

Kathryn Beck

Curriculum Vitae

University of Delaware
Department of Mathematical Sciences
214 Ewing Hall
15 Orchard Road
Newark, DE 19711
✉ kbeck@udel.edu
🏠 sites.udel.edu/kbeck

EDUCATION

University of Delaware Ph.D. Mathematics (Expected 2025) Advisor: Mahya Ghandehari	Newark, DE 2020–present
University of Delaware M.S. Mathematics Advisor: Mahya Ghandehari	Newark, DE 2020–2023
Dickinson College B.S. Mathematics, Minor: Computer Science <i>Summa cum laude</i> Advisor: Richard Forrester	Carlisle, PA 2016–2020

RESEARCH INTERESTS

Graph(on) signal processing; Spectral theory of Cayley graphs; Frames for graph signals

HONORS AND AWARDS

- Fall Fourier Talks Best Poster Award, Norbert Wiener Center for Harmonic Analysis and Applications October 2024
Voted best poster at the annual Fall Fourier Talks Conference hosted by the Norbert Wiener Center at the University of Maryland, College Park.
- Winter Research Symposium Best Poster Award, University of Delaware February 2023
Voted best poster at the annual Winter Research Symposium hosted by the University of Delaware Department of Mathematical Sciences. Awarded with travel funds.
- Fall Fourier Talks Best Poster Award, Norbert Wiener Center for Harmonic Analysis and Applications October 2022
Voted best poster at the annual Fall Fourier Talks Conference hosted by the Norbert Wiener Center at the University of Maryland, College Park.
- Lance E. Kohlhaas Memorial Prize in Mathematics, Dickinson College May 2020
Awarded to a graduating mathematics major at Dickinson College who has demonstrated excellence in that field and shows promise in an actuarial or mathematics career.
- MAA Poster Session Honorable Mention, Joint Mathematics Meeting January 2020
Received an Honorable Mention for a poster presented at the 2020 Joint Mathematics Meeting, Denver, CO.
- Howard Lane Rubendall Senior Scholarship, Dickinson College August 2019
Awarded by president of the college to a rising senior who has displayed the highest combined level of leadership, scholarship, and service at Dickinson College.

- Henry P. Cannon Memorial Prize in Mathematics, Dickinson College May 2018
Awarded to a member of the sophomore class at Dickinson College who excels in mathematics.
- William W. Landis Memorial Prize in Mathematics, Dickinson College May 2017
Awarded to a member of the freshman class at Dickinson College.

PUBLICATIONS

Refereed Journals and Conference Proceedings

- **K. Beck**, M. Ghandehari, S. Hudson, J. Paltenstein “[Frames for signal processing on Cayley graphs](#),” arXiv: 2303.02812 (2024), accepted to the *Journal of Fourier Analysis and Applications*.
- **K. Beck**, M. Ghandehari, J. Janssen, and N. Kalyaniwalla, “[Signal processing on large networks with group symmetries](#),” *Graph Signal Processing Workshop* (2023), Oxford.
- **K. Beck** and M. Ghandehari, “[Frames for graph signals on the symmetric group: a representation theoretic approach](#),” *IEEE Xplore: European Signal Processing Conference EUSIPCO* (2022), 2071-2075.
- **K. Beck**, L. Cenek, M. Cream, and B. Gelb “[Chorded pancyclic properties in claw-free graphs](#),” *The Australasian Journal of Combinatorics* 83, no. 3 (2022): 312-36.
- **K. Beck** and L. Koss “[Symmetries of an online culture: Two-colour frieze patterns in friendship bracelets](#),” *Symmetry: Culture and Science* Volume 32, no. 1 (2021): 091-102.

PRESENTATIONS

Colloquium and Invited Seminar Talks

- Discrete Math Seminar, Department of Mathematical Sciences, University of Delaware, Newark, DE November 2024
- Graphs@TMU Seminar (virtual), Toronto Metropolitan University, Toronto, ON November 2024
- Math Seminar, Department of Math and Computer Science, Washington College, Chestertown, MD October 2024
- CS Colloquium, Department of Computing Sciences, Villanova University, Villanova, PA March 2024
- Rutgers Association for Women in Math Seminar (virtual), Rutgers University, New Brunswick, NJ October 2023
- Hallenbeck Graduate Student Seminar, Department of Mathematical Sciences, University of Delaware October 2023
- Math/CS Colloquium, Department of Math and Computer Science, Dickinson College, Carlisle, PA January 2020

Conference Talks

- AMS Contributed Papers, Combinatorics, graph theory, order, and general algebraic systems III, Joint Mathematics Meetings (JMM), Seattle, WA January 2025
- Enhancing Diversity in Graduate Education (EDGE) Summer Symposium 2022, Spelman College, Atlanta, GA July 2022
- AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs, IV, Joint Mathematics Meetings (JMM), Denver, CO January 2020
- Women In Mathematics In New England (WIMIN) Conference, Smith College, Northampton, MA September 2019

