Aurora Marks

Curriculum Vitae

Education

2015-present	**In Ph.D., Mathematics Program**, *University of Nebraska, Lincoln*, PhD Candidate, Anticipated graduation date: May 2022, *Current GPA − 3.747*. Selected Coursework: Topics in Group Theory, Automata and Formal Language Theory, Group Homology, Hyperbolic Groups, Self-Similar Groups, Complexity Theory, Topology, Mathematical Analysis, Modern Algebra, Discrete Mathematics
2015-2017	**M.S., Mathematics**, *University of Nebraska, Lincoln*.
2013-2015	**B.A., Mathematics and Statistics**, *California State University, Sacramento*, *GPA − 4.0*, Major GPA − 4.0. Selected Coursework: Numerical Programming, Probability Theory, Mathematical Statistics
2011-2013	**A.A., Mathematics**, *American River College*, *GPA − 4.0*. Major GPA − 4.0

Research Interests and Experiences

General Interests

Applications of Algorithms and their Computational Complexity, I enjoy thinking about problems presented either in the real world or in the abstract mathematical world, and how to solve these problems systematically. A systematic solution to a problem can be described in words as an algorithm then implementing that algorithm on a real computer can create additional challenges. These additional challenges can stem from time requirements because you want it to complete within an hour or from computational computing constraints of the computer running a program. I am interested in understanding and working with these challenges, and discovering problems that can be solved by real computers in real time..

Current Academic Research

Groups, Graphs, and Algorithms, *Under the supervision of Dr. Susan Hermiller and Dr. Mark Brittenham*, A Cayley graph of a group has vertices labeled by group elements and the directed edges represent multiplication by elements of the group. One can ask questions about geometric patterns of this graph and how this may correspond to properties of the group. In addition to this, a group can be represented as words over an alphabet, and with this view of a group, it is necessary to be able to detect if words are simplified to the unique representative of each group element. This is one example of an algorithm for a group that has a strong connection to the geometry of the Cayley graph of the group as well as properties of the group such as finiteness, freeness, and homological finiteness properties. I'm interested in studying the computational complexity of algorithms for groups and how that complexity effects the group and the Cayley graph of the group.

Sept. 2021 - present	**Mathematician on various Research and Development Teams**, *Northrop Grumman, under the supervision of Jim Jones, Dr. Tim Nobis, and Dr. Christian Wohlwend.*
Summer 2020	**Internship with the Weather and Space Environment Impacts Research and Development Group**, *Northrop Grumman, under the supervision of Dr. Christian Wohlwend*, I researched and implemented unsupervised machine learning algorithms to perform data analysis. Since the project is still in the earlier stages, there was not real data collected yet, so I needed to generate data that approximates the anticipated data. I tested and refined the algorithms that I implemented after receiving feedback from my teammates who had a stronger understanding of the physics and engineering aspects of the project.
Summer 2014	**Modeling the Seafloor Using Tension Spline Curve Radial Basis Functions**, *California State University, Sacramento, under the supervision of Dr. David Zeigler and supported by CSUS SURE grant*, A map of the seafloor off the coast of California is constructed by interpolating bathymetric data with radial basis functions under tension (RBFT's). Data used in this study were acquired, processed, archived, and distributed by the Seafloor Mapping Lab for California State University, Monterey Bay. My roles in this research include collecting data from CSUMB website, formatting the data and constructing a fixed-resolution terrain model using RBFT's.

Computer skills

Computer Algebra Systems	Working Knowledge of GAP, kbmag, Matlab, Mathematica, Octave, Herky (software for term rewriting systems)
Programming Languages	Working Knowledge of Python ; Basic familiarity of C++, Visual Basic
Document Editing Software	Working Knowledge of LaTeX and Microsoft Word
Operating Systems	Proficient with Windows and Linux

Invited Talks, Seminar Talks, and Poster Sessions

March 2020	**Group-Semigroups-Topology Seminar Talk**, *University of Nebraska-Lincoln*, "A Deeper Exploration into Autostackable Groups".
November 2019	**Invited Great Plains Alliance Talk**, *University of Nebraska-Kearney*, "Think Like a Pac-Man Ghost".
October 2019	**Groups-Semigroups-Topology Seminar Talk**, *University of Nebraska-Lincoln*, "Orderings of free groups and surface groups using covering spaces".
October 2018	**Invited Talk**, *Nebraska Wesleyan University*, "Think Like a Pac-Man Ghost".
March 2019	**Groups-Semigroups-Topology Seminar Talk**, *University of Nebraska-Lincoln*, "Gilman's Conjecture".

November 2018	**Groups-Semigroups-Topology Seminar Talk**, *University of Nebraska-Lincoln*, "The conjugacy problem for CAT(0) groups".
October 2018	**Invited Great Plains Alliance Talk**, *Wayne State College*, "Think Like a Pac-Man Ghost".
October 2018	**Graduate Student Seminar Talk**, *University of Nebraska-Lincoln*, "FSA: Another Three Letter Acronym".
February 2018	**Groups-Semigroups-Topology Seminar Talk**, *University of Nebraska-Lincoln*, "Algorithmically complex residually finite semigroups".
October 2017	**Groups-Semigroups-Topology Seminar Talk**, *University of Nebraska-Lincoln*, "Introduction to self-similar groups and the Grigorchuk group".
January 2017	**Groups-Semigroups-Topology Seminar Talk**, *University of Nebraska-Lincoln*, "Surfaces, curves, and hyperbolic geometry".
October 2016	**Groups-Semigroups-Topology Seminar Talk**, *University of Nebraska-Lincoln*, "Geodesic Growth of Groups".
January 2015	**Poster Presentation**, *Nebraska Conference for Undergraduate Women in Mathematics*, "Modeling the Seafloor Using Tension Spline Curve Radial Basis Functions".
October 2014	**Poster Presentation**, *California State University, Sacramento Natural Science and Mathematics Undergraduate Research Presentation*, "Modeling the Seafloor Using Tension Spline Curve Radial Basis Functions".

