

## CURRICULUM VITAE

R. AMZI JEFFS

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**Current Affiliation:** Department of Mathematics at the Carnegie Mellon University

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### EDUCATION

- PhD** Mathematics, University of Washington. 2021.  
Thesis “Morphisms, Minors, and Minimal Obstructions to Convexity of Neural Codes”  
advised by Isabella Novik.
- BA** Mathematics, Harvey Mudd College, with high distinction and honors. 2016.  
Thesis “Convexity of Neural Codes” advised by Mohamed Omar and Nora Youngs.

### HONORS AND GRANTS

- 2021-2024 **NSF Postdoctoral Fellowship**  
2021 **NSERC Postdoctoral Fellowship**  
(Declined in order to accept NSF fellowship).
- 2018-2021 **NSF Graduate Research Fellowship**  
2020 **Phelps Award for Research Excellence**  
University of Washington Mathematics Department award.
- 2019 **SIAM Travel Award**  
2019 **FPSAC 2019 Travel Funding Award**  
2016 **Chavin Prize for Outstanding Mathematics Thesis**  
Harvey Mudd College Mathematics Department award.

### RESEARCH INTERESTS

Combinatorics, discrete and convex geometry. Applications of geometric and topological techniques to combinatorial problems. Combinatorics of matroids, polytopes, and simplicial complexes.

### PAPERS AND PUBLICATIONS

*Items 9-4 below are graduate work, items 3-1 are prior to graduate work.*

9. **Order-Forcing in Neural Codes**  
with Caitlin Lienkaemper and Nora Youngs.  
Available at <https://arxiv.org/abs/2011.03572>. 2020.
8. **Non-Monotonicity of Closed Convexity in Neural Codes**  
with Brianna Gambacini, Sam MacDonald, and Anne Shiu.  
Under review. <https://arxiv.org/abs/1912.00963>. 2020.
7. **Embedding Dimension Phenomena in Intersection Complete Codes**  
Under review. <https://arxiv.org/abs/1909.13406>. 2019.
6. **Sunflowers of Convex Open Sets**  
*Advances in Applied Mathematics*, Vol 111, Article 101935. 2019.
5. **Convex Union Representability and Convex Codes**  
with Isabella Novik. *International Mathematics Research Notices*, to appear. 2019.
4. **Morphisms of Neural Codes**  
*SIAM Journal on Applied Algebra and Geometry*, Vol 4(1), 99–122. 2020.
3. **Homomorphisms Preserving Neural Ideals**  
with Mohamed Omar and Nora Youngs. *Journal of Pure and Applied Algebra*, Vol 222(11), 3470-3482. 2018.
2. **Sparse Neural Codes and Convexity**

with Mohamed Omar, Natchanon Suaysom, Aleina Wachtel, and Nora Youngs.  
*Involve, a Journal of Mathematics*, Vol 12(5), 737-754. 2019.

1. **Characterizing the Cryptographic Properties of Reactive 2-Party Functionalities**  
with Mike Rosulek. *Theory of Cryptography Conference*, 2013.

## COURSES TAUGHT

- 2020 **Matrix Algebra (Math 308)** at University of Washington, Seattle.  
Sole instructor for linear algebra course with 50 students. Met regularly with fellow instructors and faculty to coordinate, develop materials, and discuss teaching practices.
- 2019 **Math in Society (Humanities and Sciences 270)** at Cornish College of the Arts.  
Sole instructor for class of 22 students. Developed math curriculum for undergraduate art students highlighting connections between math and society.
- 2018 **Math in Society (Math 107)** at Washington Corrections Center for Women.  
Co-taught a class of 8 students with a fellow graduate student through Freedom Education Project Puget Sound, a program that provides accredited college courses for incarcerated students at the Washington Corrections Center for Women.

## INVITED TALKS

*Conferences:*

- 2019 **Sunflowers of Convex Sets and New Obstructions to Convexity**  
SIAM Conference on Applied Algebraic Geometry. Minisymposium on Algebraic and Combinatorial Methods in Neural Coding.
- 2019 **Understanding Intersection Patterns of Convex Open Sets**  
University of Hawaii at Manoa. AMS Sectional Meeting Special Session.
- 2019 **New Obstructions to Convexity Via Nerves**  
Auburn University, Alabama. AMS Sectional Meeting Special Session.

