

Contact Information	Department of Mathematical Sciences 121 Bodenheimer Dr. Appalachian State University Boone, NC 28608	Office: 332 Walker Hall Phone: (828) 262-2908 Email: williamsnn@appstate.edu
Webpage	https://appstate.edu/~williamsnn	
Research Area	Probability theory with applications to random polynomials and random matrices.	
Education	<p>University of Colorado Boulder (CU Boulder), Boulder, CO Ph.D., Mathematics, May 2019. Dissertation: “On the pairing between zeros and critical points of random polynomials with independent roots.” Advisor: Sean O’Rourke.</p> <p>University of Colorado Boulder, Boulder, CO M.A., Mathematics, May 2017. Advisor: Sean O’Rourke.</p> <p>University of Wisconsin - Eau Claire (UWEC), Eau Claire, WI B.A., Mathematics, Liberal Arts, May 2013. Summa cum laude. Minor: French, Liberal Arts. Study Abroad: Pau, France, Spring 2011.</p>	
Academic Appointments	<p>2019-present: Assistant Professor, Department of Mathematical Sciences, Appalachian State University (App. State), Boone, NC.</p> <p>2018-19: Assistant Coordinator for Calculus II, Dept. of Math., CU Boulder.</p> <p>2016-17: Lead Graduate Teacher, Department of Mathematics, CU Boulder.</p> <p>2015-16: Lead Graduate Teacher for the Department of Mathematics, Graduate Teacher Program: Graduate School, CU Boulder.</p>	
Publications	<p>S. O’Rourke, N. Williams, <i>An asymptotic refinement of the Gauss–Lucas theorem for random polynomials with i.i.d. roots</i>. Available at https://arxiv.org/abs/2409.09538.</p> <p>T. Greenwood, J. Kariv, and N. Williams, <i>From discrete to continuous: Monochromatic 3-term arithmetic progressions</i>. Math. Comp. 93 (2024), No. 350, 2959–2983. Available at https://doi.org/10.1090/mcom/3970.</p> <p>S. O’Rourke, N. Williams, <i>Partial linear eigenvalue statistics for non-Hermitian random matrices</i>. Theory Probab. Appl. 67 (2023), No. 4, 613–632. Available at https://doi.org/10.1137/S0040585X97T991179 and https://doi.org/10.4213/tvp5462.</p> <p>S. O’Rourke, N. Williams, <i>On the local pairing behavior of critical points and roots of random polynomials</i>. Electron. J. Probab. 25 (2020), 1–68. Available at https://projecteuclid.org/euclid.ejp/1597737717.</p> <p>A. Brisbin, M. Riehl, and N. Williams. <i>The Deletion-Insertion model applied to the genome rearrangement problem</i>. Pure Math. Appl. (P.U.M.A.) 28 (2019), No. 1, 1–13. Available at https://doi.org/10.1515/puma-2015-0030.</p> <p>S. O’Rourke, N. Williams, <i>Pairing between zeros and critical points of random polynomials with independent roots</i>. Trans. Amer. Math. Soc. 371 (2019), No. 4, 2343–2381. Available at https://doi.org/10.1090/tran/7496.</p>	

- J. Christy, J. McHugh, M. Riehl, N. Williams. *Distribution of genome rearrangement distance under double cut and join*. *Involve* 7 (2014), No. 4, 491–507. Available at <https://doi.org/10.2140/involve.2014.7.491>.
- J. Christy, J. McHugh, M. Riehl, N. Williams. *Maximally distant genomes under the DCJ operation*. Abstract published in the proceedings of the Permutation Patterns Conference, 2010, Dartmouth New Hampshire.
- Invited Talks**
- *Upcoming* Invited Talk: *An asymptotic refinement of the Gauss–Lucas theorem for random polynomials with i.i.d. roots*, ICERM Workshop “Random Polynomials and their Applications,” Brown University, August 4–8, 2025.
- Random Thoughts on the Gauss–Lucas Theorem*, Invited Talk, Elon University Math and Stats Colloquium, March 7, 2024.
- Invited panelist, *The Joyful Journey: Graduate Student and Postdoctoral Scholar Professional Development Series*, CU Boulder Center for Teaching & Learning in partnership with the CIRTLL Network, Zoom, Jan. 26, 2024.
- Partial linear eigenvalue statistics for non-Hermitian random matrices*, Invited Talk, AMS Special Session on Random Matrix Theory and its Applications, Joint Mathematics Meetings, April 9, 2022, online.
- Invited panelist for *University of Colorado Boulder Center For Teaching & Learning Early Career Faculty Panel*, Zoom, Feb. 22, 2022
- Unfolding Math in Origami*, Invited Talk, CS4All Program, June 30, 2021
- Unfolding the Math in Origami*, Invited Talk, S-STEM Seminar, March 26, 2021
- Partial linear eigenvalue statistics for i.i.d. random matrices*, Invited talk, AMS-SIAM Special Session on Random Matrices and Integrable Systems, Joint Mathematics Meetings, Denver, CO, Jan. 18, 2020
- Random Polynomials: A Critical Look at Critical Points*, Invited Job Talk, Math Sciences Colloquium, Appalachian State University, February 28, 2019.
- Tactivation: Motivating with Manipulatives*, Invited Talk, CU Graduate Teacher Program Fall 2017 Monday Workshop Series, September 11, 2017
- Grants, Honors, and Awards, 2014–present**
- \$1200 URA grant for student researcher N. Monk, Office of Stud. Research, Fall 2022
 \$2000 2021-22 Assessment Grant Award (w/ T. Palmer, K. Mawhinney, Q. Morris)
 2018 Haller summer fellowship - Summer 2018
 2017 Summer Graduate School Fellowship - Spring 2017
 Burton W. Jones Teaching Excellence Award, CU Boulder Mathematics - Spring 2017
 “Best Should Teach” Silver Award, GTP, Graduate School, CU Boulder - August 2015
 W. E. Briggs Teaching Excellence Award, CU Boulder Mathematics - 2014
- Mentoring Student Researchers**
- 2022-present: *Defining trajectories from recursive pairing between zeros and critical points of derivatives of random polynomials* with student **Nickolos Monk, CS '21**
- 2020: *Investigating behavior of zeros of iterated derivatives of random polynomials* with students **Kira Laws** (Math Sec. Ed., '21) and **Carly Moyers** (Act. Sci. '22)
- Senior Honors Theses:
- Fall 2024: **Matthew Cvach**, *Strategies for Optimizing Resource Use in Marvel SNAP*
 Fall 2023: **Emily Lambdin**, *Exploring Algebraic Sums of Measure Zero Sets*
 Spring 2023: **Brody Miller**, *Bringing the Buffon Needle Problem Down to Earth*
- Master’s-Level Directed Research Projects:
- Fall 2023: **Brody Miller**, *Bringing the Buffon Needle Problem Down to Earth*