Poster Presentations

- Fall Fourier Talks, Norbert Wiener Center for Harmonic Analysis and Applications, Department of Mathematics, University of Maryland, College Park, MD October 2024
Received Award for Best Poster

- Women in Algebra and Combinatorics Conference, Department of Mathematics and Statistics, University at Albany, Albany, NY April 2023
- Winter Research Symposium, Department of Mathematical Sciences, University of Delaware February 2023
Received WRS Poster Award
- Fall Fourier Talks, Norbert Wiener Center for Harmonic Analysis and Applications, Department of Mathematics, University of Maryland, College Park, MD October 2022
Received Award for Best Poster
- MAA Poster Session, Joint Mathematics Meeting (JMM), Denver, CO January 2020
Received Honorable Mention Award

TEACHING AND PROFESSIONAL EXPERIENCE

University of Delaware

- **Instructor of Record**

- MATH 241: Analytic Geometry and Calculus A* Summer 2024
For Resources to Inspire Successful Engineers (RISE) Academy
- MATH 232: Integrated Calculus IB* Winter 2024
With the Mathematical Sciences Learning Laboratory (MSLL)
- MATH 010: Intermediate Algebra, 2 sections* Fall 2023
With the Mathematical Sciences Learning Laboratory (MSLL)
- MATH 221: Calculus I* Summer 2023

- **Teaching Assistant**

- MATH 230: Finite Mathematics with Applications* Spring 2023
- MATH 243: Analytic Geometry and Calculus C* Spring 2022
- MATH 241: Analytic Geometry and Calculus A* Fall 2021
- MATH 242: Analytic Geometry and Calculus B* Spring 2021
- MATH 241: Analytic Geometry and Calculus A* Fall 2020

- **Guest Lecturer**

- MATH 113: Contemporary Mathematics* Fall 2023

Dickinson College

- **Undergraduate Writing Associate**

Collaborated with professors to create writing goals for students in writing-heavy mathematics-based courses. Facilitated group peer review sessions of proof-writing portfolios and research papers. Aided students with proof structure development and motivated students towards learning and studying to build self-confidence in writing processes.

- MATH 211: Discrete Mathematics* Spring 2020
- FYSM 100: First-Year Seminar, "Post-Facts, Big Data"* Fall 2019
- MATH211: Discrete Mathematics* Spring 2018
- FYSM 100: First-Year Seminar, "Decisions, Decisions!"* Fall 2017

- **Peer Writing Tutor, Multilingual Writing Center**

Fall 2017-Spring 2020

Provided individual tutoring sessions for students working on composition and scientific writing. Promoted the development of functional writing processes. Guided students on writing assignments in all academic disciplines, with a special emphasis on mathematics literacy.

- **Mathematics Tutor, Department of Mathematics and Computer Science**

Fall 2019

Hosted Math Help Room hours once a week. Assisted students with questions related to math homework assignments and projects from all undergraduate math courses.

MENTORING EXPERIENCE

Funded Undergraduate Research Mentorship

- **Summer Scholars, University of Delaware** June 2024-August 2024
Signal processing on graphs with symmetries
 - * **Student:** David Krupiarz, Freshman
 - * **Project:** Study signals on graphs which can be interpreted as Cayley graphs on different groups using the graph Fourier transform and linear algebraic techniques.
 - * **Role:** Selected a focus for the project and came up with a problem for the student to work towards. Curated material and textbook for the student to learn the necessary background. Developed a weekly schedule of material for the student to learn and work on. Led weekly meetings to discuss student progress and teach background material. Introduced the student to LATEX and helped the student prepare a write up in LATEX of what they had learned. Taught the student how to use Mathematica.
- **UNIDEL Research and Summer Scholars, University of Delaware** June 2021-August 2021
Frames for signal processing on Cayley graphs
 - * **Faculty Supervisor:** Mahya Ghandehari
 - * **Student:** Jenna Paltenstein, Freshman
 - * **Project:** Investigate the representation-theoretic structure of the adjacency matrix of the permutahedron in order to develop bases and frames for signal processing on general Cayley graphs.
 - * **Role:** Created a schedule of weekly content for the student to work on based on an initial plan from the faculty advisor. Held weekly meetings to check in on student progress, answer questions, and teach additional background content. Introduced the student to LATEX. Guided them in designing a LATEX beamer poster with our results, to present at the summer research symposium poster session. Collaborated with the faculty supervisor and student to write a paper of our results.

