - Co-Organized a two day workshop for preparing graduate students for industry and academia jobs (Fall 2020)
  - Organized and moderated a panel for graduate students about tips for graduation (Spring 2020)
  - Organized and moderated a panel for undergraduates about Math Graduate School (Spring 2019, Spring 2020)
- Mathematics Graduate Student Organization *Secretary* (Fall 2019 - May 2020)
- Math Team at Rowan University (Senator 2013 - 2014; President 2014 - 2015)

PROJECTS

Mathematics Department   Fall 2018 - May 2021
Rutgers University *New Brunswick, New Jersey*
Advisor: Alex Kontorovich

Local-Global Conjecture for a Commutator Subgroup
- This project aims to answer questions about the trace set of the commutator subgroup of a specific principal congruence subgroup. We explore the it's relationships with Markoff-type equations and random walks on a 2D lattice, find a lower bound for the class number, and prove which traces cannot appear due to local obstructions.
- Python and Mathematica were used to run searches that lead to conjectures, inspired proofs and/or were used to prove or disprove existence of certain elements. The code can be found on it's [GitHub](#) repository.

The Erdős Institute   May 2020
Data Science Bootcamp
- As part of this bootcamp, my team explored the influence of non-character-related features, like scene location within the TV sitcom, "Friends." We also created an app for recommending episodes of the tv show. Our project was in the top 5 out of 24 teams.
- Methods used in this project: HTML Scraping via BeautifulSoup to get the scripts of every episode of Friends and their IMDB reviews, K-Prototype to cluster the episodes, Topic Analysis using LDA on the scripts, we created the app using [Streamlit](#)
- More information about the project can be found on the team's [Github](#) repository for the project
- Other tools/methods discussed in the bootcamp: MLR, Time Series analysis, Dimensionality Reduction, Neural Networks
- Attending monthly seminars on continuing the education from the bootcamp (July 2020 - present)

Institute of Computational and Experimental Research in Mathematics REU   June 2014 - June 2015
Brown University *Providence, Rhode Island*
Mentor: Michael J. Mossinghoff

Circulant Hadamard Matrices
- We show that all but 4489 integers n with $4 < n \leq 4 \cdot 10^{30}$ cannot occur as the order of a circulant Hadamard matrix. Our algorithm allows us to search 10000 times farther than prior efforts, while substantially reducing memory requirements.
- C++ was used this project to raise the bound on the conjecture

Mathematics Department   May 2013 - May 2015
Rowan University *Glassboro, New Jersey*
Advisor: Hieu D. Nguyen

Quad-Phase Complementary Code Matrices (CCMs)
- Characterized group symmetries of the CCMs and presented a method to generate more CCMs from ternary CCMs
- C++ was used in these projects to do searches for the CCMs and improve the algorithm to take into account equivalencies

PUBLICATIONS *(maiden name Logan, B.)*

- [On the Local-Global Conjecture for Commutator Traces](#) Author: Ogrodnik, B.L. Preprint
- [Double Wieferich pairs and Circulant Hadamard Matrices](#) Authors: Logan, B., Mossinghoff, M.J. *Journal of Combinatorial Mathematics and Combinatorial Computing*, May 2017, 145-156
- [Group Symmetries of Complementary Code Matrices](#) Authors: Logan, B., Nguyen H.D. *IEEE Transactions on Aerospace and Electronic Systems*, October 2016, 2255-2262
- [Row-Correlation Function: A New Approach to Complementary Code Matrices](#) Authors: Coxson, G.E., Logan, B., Nguyen H.D. *Proceedings of 52nd Annual Allerton Conference on Communication, Control, and Computing*, October 2014, 1357-1361.

BROADER IMPACT

- Volunteer at DataKind (Fall 2020)
- Supervised students during the Rutgers DIMACS REU (Summer 2020)
- Created a math video for an elementary school's STEM week during the COVID-19 shutdowns (Spring 2020)
- Directed Reading Program Mentor (Fall 2019)
- Solutions Presenter at MoMath Middle School Math Tournament (Spring 2018, 2019, 2020, 2021)
- Gave an invited talk at Rowan College at Burlington County, entitled, "Keeping the Fun in FUNdamental Domain" for the May Induction of their Mu Alpha Theta Mathematics Honor Society (Spring 2018)
- Coffee Hour Coordinator (Fall 2017- Spring 2018)

PANELS

- Panelist in a Q&A for undergraduates (Fall 2020)
- Participated in a Graduate School Panel for undergraduates (Summer 2020)
- Alumni Panelist for Careers in Mathematics at Rowan University (Spring 2019)

PRESENTATIONS

- *"Dirichlet's Class Number Formula"* talk at the Rutgers Graduate Number Theory Seminar/Learning Seminar, November 2020
- *"Scary Stories to tell in the Pizza Seminar"* talk at the Rutgers Pizza Seminar, October 2020
- "On the Local-Global Conjecture for Commutator Groups" talk at the Rutgers Graduate Student Number Theory Seminar/Learning Seminar, July 2020
- "Illustrating Thin Groups" poster presentation at ICERM's Illustrating Number Theory and Algebra Workshop, October 2019
- "Reciprocal Geodesics" talk at the Rutgers Graduate Student Number Theory Seminar/Learning Seminar, September 2019
- "Putting the Fun in Fundamental Domain," talk at the Rutgers Pizza Seminar, April 2019
- "Constructing A Dirichlet Domain in Hyperbolic Three Space," talk at the Rutgers Graduate Student Number Theory Seminar (supplementary notes), March 2019
- "Selberg's Upper Bound Sieve," talk at the Rutgers Graduate Student Number Theory Seminar November 2018
- "Group Symmetries of Complementary Code Matrices" Combinatorics and Computer Algebra Conference, July 2015
- "Raising the Bound on the Circulant Hadamard Matrix Conjecture" Garden State Undergraduate Math Conference Outstanding Presentation Award, April 2015
- "Equivalency classes of Complementary code matrices" SIAM Talk at George Mason University, March 2015
- "Raising the Bound on the Circulant Hadamard Matrix Conjecture" Joint Mathematics Meetings Poster Session, January 2015
- *"Advances in Possible Orders of Circulant Hadamard Matrices and Sequences with Large Merit Factor"* Presentation at the Institute of Computational and Experimental Research in Mathematics, August 2014
- "Scanning for Complementary Code Matrices" Joint Mathematics Meetings Poster Session, January 2014
- "Symmetry Groups and Constructions of Complementary Code Matrices" Rowan University Stem Symposium Poster Session, April 2014
- "Symmetry Groups of Complementary Code Matrices" Garden State Undergraduate Math Conference Presentations, April 2014

CONFERENCES/WORKSHOPS *(that I did not speak or present at)*

- ICERM Workshop Lattice Point Distribution and Homogeneous Dynamics (virtual June 2020)
- Bill Duke Birthday Conference ETH Zürich (June 2019)
- Joint Mathematics Meetings (January 2021, 2019, 2016, 2015, 2014)
- MAA NJ Sectional Meeting (April 2018)

REFERENCES

- Alex Kontorovich *Professor of Mathematics* at Rutgers University alex.kontorovich@rutgers.edu
- Stephen D. Miller *Distinguished Professor of Mathematics* at Rutgers University sdmiller@math.rutgers.edu
- Roman Holowinsky *Associate Professor* at The Ohio State University holowinsky.1@osu.edu