

SEAN GRATE

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EDUCATION

Auburn University, Auburn
Ph.D. candidate, Mathematics

August 2020 –Present

University of Kentucky, Lexington
B.S. in Mathematics with minors in History and Classics, *cum laude*

August 2016 –May 2020

PROFESSIONAL EXPERIENCE

Auburn University Department of Mathematics and Statistics
Graduate Teaching Assistant

August 2020–Present

UK Department of Computer Science
Undergraduate Research Assistant

August 2019–August 2020

Continued researching the topics studied at the 2019 Computer Vision REU, e.g., estimating flight routes. Also performed research on point cloud resampling via machine learning where the goal is to produce arbitrary resolutions for a given point cloud.

Computer Vision REU
Undergraduate Researcher

May–August 2019

REU in computer vision under the guidance of Dr. Nathan Jacobs at the University of Kentucky. Used machine learning to estimate the flight paths of planes capturing LiDAR data across all of Kentucky.

PUBLICATIONS

- [3] Nasrin Altafi, Roberta di Gennaro, Federico Galetto, Sean Grate, Rosa M. Miró-Roig, Uwe Nagel, Alexandra Seceleanu, and Junzo Watanabe. “Betti numbers for connected sums of graded Gorenstein Artinian algebras”. *Transactions of the AMS* (2024), to appear. arXiv: 2401.10492 [math.AC].
- [2] Sean Grate and Hal Schenck. “Betti tables forcing failure of the Weak Lefschetz Property”. *Lefschetz properties: Current and New Directions*. Vol. 59. Springer INdAM Series. 2024, to appear. arXiv: 2307.13126 [math.AC].
- [1] Hunter Blanton, Sean Grate, and Nathan Jacobs. “Surface Modeling for Airborne Lidar”. *IGARSS 2020 - 2020 IEEE International Geoscience and Remote Sensing Symposium*. 2020, pp. 1110–1113. DOI: 10.1109/IGARSS39084.2020.9323522.

PREPRINTS

- [5] Ayah Almousa, Shiliang Gao, Sean Grate, Daoji Huang, Patricia Klein, Adam LaClair, Yuyuan Luo, and Joseph McDonough. *The MatrixSchubert package for Macaulay2*. Submitted. 2023. arXiv: 2312.07393 [math.AG].

- [4] Haile Gilroy, Melinda Lanius, and Sean Grate. “Graph Theoretic Reflection to Foster Alignment in Coordinated Courses”. Submitted.
- [3] Nicholas Gaubatz, Sean Grate, and Haile Gilroy. “Minimal Out-Neighborhoods in the F -Lattice”. in preparation.
- [2] Sean Grate. “Castelnuovo-Mumford Regularity of Toric Surfaces”. in preparation.
- [1] Herman Chau, Spencer Daugherty, Sean Grate, J. Carlos Martínez Mori, and Anna Pun. “The combinatorics of stable Tamari posets”. in preparation.

AWARDS AND HONORS

- Auburn University DMS Bennett Fellowship 2023
- Auburn University DMS Research Citation Award 2021, 2022
- Auburn University DMS Teaching Citation Award 2022
- Auburn University COSAM Outstanding GTA Award 2022
- Best Presentation at UK Computer Science Summer Research Program August 9th, 2019
- University of Kentucky Dean’s List Fall 2016, Spring 2017, Fall 2017, Spring 2019, Spring 2020
- Kentucky Educational Excellence Scholarship (KEES) (\$2,225 per year) 2016-2020
- University of Kentucky Provost Scholarship (\$1,500 per year) 2016-2020

CONFERENCE TALKS

- “Castelnuovo-Mumford Regularity of Toric Surfaces”, AMS Fall Central Sectional, September 2024
- “Betti tables forcing failure of the Weak Lefschetz Property”, Combinatorial Algebra meets Algebraic Combinatorics (CAAC), January 2024
- “Betti tables forcing failure of the Weak Lefschetz Property”, Workshop on Lefschetz Properties in Algebra, Geometry, Topology and Combinatorics, May 2023

SEMINAR TALKS

- “Betti tables and Lefschetz properties”, University of Kentucky Algebra Seminar, November 2023
- “Lefschetz properties and Artinian rings”, McNeese State University Math Seminar, November 2023
- Auburn University
 - “The Stable Tamari Lattice”, Discrete Math Seminar, Spring 2024
 - “Castelnuovo-Mumford regularity of toric surfaces”, Algebra Seminar, September 2024
 - “Betti tables and Lefschetz properties”, Algebra Seminar, February 2024
 - “Suturing the severed didactic tetrahedron: Graph-Theoretic reflection to foster alignment in coordinated courses”, Auburn University DBER Seminar, February 2024
 - “Leveraging software for mathematics and graduate school”, Graduate Student Seminar, September 2023
 - “A brief introduction to tropical geometry”, Graduate Student Seminar, August 2022
 - “An overview of topological data analysis”, Math Club, February 2022
 - “A brief introduction to tropical geometry”, Algebra Seminar, November 2021
 - “Computations in topological data analysis”, Graduate Algebra Seminar, August 2021

- “Tropical algebra”, Graduate Algebra Seminar, July 2021
- “Geometry in noncommutative algebra”, First Year Graduate Student Seminar, January 2021
- “What/Why/How of neural networks”, First Year Graduate Student Seminar, November 2020

CONFERENCES AND WORKSHOPS ATTENDED

- AMS Fall Central Sectional Meeting September 2024
- UweFest August 2024
- AMS MRC on Algebraic Combinatorics June 2024
- Computational Algebraic Geometry and String Theory June 2024
- JM Invariant at 60 May 2024
- Combinatorial Algebra meets Algebraic Combinatorics (CAAC) January 2024
- SIAM Texas-Lousiana Sectional Meeting November 2023
- BrianFest August 2023
- Macaulay2 Week June 2023
- SLMath Commutative Algebra Summer School May 2023
- Workshop on Lefschetz Properties in Algebra, Geometry, Topology and Combinatorics May 2023
- Commutative Algebra in the South (CATS) April 2023
- SLMath Tropical Geometry Summer School August 2022

TEACHING EXPERIENCE

- Instructor of Record
 - MATH 1610 Calculus I Spring 2022
 - MATH 1120 Precalculus Algebra Fall 2021
- Recitation Leader
 - MATH 1610 Calculus I Fall 2022, Spring 2023, Fall 2023
 - MATH 1620 Calculus II Spring 2024, Fall 2024
- Tutor
 - MATH 1120 Precalculus Algebra
 - MATH 1610 Calculus I
 - MATH 1620 Calculus II
 - MATH 1680 Business Calculus I

SERVICE

- President of the Mathematics Club at Auburn University 2021-2024
- Secretary for the Auburn University DMS Graduate Student Council August 2022-August 2023
- Graduate Student Representative on the Auburn University DMS Graduate Student Council August 2021-August 2023

OUTREACH

- Destination STEM October 2022, October 2023
- Auburn Mathematical Puzzle Challenge (AMP'd) November 2022
- University of Kentucky Math Club 2016-2020
- Expanding Your Horizons workshop mentor 2019
- Julia Robinson Math Festival volunteer 2019

TECHNICAL STRENGTHS

Software & Tools	Python, Macaulay2, PyTorch, SageMath
Macaulay2 Packages	MatrixSchubert, Permutations