Peer Mentorship

- **Graduate Student Peer Mentorship Program Organizer** August 2023-ongoing
Co-organized the AWM student chapter's Graduate Student Peer Mentorship Program, which pairs first year graduate students with upper-year graduate students. Mentors serve as a resource to the mentees to help ease their transition into graduate school and support them during their first year.
- **Graduate Student Peer Mentor** August 2022-May 2024
Served as a mentor to three graduate students during their first year of the graduate program, through the AWM student chapter's Peer Mentorship Program. Met regularly throughout the year to discuss the mentee's expectations, goals, and challenges. Guided the students and provided advice on coursework, qualifying exams, work/life balance, and choosing a research advisor. Participated in mentor/mentee networking events organized by AWM.

Other Mentorship

- **Graduate Student Orientation Presentation** August 2024
"Tips and hints - a graduate student perspective," with Isabel Byrne, Graduate Student Orientation, Department of Mathematical Sciences, University of Delaware, Newark, DE
- **MAA Math Values Article** April 2023
"Questions to ask to identify a supportive graduate program as a woman or gender minority in math," K. Beck, B. Gelb, J. Hamlin, H. Mahmoudian, N. Malawo, L. Martinez, and R. Whitman, *MAA Math Values* (2023)
- **Panel Member** Fall 2021 and Fall 2023
Served on the preliminary exam panel for the Hallenbeck Graduate Student Seminar (HGSS). Answered questions regarding my experiences with the preliminary exam process at University of Delaware, and provided advice for student success.

SERVICE AND OUTREACH

University of Delaware

- **Association for Women in Mathematics (AWM) Student Chapter** September 2022–ongoing
Executive committee member
Served on the executive committee in multiple roles including president (2023-2024), vice president (2022-2023), and treasurer (2024-ongoing). Coordinated professional development workshops in STEM for graduate and undergraduate students, organized the AWM Graduate Student Peer Mentorship Program, and hosted social events for members. Facilitated weekly executive committee meetings, planned and maintained a \$2000 budget, and coordinated with the faculty liaison.

Selected Events

- * **Job Search Process Seminar:** Two faculty members share advice on the academic job search process, with topics including submitting applications responsive to job ads, preparing for interviews, and engaging with the search committee.
 - * **Mental Health and Wellbeing Panel:** A panel of graduate students discuss how they have managed their mental during graduate school, and what tools and resources they have used to help. The panel is followed by an open discussion about graduate student mental health, in a safe space where all graduate students are welcome to participate.
 - * **Coffee Hour and Discussion - National Labs:** A visiting speaker from Los Alamos National Lab shares their experience working for a national lab, and answers questions for students interested in this career path.
- **Hallenbeck Graduate Student Seminar (HGSS)** June 2022-May 2024
Co-organizer
Collaborated with peer organizer to host the weekly graduate student seminar. Sent out open calls for graduate student speakers, individually invited student speakers, and curated a schedule. Facilitated question and answer sessions with speakers, and managed a weekly food order. Designed and hosted a special event with a panel of graduate students discussing the preliminary exams, intended for first-year graduate students.
 - **Math Circle** October 2023-ongoing
Chapter co-founder and co-organizer
Established and organized the University of Delaware Math Circle chapter, a recurring outreach event at local schools which seeks to encourage high school aged students to pursue STEM fields by engaging in extracurricular math problems posed as puzzles and games.

Dickinson College

- **Inclusivity in STEM Initiative** August 2019-May 2020
Planning Committee Member
Organized campus-wide events to encourage and raise awareness about inclusivity in STEM, Facilitated Clarke-Forum Tertulia, “Bias in AI,” Guided Discussion, 21 Nov. 2019, Hosted film screening and discussion group, “Code: Debugging the Gender Gap,” 27 Feb. 2020.
- **Computer Science Professor Search Committee Student Participant** August 2019-November 2019
Conducted lunch interviews for prospective faculty candidates. Attended research presentations of prospective candidates. Provided feedback on prospective candidates to the Department of Mathematics and Computer Science.

SUMMER PROGRAM PARTICIPATION

- **Enhancing Diversity in Graduate Education (EDGE) Summer Program** June 2020-July 2020

2020 EDGE Cohort, Virtual

Selected for and participated in the 2020 EDGE Summer Program, a Ph.D. preparatory and mentorship program for women and gender nonconforming students who are entering or have finished their first year of a Ph.D. program in the mathematical sciences. Completed courses in analysis, measure theory, algebra, numerical linear algebra, and programming. Participated in daily collaborative problem-solving sessions, attended research colloquia and panel talks, and engaged in Difficult Dialogues sessions where cohort members discussed and learned about issues of equity and identity within the mathematics profession.

COMPUTER SKILLS

Proficient: Python, Java, MATLAB, Mathematica, L^AT_EX, Canvas, ALEKS, WebAssign, Microsoft Office

Some experience: HTML