RACHEL BAILEY

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EDUCATION

University Of Connecticut, Ph.D, Mathematics — *Fall 2019 - August 2024*
Advisors: Maria Gordina and Maxim Derevyagin

University of Connecticut Bachelor of Arts, Mathematics — *Fall 2016-Fall 2018*
Minor in statistics

Three Rivers Community College — *Spring 2015 -Spring 2016*

EMPLOYMENT

Assistant Professor, Bentley University — *Fall 2024-Present*

Graduate Assistant, University of Connecticut — *Fall 2019-June 2024*

Graduate Complex Analysis Qualifying Exam Tutor, UConn — *Summer 2024, Summer 2021, Winter 2021*

Graduate Complex Analysis Grader, UConn — *Spring 2022*

Undergraduate Math Q-Centor tutor, UConn — *Spring 2018, Fall 2018*

TEACHING EXPERIENCE

Assistant Professor Bentley University

- MA139 Calculus II — *Fall 2025*
- MA131 Calculus I — *Fall, 2025, Spring 2025, Fall 2024*
- MA401 Analysis with an Introduction to Proofs — *Spring 2025*

Graduate Assistant University of Connecticut

- MATH 1071Q Calculus for Business and Economics *(primary instructor)* — *Fall 2023*
- MATH 1131Q Calculus 1 *(teaching assistant)* — *Fall 2019, Fall 2023*
- MATH 2410 Elementary Differential Equations *(primary instructor)* — *Spring 2023*
- MATH 2110Q Multivariable Calculus *(teaching assistant)* — *Fall 2022*
- MATH 1132Q Calculus 2 *(teaching assistant)* — *Spring 2020, Fall 2021*
- MATH 1060Q Pre Calculus *(primary instructor)* — *Fall 2020*

PAPERS

R. Bailey, S. Costa, M. Derevyagin et al. *Hamiltonians that realize perfect quantum state transfer and early state exclusion*. Quantum Inf Process 24, 51 (2025).

R. Bailey and M. Derevyagin. *DEK-type orthogonal polynomials and a modification of the Christoffel formula*. J. Comput. Appl. Math. 438 (2024), Paper No. 115561.

R. Bailey and M. Derevyagin. *Complex Jacobi matrices generated by Darboux transformations*. J. Approx. Theory 288 (2023), Paper No. 105876, 33 pp.

R. Bailey and E. Gunawan. *Cluster Algebras and Binary Subwords*. *Order* 39 (2022), no.1, 55–69.

PEER-REVIEWED CONFERENCE PROCEEDINGS

R. Bailey and E. Gunawan. *Cluster Algebras and Binary Words*. *Sem. Lothar. Combin.* 82B (2020), Art. 81, 12pp.

PREPRINT

R. Bailey. *Orthogonal Polynomials and Perfect State Transfer*. 2024. arXiv: 2412.16351 [quant-ph].

B. Akwei et al. *Convergence, optimization and stability of singular eigenmaps*. 2024. arXiv: 2406.19510 [math.PR].

IN PREPARATION

R. Bailey et al. *A Characterization of Fractional Gaussian Fields* on S^1 and the d-Torus. 2022.

UNDERGRADUATE RESEARCH MENTORSHIP

Transformations of Orthogonal Polynomials *Spring 2025*
Worked with Bentley undergraduate research assistants studying modifications of sequences of orthogonal polynomials.

Bentley Valente Undergraduate Student Research Mentor *Fall 2024, Spring 2025*

UConn Mathematics REU Graduate Mentor* *Summer 2024*
Laplacian Eigenmaps, orthogonal polynomials, quantum information

UConn Mathematics REU Graduate Mentor* *Summer 2023*
Laplacian Eigenmaps

UConn Directed Reading Program *Spring 2023*
Mentored an undergraduate student through a semester-long independent study on random walks on graphs

UConn Mathematics REU Graduate Mentor * *Summer 2022*
Fractional Gaussian Fields on Surfaces and Graphs

**Duties included of teaching an introduction to probability, helping write abstracts for the Young Mathematicians Conference, and directing students through the process of research and writing a research paper.*

HONORS AND AWARDS

Bentley University FAC Teaching Grant *Fall 2024*

ProjectNExT Fellow *2024-2025*

UConn Summer Doctoral Dissertation Fellowship *Summer 2024*

UConn Predoctoral Fellowship *Spring 2024*

Louis J. Deluca Memorial Award: Excellence in Teaching *Spring 2023*

Connie Strange Graduate Community Award *Spring 2023*

UConn Provost "Excellence In Teaching" *Fall 2019, Fall 2020*

SERVICE

Bentley Dept. of Math. Sciences Social Committee *Fall 2024-Current*

Bentley Calculus Enrollment Working Group *Fall 2024-Current*

UConn Sports Analytics Symposium *April 2024*
Volunteer judge for the poster session