Teaching Experiences

2015–Present	**Graduate Teaching Assistant**, *University of Nebraska, Lincoln*. Teach classes as instructor of record. Lead recitation sections. Course Development for Calculus. Lead activities for graduate course for Master's in math education. Grade assignments for undergraduate-level proof courses
2014	**Athletics Department tutor**, *California Sacramento University, Sacramento*. Tutored athletic students one-on-one regularly in lower division mechanical physics.
2013–2015	**Math Lab tutor**, *California State University, Sacramento*. Tutored students in a drop in tutoring lab in lower division mathematics courses up to Calculus III and lower division statistics courses. Although not required, I often tutored students in upper division classes that I had previously taken.

Teaching and Pedagogical Training

As Instructor on Record.

Fall 20	Math 208: Calculus 3, University of Nebraska - Lincoln
Spring 20	Math 103: College Algebra and Trigonometry, University of Nebraska - Lincoln
Spring 19	Math 208: Calculus 3, University of Nebraska - Lincoln
Fall 18	Math 300: Mathematics Matters, University of Nebraska - Lincoln
Summer 18	Math 301:Geometry Matters, University of Nebraska - Lincoln
Spring 18	Math 300: Mathematics Matters, University of Nebraska - Lincoln
Fall 17	Math 103: College Algebra and Trigonometry, University of Nebraska - Lincoln
Spring 17	Math 100A: Intermediate Algebra, University of Nebraska - Lincoln

Fall 16	Math 100A: Intermediate Algebra, University of Nebraska - Lincoln
	As Recitation Leader or Teaching Assistant.
Fall 20	Math 208: Calculus 3, University of Nebraska - Lincoln
Fall 19	Math 208: Calculus 3, University of Nebraska - Lincoln
Summer 19	Math 802T: Functions, Algebra, and Geometry
Spring 16	Math 107: Calculus 2, University of Nebraska - Lincoln
Fall 15	Math 107: Calculus 2, University of Nebraska - Lincoln

Service and Mentoring

Fall 2018 – Present	**Graduate Mentoring Program**, *Graduate Mentor*, University of Nebraska, Lincoln. The goal of this program is to help first-year graduate students with the transition to grad school by providing moral support and advice. Mentors are expected to check-in with their mentees regularly and be able to be there when their mentees need help.
January 2019	**Invited Graduate student at NCUWM 2019**. Answered questions about applying to graduate school and picking graduate schools.
Fall 2018 – Spring 2019	**Seminar Coordinator**. Organize the weekly seminar the Graduate Students Talking about Groups, Semigroups, and Topology, a.k.a. $(GST)^2$
Summer 2017	**All Girls/All Math, AGAM**, *Graduate Coordinator*, University of Nebraska, Lincoln. AGAM is a week-long summer camp for girls in grades 10-12. Participants learn about cryptography as well as a variety of other topics in mathematics. In addition to interacting with professors, graduate students, and peers, the campers meet professionals who use mathematics in jobs outside of academia.
Fall 2016 - Spring 2017	**Graduate Student Assembly Member**, University of Nebraska, Lincoln. During the time I was a Graduate Student Assembly (GSA) member representing the Mathematics department. The GSA is a student government made up of graduate students that makes sure that the interests of graduate students are represented in the making of university policy. I serve on the GSA's Quality of Life Committee which focuses on issues such as housing, child care, parking, health coverage and any other possible issues affecting the lives of graduate students.

Conferences and Workshops Attended

September 2018	*Logic and Algorithms in Group Theory* at Hausdorff Research Institute of Mathematics. Topics discussed at workshop: Undecidability in Groups, Algorithms for finitely-presented groups, Pseudofinite groups, Stability and invariant random subgroups.
March 2018	*Young Geometric Group Theorists* at Les Diablerets, Switzerland. Topics discussed at workshop: Isomorphism problem for Coxeter groups, Connections between dynamics and group theory, Large-Scale geometry of groups
May 2017	*Program for Women and Mathematics* at Institute of Advanced Study in Princeton, New Jersey. Topics discussed at workshop: Free and Hyperbolic groups, Random Groups, Examples of Non-positively curved groups, Amenability
April 2017	*Redbud Topology Conference* at University of Arkansas in Fayetteville, Arkansas

January 2015 *Nebraska Conference for Undergraduate Women in Mathematics* at University of Nebraska-Lincoln in Lincoln, Nebraska

Honors

2020 **Certificate of Recognition for Contribution to Students**, The UNL Parents Association solicits parents of university students to consult with their student(s), and to nominate a faculty or staff member who "has made a significant contribution to their lives while at the University"., Received at UNL.

2019 **Steve Haataja Award**, The Steven Haataja Award for Outstanding Exposition by a Graduate Student is in memory of Steven Haataja, 1960-2006, who received his Ph.D. from UNL in 2006, Received at UNL.

2018 **Emeritus Faculty Award**, The Emeritus Fellowship is given each academic year to support graduate student research. It honors our emeritus faculty and is funded by contributions from faculty and alumni, Received at UNL.

2015 **Dean's Award for the College of Natural Sciences and Mathematics**, *Received at CSU, Sacramento.*

2015 **Phi Kappa Phi Joe DiGiorgio and Jeri Langham *Senior Honoree***, *Received at CSU, Sacramento.*

2015 ***Student Honoree* for the Department of Mathematics and Statistics**, *Received at CSU, Sacramento.*

2015 **Member of Pi Mu Epsilon National Honorary Mathematics Society**, *Received at CSU, Sacramento.*