BRYSON G. KAGY

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EDUCATION

North Carolina State University *2019-Present*
PhD Advisor: Seth Sullivant
Master's in Mathematics, May 2021
Qualifying exams in Combinatorics, Algebra, and Linear algebra/Lie Theory

Georgia Institute of Technology *2015-2019*
B.S. Mathematics with Pure Mathematics concentration, May 2019
B.S. Physics, May 2019
Science and Math Research Training (SMaRT) Program

RESEARCH INTERESTS

algebraic statistics, algebraic combinatorics, algebraic geometry, polyhedral geometry, graphical models, graph theory, cluster algebras, coexter groups ,game theory, fair division, and knot theory.

CURRENT RESEARCH PROJECTS

North Carolina State University Fall 2022

- Advisor: Seth Sullivant
- Characterized the cone of distance functions phylogenetic equidistant circular split networks. Gave both a facet and extreme ray description.

Institute of Mathematical and Statistical Innovation Fall 2023

- Phylogenetics Working group started at IMSI
- Applying incomplete u-statistics to multiple Phylogenetic models.

Institute of Mathematical and Statistical Innovation Fall 2023

- Colored Graphical Models Working group started at IMSI
- Looking at Colored Guassian graphical models and trying to characterize the maximum likely threshold of classes of graphs, especially ones with threshold 1.

Institute of Mathematical and Statistical Innovation Fall 2023

- Game Theory Working group started at IMSI
- Looking at characterizing types of correlated polytopes for classes of games such as zero sum games.

North Carolina State University Spring 2022

- Advisor: Seth Sullivant
- Generalized a characterization of idenitifibilty of phylogentic mixture mixtures models. Specifically, characterizing when the underlying model is JC, K2P, K3P, SSM instead of an underlying General Markov model.

North Carolina State University Fall 2022

- In collaboration with Spencer Daughtery
- Looking at bijections on trees between stable matchings of vertices and set partitions of edges. Ultimate goal of working towards Stanely's conjecture about the complete invariance of the chromatic polynomial of trees.

TECHNICAL STRENGTHS

Computer Languages Java, LaTeX, Polymake, Macaulay2, Maple, Python

AWARDS AND HONORS

Spring 2019 North Carolina State University Provost Fellowship
2017-2018 Georgia Institute of Technology School of Mathematics Outstanding Math Major Award

WORKSHOPS AND CONFERENCES

Workshops
Fall 2023 IMSI long program - Algebraic Statistics and Our Changing World
Summer 2022 Joint MSRI-BIRS Graduate Summer School - Sums of Squares Method in Geometry, Combinatorics and Optimization
Conferences
2024 Joint Mathematics Meeting, Talk in AMS Special Session on Algebraic Approaches to Mathematical Biology: "A Description of the Polyhedral Geometry of Equidistant Phylogenetic Networks"
2019 Joint Mathematics Meeting, Poster "Fair Division for Drawing Legislative Districts"
2019 National Conference on Undergraduate Research, Talk: "Fair Division for Drawing Legislative Districts"
2018 SIAM LA-TX conference, Talk: "Fair Division for Drawing Legislative Districts"
2018 Joint Mathematics Meeting, Poster: "One-Bit Johnson-Lindenstrauss Lemma"
2017 Young Mathematicians Conference, Poster: "One-Bit Johnson-Lindenstrauss Lemma"

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algebraic statistics, algebraic combinatorics, algebraic geometry, polyhedral geometry, graphical models, graph theory, cluster algebras, coexter groups ,game theory, fair division, and knot theory.

PAST RESEARCH PROJECTS

Carnegie Mellon University Summer 2018

- Advisor: Dr. David Offner and Dr. Jessica De Silva
- Summer Undergraduate Applied Mathematics Institute (SUAMI)
- Analyzed a protocol by Zeph Landau and Francis Su that ensured fair legislative districting through concepts of fair division. We proved their protocol must return a result to a party that is within 2 districts of their geometric target, a measure of fairness. Preprint at arxiv.org/abs/1811.05705.

Georgia Institute of Technology Summer 2017

- Advisor: Dr. Michael Lacey
- Georgia Institute of Technology Impact Math REU
- Created a one-bit Johnson-Lindenstrauss Lemma where just the sign of each part of the measurements is taken. We found bounds for how many one-bit measurements are required to maintain the structure between points, showing it is not more than in the linear case. Preprint at arxiv.org/abs/1903.02123.

Georgia Institute of Technology Fall 2018 - Spring 2019

- Advisor: Dr. Michael Lacey
- Reading Course and Designing Data Analysis Course Worked through Guth's book on Polynomial Methods and their applications to combinatorics, algebra, and incidence geometry. Planned out and complied notes to create a new course about the math of data analysis.

TEACHING EXPERIENCES

North Carolina State University Summer 2020-Present

- Instructor of Record for MA 111 Pre-Calculus, MA 141 Calculus 1, MA 241 Calculus 2, MA 103 Intro to Contemporary Math. Wrote and gave lectures, held office hours, wrote tests.
- For MA 103, chose what topics were taught which were were Voting Theory, Graph theory, Fair division, and Cryptography.

OUTREACH

Mathapalooza Exhibit Fall 2018-Spring 2019

- Event at Atlanta Science Festival 2019
- Advisor: Dr. Evans Harrell
- Designed a new exhibit for the Atlanta Science Festival. Mathapalooza was an immersive public event with math puzzles, stage shows and art installations aimed to foster math appreciation in Atlanta students.

Seven Bridges of Königsberg Show Fall 2018

- Math in Motion Exhibition
- Advisor: Dr. Evans Harrell
- Created and presented interactive exhibits explaining foundational concepts in graph theory. These demonstrations accompanied original composition and dance performances at public venues around Atlanta.