Harrison Chapman
Curriculum Vitæ

Colorado State University
Department of Mathematics
1874 Campus Delivery
Fort Collins, CO 80523-1874

Office: Weber 223C
Email: hchaps@gmail.com
Homepage: https://hchapman.github.io/

Employment

Postdoctoral Fellow. Colorado State University, Fort Collins CO. 2017–present.

Education

Ph.D. Mathematics, University of Georgia, 2017.
- Advisor: Jason Cantarella.
- Thesis: *A diagrammatic theory of random knots.*

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

B.A. Mathematics and Computer Science, Bowdoin College, 2011.
- Cum laude
- Honors in Mathematics, thesis: *On orbital varieties of type A.*
- Advisor: Thomas Pietraho.

Awards

B.J. Ball Scholarship, 2016.

UGA VIGRE Research Fellowship, 2012—2013, Summer 2014.

Bowdoin Faculty Scholar, 2007.

Publications

[1] **In progress**, "On the structure and scarcity of alternating knots."

[2] **Mar. 2018**, "Slipknotting in the knot diagram model," Submitted.
arXiv: 1803.07114.

[3] **Mar. 2018** (with A. Rechnitzer), "A Markov chain sampler for plane curves," Submitted.

[4] **Jun. 2017**, "Asymptotic laws for random knot diagrams," *Journal of Physics A: Mathematical and Theoretical*, vol. 50, no. 22, p. 225 001,
DOI: 10.1088/1751-8121/aa6e45.
arXiv: 1608.02638.
URL: http://stacks.iop.org/1751-8121/50/i=22/a=225001.

[5] **May 2017**, "A diagrammatic theory of random knots," PhD thesis, University of Georgia, Athens, GA.

[6] **Sep. 2016** (with J. Cantarella, and M. Mastin), "Knot probabilities in random diagrams," *Journal of Physics A: Mathematical and Theoretical*, vol. 49, no. 40, p. 405 001,
DOI: 10.1088/1751-8113/49/40/405001.
arXiv: 1512.05749.
URL: http://stacks.iop.org/1751-8121/49/i=40/a=405001.

[7] **Nov. 2012** (with E. Arnold, and M. Rupert), "A group-theoretic approach to human solving strategies in Sudoku," *Colonial Academic Alliance Undergraduate Research Journal*, vol. 3, no. 1, p. 3,
URL: http://publish.wm.edu/caaurj/vol3/iss1/3/.

[8] **May 2011**, "On orbital varieties of type A," Honors thesis, Bowdoin College, Brunswick, ME.

Software

1. `pd_markov`. C++ and Python. Library for Markov chain Monte Carlo sampling of plane curves, knot diagrams, and related objects.
2. *LiveFit*. C++. Augmented reality projectile-tracking demonstration for use in calculus classes.
   `https://github.com/hchapman/LiveFit`
3. `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.*
   `http://www.jasoncantarella.com/wordpress/software/plcurve/`
4. *Reverb*. Java and C. An Android app which uses PulseAudio to control volume and audio streams on Linux computers.
   `https://github.com/hchapman/reverb`

External Talks

[1] **Mar. 2018**, "An efficient markov chain sampler for plane curves."
Discrete Math Seminar, Invited, University of British Columbia, Vancouver, BC.

[2] **Mar. 2018**, "Monte carlo sampling of knot diagrams (workshop tutorial)."
Approximate Enumeration of Polygons, Polymers and Link Diagrams, Invited, University of British Columbia, Vancouver, BC.

[3] **Nov. 2017**, "Slipknotting in random knot diagrams."
The Geometry and Topology of Knotting and Entanglement in Proteins, Invited, Casa Matematica Oaxaca (CMO), Oaxaca, Mexico.

[4] **Jun. 2017**, "A Sumners-Whittington result for knot diagrams."
Means, Methods, and Results in the Statistical Mechanics of Polymeric Systems II, Invited, Fields Institute, Toronto, ON.

[5] **May 2017**, "A Markov chain sampler for knot diagrams."
Special Session on Invariants of Knots, Links, and 3-manifolds (AMS Spring Eastern Sectional Meeting 2017), Invited, Hunter College, New York, NY.

[6] **Mar. 2017**, "Slipknotting in the knot diagram model."
Special Session on Knot Theory and its Applications (AMS Spring Southeast Sectional Meeting 2017), Invited, College of Charleston, Charleston, SC.

[7] **Jan. 2017**, "Slipknotting in the knot diagram model."
MAA Invited Paper Session on Random Polygons and Knots (Joint Mathematics Meetings 2017), Invited, Atlanta, GA.

[8] **Nov. 2016**, "Random knots in physics and biology."
Annual Math and Physics Lecture, Invited, Piedmont College, Demorest, GA.

[9] **Jul. 2016**, "Asymptotic laws for knot diagrams."
28^{th} International Conference on Formal Power Series and Algebraic Combinatorics, Vancouver, BC.

[10] **Apr. 2016**, "Asymptotic laws for knot diagrams."
Graduate Student Topology and Geometry Conference 2016, IU Bloomington, Bloomington, IN.

[11] **Jan. 2016**, "A robotics-based calculus class."
MAA Session on Mathematical Modeling in the Undergraduate Classroom (Joint Mathematics Meetings 2016), Invited, Seattle, WA.

[12] **Jan. 2016**, "Asymptotic laws for knot diagrams."
AMS Session on General Topics (Joint Mathematics Meetings 2016), Seattle, WA.

