Harrison Chapman
Curriculum Vitae

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Education

B.A. Mathematics and Computer Science, Bowdoin College, 2011.
- Cum laude
- Honors in Mathematics (advisor: Thomas Pietraho)

M.S. Mathematics, University of Georgia, 2015.

Ph.D. Mathematics, University of Georgia, 5th year (ABD), expected May 2017.
- Advisor: Jason Cantarella.

Teaching

1. Instructor, Calculus for Science and Engineering I (MATH2250), University of Georgia (Spring 2014, Spring 2016)
2. Instructor, Precalculus (MATH1113), University of Georgia (Fall 2013, Fall 2015)
3. Writing Intensive Program (WIP) teaching assistant for a lab and robotics-focused Calculus I (MATH2250) (Fall 2015)
4. Graduate assistant, Online Precalculus (MATH1113E), University System of Georgia. (Fall 2014–Spring 2015)
5. Recitation instructor, Analytic Geometry and Calculus (MATH2200), University of Georgia (Fall 2011, Spring 2012, Fall 2014)

Publications

1. Markov chain sampling of random knot diagrams. (with A. Rechnitzer). In preparation.
   We discuss sampling of random knot diagrams uniformly by using a Markov Chain Monte Carlo sampler.
2. Slipknotting in knot diagrams. In preparation.
   I apply pattern theorem results to knot diagrams to show that slipknots of any topological type appear almost surely in different classes of knot diagrams.
3. Asymptotic laws for random knot diagrams. In preparation.
   I show a pattern theorem result for knot diagrams and use it to prove 0-1 laws for tangles in diagrams using techniques and results from the study of combinatorial maps.
4. On probabilistic unknotting algorithms using only local information.
   with J. Cantarella, E. Lybrand. In preparation.
   There is a simple deterministic algorithm for converting any knot diagram to a diagram of the unknot

by crossing changes, but it requires global information about the diagram. Using our enumeration of diagrams, we consider whether there is a probabilistic algorithm for unknotting a diagram as such with only local information. This question is relevant to the untangling of DNA by topoisomerase action.

5. Knot Probabilities in Random Diagrams.
   with J. Cantarella, M. Mastin. arXiv:1512.05749.
   We compute the exact probability that a random diagram of n crossings has a given knot type (for $n \leq 10$) by directly enumerating and classifying the knot diagrams of n crossings. Our enumeration method is based on identifying knot diagrams with a class of embedded 4-regular planar graphs.

6. A Group-theoretic Approach to Human Solving Strategies in Sudoku.
   with M. Rupert (Mentor: E. Arnold). *Colonial Academic Alliance Undergraduate Research Journal* (2012) vol 3, article 3.
   Paper produced during an NSF REU at James Madison University in 2010. We quantify the data of Sudoku board states by considering which numbers cannot *go in a given cell and consider how a typical player's solving strategies are a group acting on this set of states.*

7. On orbital varieties of type A.
   Advisor: T. Pietraho. *Honors thesis*, (2011). Bowdoin College.
   Thesis on the Smith conjecture on orbital varieties of nilpotent orbits in the Lie group GL_n. Outlines the correspondence between Young tableaux and orbital varieties and concludes with conditions for which certain shapes of Young tableaux will admit orbital varities which are not Smith.

Software

1. `plCurve`. C and Python. Piecewise-linear curve and link diagram library.
   with T. Ashton, J. Cantarella, M. Mastin. *My primary contribution has been a Python interface to the C library code.*

2. Reverb. Java and C. An Android app which uses PulseAudio to control volume and audio streams on Linux computers.
   `https://github.com/hchapman/reverb`

Talks

1. Joint Mathematics Meetings, January 2016.
   MAA Session on Mathematical Modeling in the Undergraduate Classroom.
   A robotics-based calculus class.

2. Joint Mathematics Meetings, January 2016.
   AMS Session on General Topics.
   Asymptotic laws for knot diagrams.

3. Tulane University, Geometry Seminar, October 2015.
   Asmyptotic laws for knot diagrams.

4. AMS Fall Western Sectional Meetings, October 2015.
   Special Session on Algebraic and Combinatorial Structures in Knot Theory.
   Asymptotics of random knot diagrams.

5. University of Georgia, Geometry Seminar, October 2015.
   The quantum harmonic oscillator.

6. AMS Fall Southeastern Sectional Meetings, October 2015.
   Special Session on Topological Combinatorics.
   Asymptotics of random knot diagrams.
7. University of British Columbia, Discrete Math Seminar, September 2015.
   Asmyptotic laws for knot diagrams.
8. Simon Fraser University, Discrete Math Seminar, September 2015.
   Asmyptotic laws for knot diagrams.
9. University of Georgia, Geometry Seminar, September 2015.
   Asmyptotic laws for knot diagrams.
10. University of Georgia, Graduate Student Seminar, September 2015.
    How to count (a quick glance at analytic combinatorics).
11. University of Georgia, Mock AMS Conference, July 2015.
    Asymptotics of knot and link diagrams.
12. AMS Spring Western Sectional Meetings, April 2015.
    Special Session on Inverse Problems and Related Mathematical Methods in Physics.
    Random knot diagrams.
13. University of Georgia, Graduate Student Seminar, February 2015.
    Virtual Knot Theory.
14. University of Georgia, Geometry Seminar, January 2014.
    Random Planar Diagrams.
15. University of Georgia, Graduate Student Topology Seminar, November 2014.
    The Poincaré homolgy sphere as the link of a singularity.
16. University of Georgia, Research Group on Minimal Surfaces, November 2014.
    Discrete Ricci Flow.
17. University of Georgia, Mock AMS Conference, June 2014.
    The Tropical Grassmannian.
18. University of Georgia, Mock AMS Conference, June 2013.
    Hope for slackers: Playing games to prove theorems.
19. University of Georgia, Mock AMS Conference, June 2012.
    The Classification of Surfaces.
20. University of Georgia, VIGRE Research Group on Minkowski's Geometry of Numbers, March 2012.
    Vinogradov's generalization of a theorem of Aubry-Thue.
21. Joint Mathematics Meetings, January 2011.
    AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs.
    Packets, Solving Symmetries, and Sudoku.
22. The Ohio State University, Young Mathematicians Conference, August 2010.
    Packets, Solving Symmetries, and Sudoku.