Frances Herr

Contact: herrf@uchicago.edu
franherr.github.io

Education

University of Chicago – Chicago, IL

M.S. in mathematics – 2024
PhD candidate in mathematics

University of Washington – Seattle, WA

B.S. in mathematics, honors – 2022
B.A. in dance – 2022

Research Papers

Curve Stitching and Dancing Planets   2025
pdf. Github Repository. YouTube video.

- ➤ Modular stitch graphs are visual representations of multiplying members of $\mathbb{Z}/m\mathbb{Z}$ by some integer a. The caustics of the pictures are epicycloids.
- ➤ I connect these to a continuous dynamical system and classify the patterns that appear.

Iterated Jump Graphs   2022
joint with Legrand Jones II. arxiv. publication.

- ➤ Published in Rose-Hulman Undergraduate Journal.
- ➤ We look at the jump graph operation under iteration and find the end behavior of any given graph.

A characterization of two-dimensional Buchsbaum matching complexes   2021
joint with Jones, Goeckner, Rowlands. arxiv. publication.

- ➤ Published in The Electronic Journal of Combinatorics.
- ➤ We characterize all graphs whose matching complex is a two-dimensional Buchsbaum complex.

Explanatory Papers

Foliating Three-Dimensional Manifolds by Surfaces pdf.   2025
- ➤ Topics proposal for candidacy exam.
- ➤ Teichmüller space, mapping class groups, hyperbolic three-manifolds, foliations.

Unpacking Thurston's Theorem for post-critically finite maps *pdf.*   2024
- ➤ Final paper for Differential Topology graduate course.
- ➤ Classifying which topological branched coverings of S^2 are rational maps by looking at an action on a Teichmüller space.

All cellular strings on polytopes at once *pdf.*   2022
- ➤ Senior thesis for UW Mathematics major.
- ➤ Investigating a generalized version of the Baues problem on polytopes.

The Platonic Solids Strike Again! *pdf.*   2020
- ➤ Final paper for Complex Analysis at UW.
- ➤ Explanatory paper about the finite subgroups of Möbius Transformations.

OTHER PROJECTS

YouTube Channel GrapefruitGecko   June 2019 - present
Math communication and visual explanation through physical demonstration.

Braiding Through Time *link.*   May 2024
➤ A dance film about configuration spaces of points in the plane.
➤ Premiered at Bridges Conference film festival.

UW Dance Majors Concert choreography   March 2022
I lift up my eyes to the hills.
➤ Dance piece inspired by the optimal solution to the Tower of Hanoi puzzle.
➤ I set up a display with the Tower of Hanoi and information about the puzzle in the lobby.
➤ Experimenting in ways to engage a general audience with math.

RELEVANT WORK EXPERIENCE

- **Lead Instructor at U Chicago**   September 2025 - present
  Lecturing for Math 13100 calculus, holding office hours, communicating with students.
- **Teaching Assistant at U Chicago**   September 2024 - June 2025
  Running office hours, interacting with students, giving feedback on work.
- **National Museum of Mathematics**   July 2022 - July 2023
  Working as a docent, interacting with visitors, developing math communication content.
- **Mathnasium of Northwest Seattle**   May 2019 - September 2020
  Tutoring children in various levels of math (6 - 16 yrs).

ACTIVITES AND INTERESTS

- Leadership for the UChicago *Association for Women in Mathematics*
- Dance (modern, contemporary, swing, ballet)
- Crocheting mathematical spaces
- Programming in Sage, Python, Java, MATLAB, Html
- LaTex and Beamer formatting
- Video and sound editing
- Photography and videography
- Obscure Rubik's cube puzzles

AWARDS AND SCHOLARSHIPS

- McCormick Fellowship 2023-2025
  U Chicago fellowship for an incoming graduate student.
- Dean's Medal for the Natural Sciences 2022
  Award for a single undergraduate in the natural sciences at U Washington. Nominated by math faculty and selected by a committee of natural sciences faculty.
- Barbara Sando Scholarship in Mathematics 2020-21, 2021-22
  Scholarship for outstanding undergraduate women in mathematics.
- WA State Opportunity Scholarship 2018 - 2022
  Scholarship for promising WA state students in STEM fields.
- Annual Dean's List of Academic Excellence 2019, 2020, 2021, 2022