[13] **Oct. 2015**, "Asymptotic laws for knot diagrams."
Geometry Seminar, Invited, Tulane University, New Orleans, LA.

[14] **Oct. 2015**, "Asymptotics of random knot diagrams."
Special Session on Algebraic and Combinatorial Structures in Knot Theory (AMS Fall Western Sectional Meetings 2015), Invited, CSU Fullerton, Fullerton, CA.

[15] **Oct. 2015**, "Asymptotics of random knot diagrams."
Special Session on Topological Combinatorics (AMS Fall Southeastern Sectional Meetings 2015), Invited, University of Memphis, Memphis, TN.

[16] **Sep. 2015**, "Asymptotic laws for knot diagrams."
Discrete Math Seminar, Invited, University of British Columbia, Vancouver, BC.

[17] **Sep. 2015**, "Asymptotic laws for knot diagrams."
Discrete Math Seminar, Invited, Simon Fraser University, Burnaby, BC.

[18] **May 2015**, "Knot diagrams and blossom trees."
PIMS-USASK Graduate Summer School on Applied Combinatorics, University of Saskatchewan, Saskatoon, SK.

[19] **Apr. 2015**, "Random knot diagrams."
Special Session on Inverse Problems and Related Mathematical Methods in Physics (AMS Spring Western Sectional Meetings), Invited, University of Nevada, Las Vegas, NV.

[20] **Jan. 2011** (with M. Rupert), "Packets, solving symmetries, and Sudoku."
AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs (Joint Mathematics Meetings 2011), New Orleans, LA.

[21] **Aug. 2010** (with M. Rupert), "Packets, solving symmetries, and Sudoku."
Young Mathematicians Conference, The Ohio State University, Columbus, OH.

Internal Talks

[22] **Mar. 2018**, "Statistical mechanics of knot diagrams."
Postdoc Seminar, Colorado State University, Fort Collins, CO.

[23] **Mar. 2017**, "A Markov chain Monte Carlo sampler for knot diagrams."
Geometry Seminar, University of Georgia, Athens, GA.

[24] **Aug. 2016**, "Patterns in knot diagrams."
Geometry Seminar, University of Georgia, Athens, GA.

[25] **Oct. 2015**, "The quantum harmonic oscillator."
Geometry Seminar, University of Georgia, Athens, GA.

[26] **Sep. 2015**, "Asymptotic laws for knot diagrams."
Geometry Seminar, University of Georgia, Athens, GA.

[27] **Sep. 2015**, "How to count (a quick glance at analytic combinatorics)."
Graduate Student Seminar, University of Georgia, Athens, GA.

[28] **Jul. 2015**, "Asymptotics of knot and link diagrams."
Mock AMS Conference, University of Georgia, Athens, GA.

[29] **Feb. 2015**, "Virtual knot theory."
Graduate Student Seminar, University of Georgia, Athens, GA.

[30] **Nov. 2014**, "Discrete Ricci flow."
Research Group on Minimal Surfaces, University of Georgia, Athens, GA.

[31] **Nov. 2014**, "The Poincaré homolgy sphere as the link of a singularity."
Graduate Student Topology Seminar, University of Georgia, Athens, GA.

[32] **Jun. 2014**, "The tropical Grassmannian."
Mock AMS Conference, University of Georgia, Athens, GA.

[33] **Jan. 2014**, "Random planar diagrams."
Geometry Seminar, University of Georgia, Athens, GA.

[34] **Jun. 2013**, "Hope for slackers: Playing games to prove theorems."
Mock AMS Conference, University of Georgia, Athens, GA.

[35] **Jun. 2012**, "The classification of surfaces."
Mock AMS Conference, University of Georgia, Athens, GA.

[36] **Mar. 2012**, "Vinogradov's generalization of a theorem of Aubry-Thue."
VIGRE Research Group on Minkowski's Geometry of Numbers, University of Georgia, Athens, GA.

Teaching

Colorado State University

1. Instructor, Linear Algebra I (MATH369).
   Fall 2017 (2 sections), Spring 2018.

University of Georgia

1. Instructor, Calculus for Science and Engineering I (MATH2250).
   Spring 2014, Spring 2016, Fall 2016
2. Instructor, Precalculus (MATH1113).
   Fall 2013, Fall 2015, Spring 2017
3. Graduate assistant for Topology Qualifying Exam problem session (volunteer).
   Summer 2016
4. Writing Intensive Program (WIP) teaching assistant for a lab and robotics-focused Calculus I (MATH2250).
   Fall 2015
5. Graduate assistant, Online Precalculus (MATH1113E).
   This was a course for all of the University System of Georgia.
   Fall 2014–Spring 2015
6. Recitation instructor, Analytic Geometry and Calculus (MATH2200).
   Fall 2011, Spring 2012, Fall 2014

Workshops

1. Workshop on Geometry and Topology of 3-manifolds.
   OIST, Okinawa, Japan, May 2018.

2. Approximate Enumeration of Polygons, Polymers and Link Diagrams. (Tutorial leader)
   University of British Columbia, Vancouver BC, March 2018.

3. Graphs and Surfaces: Algorithms, Combinatorics, and Topology.
   CIRM, Marseille, France, May 2016.

4. Symplectic and Algebraic Geometry in the Statistical Physics of Polymers.
   Simons Center for Geometry and Physics, Stony Brook NY, October 2015.

5. PIMS-USASK Graduate Summer School in Applied Combinatorics.
   University of Saskatchewan, Saskatoon SK, May 2015.

Last updated: April 9, 2018
`https://hchapman.github.io/static/CV.pdf`