JOY Z. ZHANG

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EDUCATION

Center for Applied Mathematics, Cornell University
Ph.D. student, advised by Prof. Dan Kowal — Expected: May 2027

Swarthmore College
Bachelor of Arts in Mathematics and Philosophy *with Honors* — Graduated: May 2022

RELEVANT GRADUATE-LEVEL COURSEWORK

Statistics & Machine Learning

STSCI 6780: Bayesian Statistics and Data Analysis
STSCI 5090: Theory of Statistics
STSCI 7170: Theory of Linear Models
CS 6789: Foundations of Reinforcement Learning
CS 5789: Intro Reinforcement Learning

Mathematics & Probability

ORIE 6510: (Graduate level) Probability
MATH 6110: (Graduate level) Real Analysis
MATH 6310: (Graduate level) Algebra
MATH 6230: Differential Games and Optimal Control
CEE 6745: Inverse Problems
MATH 6510: (Graduate level) Algebraic Topology

PREPRINTS AND PUBLICATIONS

Methodological considerations for semialgebraic hypothesis testing with incomplete U-statistics (with David Barnhill, Marina Garrote-López, Elizabeth Gross, Max Hill, Bryson Kagy, and John A Rhodes), *submitted*, 2025.

Bayesian phylodynamic inference of population dynamics with dormancy (Lorenzo Cappello (co-first author), Wai Tung Lo (co-first author), **Joy Z. Zhang (co-first author)**, Daniel Barrow, Ishani Chopra, Perry Xu, Shenni Liang, Andrew G. Clark, Martin T. Wells, and Jaehee Kim), published in ***Proc. Natl. Acad. Sci. U.S.A***, 122 (18) e2501394122, 2025.

Geometric analysis of admixed nodes in the neighbor-joining algorithm (with Wai Tung Lo, Michael Stillman, and Jaehee Kim), *in preparation for submission*, 2024.

Friezes over $\mathbb{Z}[\sqrt{2}]$ (with Esther Banaian, Libby Farrell, Amy Tao and Kayla Wright), published in *Involve, a Journal of Mathematics*, 2025.

Topology of augmented Bergman complexes (with Elisabeth Bullock, Aidan Kelley, Victor Reiner, Kevin Ren, Gahl Shemy, Dawei Shen, Brian Sun and Amy Tao), published in *Electronic Journal of Combinatorics*, 2021.

Frobenius templates in certain 2×2 **matrix rings** (with Timothy Eller, Jakub Kraus, and Yuki Takahashi), published in *International Journal of Mathematics and Computer Science*, 2020.

Graphs with prescribed radius, diameter, and center (with Kelly Guest, Andrew Johnson, Peter Johnson, William Jones, and Yuki Takahashi), published in *International Journal of Mathematics and Computer Science*, 2020.

RESEARCH ACTIVITIES

Invited Talks

Bayesian phylodynamic inference of population dynamics with dormancy August 2024
The Great Lakes Annual Meeting of Evolutionary Genomics (GLAM-Evogen), Syracuse University

Geometric analysis of admixed nodes in the neighbor-joining algorithm July 2024
3rd Joint Congress on Evolutionary Biology, Montreal, Canada

Testing Phylogenetic Tree Models with Algebraic Constraints Using Incomplete U-Statistics April 2024
AMS Spring Central Sectional Meeting, the University of Wisconsin-Milwaukee

Testing Phylogenetic Tree Models with Algebraic Constraints Using Incomplete U-Statistics December 2023
Institute for Mathematical and Statistical Innovation, the University of Chicago

Friezes from Dissection over $\mathbb{Z}[\sqrt{2}]$ *and* $\mathbb{Z}[\sqrt{3}]$ October 2021
Gulf Coast Undergraduate Research Symposium, Rice University

Frobenius Templates in Certain 2×2 *Matrix Rings* October 2020
Women in Mathematics in New England, Smith College

Frobenius Templates in Certain 2×2 *Matrix Rings* August 2020
Young Mathematicians Conference, the Ohio State University

Poster Presentations

Efficient inference frameworks for the seedbank coalescent with a fixed genealogy March 2025
Probabilistic Modeling in Genomics, Cold Spring Harbor Laboratory

Bayesian phylodynamic inference of population dynamics with dormancy October 2024
From Phylogenetics to Phylogenomics: Mathematical and Statistical Challenges, ICERM

Frobenius Templates in Certain 2×2 *Matrix Rings* January 2021
Nebraska Conference for Undergraduate Women in Mathematics, University of Nebraska-Lincoln

Workshops Attended

The Computational Genomics Summer Institute (CGSI) July 2024
The University of California, Los Angeles

Algebraic Statistics and Our Changing World September - December 2023
Institute for Mathematical and Statistical Innovation (IMSI), the University of Chicago

AWARDS AND FELLOWSHIPS

Lockwood Fellowship from Swarthmore College June 2023
Awarded to outstanding recent graduates pursuing a graduate degree.

Cornell Fellowship 2022 - 2023
Awarded to approximately 20 percent of doctoral students studying on campus.

Baltimore/Broad Summer Research Fellowship from Swarthmore College Summer 2021
Awarded for summer research in the natural sciences or engineering.