*Seminars:*

- 2021 **How Can We Arrange Sunflowers of Convex Open Sets?**  
University of Minnesota. Graduate Student Combinatorics Conference. Delivered on Zoom.
- 2021 **Classifying Intersection Patterns of Convex Sets**  
University of Kentucky. Discrete Math Seminar. Delivered on Zoom.
- 2021 **Convex Codes: Realizations, Minors, and Embedding Dimensions**  
Graduate Online Combinatorics Colloquium. Delivered on Zoom.
- 2020 **Applying Sunflowers of Convex Sets to the Study of Neural Codes**  
Simon Fraser University. Operations Research Seminar. Delivered on Zoom.
- 2020 **Flexible Sunflowers of Convex Open Sets and Applications to Neural Codes**  
Pennsylvania State University. Curto Lab Weekly Meeting. Delivered on Zoom.  
University of British Columbia. Discrete Math Seminar. Delivered on Zoom.
- 2020 **Open and Closed Convex Codes and Their Embedding Dimensions**  
Iowa State University. Combinatorial Structures and Processes Seminar on Topological Combinatorics. Delivered on Zoom.
- 2020 **Convex Sunflower Theorems and Neural Codes**  
University of Minnesota. Applied Algebraic Topology Research Network Seminar.  
Delivered on Zoom.
- 2020 **Sunflower Theorems and Convex Codes**  
University of California, Davis. Algebra & Discrete Mathematics Seminar.  
Delivered on Zoom.

- 2020 **Embedding Dimensions of Convex Codes**  
University of Washington, Seattle. Combinatorics Seminar.
- 2019 **A Deep Dive into the Abyss of Convex Neural Codes**  
Carnegie Mellon University. Algorithms, Combinatorics and Optimization Seminar.
- 2018 **Minimal Obstructions to Convexity in Combinatorial Codes**  
University of Washington, Seattle. Combinatorics Seminar.
- 2018 **Convex Union Representable Complexes**  
University of Miami. Combinatorics Seminar.
- 2018 **Morphisms of Neural Codes**  
Pennsylvania State University. Invited talk.

#### MENTORING AND ADVISING ACTIVITIES

- 2019 **Mentor with Washington Experimental Mathematics Lab (WXML).**  
Assisted undergraduate research project on “higher nerves” and combinatorial geometry. Met twice per week with three students during Spring quarter.
- 2017-2019 **Mentor for Advanced High School Student.**  
Met biweekly to tutor an advanced high school student in mathematics. Covered the basics of combinatorics, abstract algebra, algebraic geometry, and topology.
- 2018 **University of Washington Math Circle Mentor.**

#### SERVICE AND PROFESSIONAL DEVELOPMENT

- 2021 **Panelist on Graduate Student Labor Organizing** at ParaDIGMS Conference on Diversity in Graduate Mathematical Sciences.
- 2021 **Co-organizer for SIAM AG21 Minisymposium on Algebraic and Geometric Methods in Combinatorial Neural Coding.**
- 2020 **Referee for SIAM Journal on Discrete Mathematics.**
- 2018-2020 **UAW4121 Union Steward and Head Steward.**  
Regularly organize and facilitate union meetings and actions to build a stronger UW community and improve campus for all students, workers, and faculty. I am active on a weekly basis with our union’s Organizing Committee, Housing Justice Workgroup, Bargaining Team, and Joint Council.
- 2019 **Cornish College Faculty Development Workshops.**  
Three days of intensive faculty trainings to prepare for Fall 2019 semester.
- 2019 **“Teaching and Learning in Higher Education.”**  
University of Washington summer graduate course. Student.
- 2019 **Conference on Formal Power Series and Combinatorics.**  
University of Ljubljana, Slovenia. Attendee.
- 2019 **Summer School on Algebraic and Geometric Combinatorics.**  
Sorbonne Université, Paris. Student.
- 2019 **“Breaching Borders: Intersectional Pathways Towards Equity and Justice.”**  
University of Washington graduate course on equity in higher education. Student.
- 2018 **University of Washington Math Hour Olympiad Judge.**