Hannah Park-Kaufmann

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Website: hakuupi.github.io (...with updates long overdue)

30 Campus Road
Annandale-on-Hudson
NY 12504, USA

Education

B.A. in Mathematics
B.M. in Classical Piano Performance 2020-2024 (expected)
Bard College Annandale-on-Hudson, NY
Cumulative GPA: 3.80/4.00

Research & Teaching Experience

Immersion Lab Research Assistant + Visiting Student 01.2023 - 05.2023 and 07.2023 - 09.2023
MIT - Department of Mechanical Engineering (Virtual) + Cambridge, MA

Physiological Correlates of Healthy vs. Injury-prone Pianist Movement

- Study lead. Broadly integrating methods from ML, physics, medical sciences, and mathematics with traditional schools of pianist education in order to understand the physiological correlates of healthy vs. injury-prone pianist movement. Designed experiment script, recruited subjects, wrote IRB protocol, lead data collection, and now directing analysis.

Analysing and Recording Data Modalities of Human Movement

- Formed comparative analysis of guitarists' heart and flow state data. Recorded motion capture, muscle, heart, acceleration, and force data for pilot studies. **Advisor:** Dr. Praneeth Namburi

Geometry and Topology in a Discrete Setting REU Researcher 05.2023 - 07.2023
Carnegie Mellon University - Department of Mathematical Sciences Pittsburgh, PA

Topological Methods for Advances in Combinatorics and Data Analysis

- Introduced topological generalizations to derive results in zero-sum Ramsey theory.
- Investigated nerve complexes & minimal distortion embeddings. **Advisor:** Prof. Florian Frick

Murthy Lab Research Intern 08.2022 - 09.2022
Harvard University - Department of Molecular and Cellular Biology Cambridge, MA

Ant Gait Analysis On Video Data With Computational Ethology

- Assembled cleaning, dimensionality reduction & modeling pipeline. **Advisor:** Dr. Souvik Mandal

Computational Mathematics for Data Science REU Researcher 06.2022 - 08.2022
Emory University - Department of Mathematics, Scientific Computing Group Atlanta, GA

Data Assimilation for Geophysics Models

- Integrated an Ensemble Kalman filter to improve simplified glacier model's predictions; coupled a storm surge model to explore sea level rise impact on storm surges. **Advisor:** Prof. Talea Mayo

Numerical Semigroups and Polyhedra REU Researcher 06.2021 - 08.2021
Polymath Jr. REU (Virtual)

Minimal Presentation Sizes of Numerical Semigroups

- Introduced a combinatorial approach involving posets to determine the attainable minimal presentation sizes given a fixed multiplicity. **Advisor:** Prof. Christopher O'Neill

Math Tutor 02.2022 - present
Bard Prison Initiative (BPI)
Bard College Department of Mathematics Green Haven | Annandale-on-Hudson, NY

- Math tutor for BPI at Green Haven Correctional Facility
- Tutored 'Proofs & Fundamentals', 'Time, Space & Infinity', Calculus 1 and 2 (MATH261,105,141,142)

Outreach & Leadership

President of Association for Women in Mathematics (AWM) Club & Chapter 2022-present
Bard College Annandale-on-Hudson, NY

Member of Outreach Committee 2022
Emory University Computational Mathematics for Data Science REU+RET Atlanta, GA

– Maximizing the broader impact of the site with dissemination of the site's activities and results beyond the REU+RET

Grants & Awards

– Bard...: Distinguished Scientist Scholar (DSS) Award ($10,000) - Independent Research Grant from Bard-President Botstein ($2,000) - DSS Independent Summer Research Grant ($1,500) - Mind, Brain and Behavior Award ($700) - Seniors to Seniors Award ($625) - Community Action Award ($350)

– Sustainability track of MIT hackathon (hackMIT2022), winning project

– International piano competition "Piano Talents", first prize

– Austrian national piano competition "Prima la Musica", first prize

Relevant Coursework

Mathematics: Control Theory & Optimization, Algebraic Topology, Discrete and Computational Geometry, Abstract Algebra, Real Analysis, Complex Analysis, Differential Equations, Math Methods of Physics I & II, Elementary Linear Algebra, Proofs and Fundamentals, Calculus II
Programming: Machine Learning, Data Structures, Object Oriented Programming
Other: To Overthrow the World, Translating Tact, Intr. Information Security

Relevant Skills

Languages: English (native), German (native), Chinese (fluent), Korean (proficient), French (beginner)
Programming: Extensive experience coding with Python, significant experience with Java, and functionally proficient with MATLAB, Mathematica, C++, and R. Comfortable with LaTeX, excel, and HTML/CSS.

Publications

[1] Florian Frick, Jacob Lehmann Duke, Meenakshi McNamara, **Hannah Park-Kaufmann**, Steven Simon, Zoe Wellner. Topological methods in zero-sum Ramsey theory. *In preparation*.

[2] Florian Frick, **Hannah Park-Kaufmann**, Steven Simon, Zoe Wellner. Cech Complexes of Hypercube Graphs. *In preparation*.

[3] Ceyhun Elmacioglu, Kieran Hilmer, Christopher O'Neill, Melin Okandan, **Hannah Park-Kaufmann**. On the cardinality of minimal presentations of numerical semigroups. *Submitted to Algebraic Combinatorics*. arXiv:2211.16283 [math.CO] (2022).

[4] Emily Corcoran, Logan Knudsen, Talea Mayo, **Hannah Park-Kaufmann**, Alexander Robel. Ensemble Kalman Filtering for Glacier Models. *Submitted to La Matematica*. arXiv:2210.02647 (2022).

Select Contributed Talks and Posters

[1] *Generalizations of the Erdos–Ginzburg–Ziv theorem via topology*, presented at the Young Mathematicians Conference, Columbus, OH, August 2023.

[2] *Data Assimilation for Glacier Models*, presented at the Joint Mathematics Meetings (JMM) - AMS-SIAM Special Session on Research in Mathematics by Undergraduates, Boston, MA, January 2023.

[3] *Minimal Presentation Sizes of Numerical Semigroups*, presented at JMM - American Mathematical Society and Pi Mu Epsilon (AMS-PME) Poster Session, (virtual), April 2022.