MathCounts *February 2023/2024*
Volunteer grader

UConn SIGMA Organizer *Fall 2022-Spring 2024*
Organized speakers for the weekly SIGMA seminar

Volunteer math tutor for the UConn Women in Math, Science and Engineering learning community *Spring 2022, Fall 2022*

Vice President of AMS Graduate Student Chapter *Fall 2020-Spring 2023*

Graduate Student Mentor *Fall 2020-Present*
Mentored first year graduate students

UCONN AMS Integration Bee *October 2019, March 2020, October 2021, and October 2022*
Organized and judged the integration bee for undergraduate students both online and in person

RESEARCH ASSISTANTSHIPS

Research Assistant supported by NSF DMS grant no. 2246549 *Spring 2024*

Research Assistant supported by NSF DMS grant no. 2008844 *Summer 2021, Spring 2022*

Research Assistant through Research Excellence Program Award for 2020–2021 *Spring 2021, Summer 2021*
Padé approximation in noise filtering, $19,243

Research on Coxeter groups and cluster algebras *Summer 2018*

INVITED TALKS

The Third Joint SIAM/CAIMS Annual Meetings Upcoming July 2025
"Orthogonal Polynomials and Perfect State Transfer"

International Celebration of Women in Math (UConn) May 2025
"Celebrating Women in Math"

AMS Spring Eastern Sectional Meeting April 2025
"Orthogonal Polynomials and Perfect State Transfer"

University of New Mexico Analysis Seminar *April 2024*
"DEK-Type Orthogonal Polynomials" (The Extended Version)

University of Hartford Mathematics Colloquium *March 2024*
"A Random Walk Along the Theory of Orthogonal Polynomials"

JMM Special Session: Numerical Analysis, Spectral Graph Theory, Orthogonal Polynomials, and Quantum Algorithms *January 2024*
"A new perspective on an old example"

AWM JMM 2024 Poster Session and Workshop *January 2024*
"DEK-Type Orthogonal Polynomials"

SIAM Quantum Walks on Graphs Workshop *April 2023*
"Orthogonal Polynomials and Quantum Walks on Graphs"

JMM Special Session: Orthogonal Polynomials and their Applications III *January 2023*
"A Modification of the Christoffel Formula"

Bridgewater State University Math Seminar *December 2022*
"Darboux Transformation and Exceptional Orthogonal Polynomials"

Advances In Operator Theory and Applications to Mathematical Physics *November 2022*
"Modification of the Christoffel Formula"

UConn Math Club *September 2022*
"An Introduction to Orthogonal Polynomials"

SIAM Quantum Computing Workshop *March 2022*
"Probability in Quantum Computing"

UConn SIGMA Seminar *March 2022*
"Orthogonal Polynomials and the Christoffel Formula"

AMS Spring Eastern Sectional Meeting *March 2022*
"The Dubov-Eleonskii-Kulagin Polynomials and a Modification of the Christoffel Formula"

UConn Mathematics Continued Conference *October 2021*
"Orthogonal Polynomials: When Analysis Meets Linear Algebra"

Formal Power Series and Algebraic Combinatorics *July 2019*
Presented "Cluster Algebras and Binary Words" poster

WIMIN at Smith College *September 2018*
"Binary Words and Antichains of Posets"

CONFERENCES AND WORKSHOPS

Joint Mathematics Meetings *January 2025*

MAA MathFest *August 2024*

Joint Mathematics Meetings January 2024

Séminaire de Mathématiques Supérieures 2023: Periodic and Ergodic Spectral Problems *July 2023*
SLMath Summer School

SIAM Quantum Walks on Graphs Workshop *April 2023*

Advances in Operator Theory and Applications to Mathematica Physics *November 2022*

Joint Mathematics Meeting 2023 *January 2023, 2024*

UConn Teaching Seminar *Fall 2022-Present*

UConn Mathematics Continued Conference *October 2022, 2023, 2024*

Radboud Summer School (Nijmegen, Netherlands) *August 2022*
Orthogonal Polynomials, Special Functions and their Applications

MSRI Workshop: A Celebration for Women in Mathematics *May 2022*

SIAM Quantum Computing Workshop *March 2022*

Analysis Learning Seminar- University of Connecticut *Fall 2020*

Binghampton University Graduate Conference in Algebra and Topology *November 2020*

Formal Power Series and Algebraic Combinatorics (Ljubljana, Slovenia) *July 2019*

ORGANIZATIONS

Member of AWM *Current*

Member of MAA *Current*

Member of Pi Mu Epsilon Mathematical Society *Inducted April 2019*