Mentoring Fall 2024: Claire Calhoun, *College Algebra*, Teaching Assistantship
Grad-Student Spring 2024: Brody Miller, *College Algebra*, Teaching Assistantship
Teachers at ASU Spring 2024: Caroline Fehlman, *Intro to Linear Algebra*, Teaching Apprenticeship
 Fall 2023: Armissa Bowles, *Introduction to Mathematics*, Teaching Assistantship
 Spring 2022: Nic Garzone, *Introduction to Mathematics*, Teaching Assistantship

Teaching at App. State University 2019-present: Assistant Professor of Mathematical Sciences

Full-time teaching load of 18 credit hours per academic year. Class sizes limited to roughly 33 students per section. I taught these courses using a variety of styles and formats that sought to prioritize space for student practice and group work during class rather than uninterrupted lecture. I graded all student homework, quizzes, and exams with the exception of some online homework assignments in my Calculus I and Linear Algebra classes (Macmillan Learning's Sapling, Pearson's MyLab online) and all assessments in Introduction to Statistics (Pearson's MyLab online). In addition to synchronous in-person courses, I have also experimented with synchronous and asynchronous online formats including several "hybrid" courses, where some students attended online and others were present in the classroom.

**The COVID-19 pandemic challenged learning & teaching in *-ed courses, 2020–22.*

Fall 2024 - in progress:

Introduction to Mathematics (2 sections, 60 students, in person)
 Computational Probability (master's level, 6 students, in-person)

Spring 2024:

Introduction to Linear Algebra (1 section, 33 students, in person)
 Fundamentals of Probability (1 section, 13 students, in person)

Fall 2023:

Introduction to Mathematics (2 sections, 68 students, in person)
 Computational Probability (master's lvl., 10 in-person, 12 synchronous online stud.)

Spring 2023:

Intro. to Measure Theory, Jr. Honors Seminar (1 section, 10 students, in person)
 Fundamentals of Probability (1 section, 10 students, in person)

Fall 2022:

Introduction to Mathematics (2 sections, 66 students, in person)
 Computational Probability (master's level, 6 students, in person)

Spring 2022:

*Introduction to Linear Algebra (1 section, 20 students, in person)
 *Fundamentals of Probability (1 section, 11 students, in person)

Fall 2021:

*Introduction to Mathematics (2 sections, 68 students, in person)
 *Computational Probability (master's level, 12 students, in person)

Spring 2021:

*Calculus I (1 section, 31 students, some online synchronous portions)
 *Introduction to Statistics (1 section, 33 students, some online synchronous portions)

Fall 2020:

*Introduction to Mathematics (2 sections, 68 students, online synchronous)
 *Computational Probability (master's level, 14 students, hybrid-online synchronous)

Spring 2020:

*Calculus I (1 section, 37 students, second half was online asynchronous)
 *Fundamentals of Probability (1 section, 16 students)

Fall 2019:

Introduction to Mathematics (2 sections, 67 students)
 Probability and Random Matrices, Junior Honors Seminar (1 section, 8 students)

Teaching at CU Boulder**2018-19: Assistant Coordinator for Calculus II**

I co-coordinated 24 sections of second semester calculus with Joseph Timmer in Spring 2019 and 15 sections with Sebastian Casalaina-Martin in Fall 2018. In this role, I led weekly instructor meetings, taught a weekly pedagogy class to prepare undergraduate Learning Assistants (LAs) and graduate Teaching Assistants (TAs) to lead their recitations, and maintained the course website (<http://math.colorado.edu/math2300>, Spring 2019) and Canvas page (Fall 2018). I also participated in curriculum development and scheduling. During Fall 2018, I supported 11 instructors, 5 TAs and 6 LAs, and in Spring 2019, I supported 20 instructors, 6 TAs, and 9 LAs.

2015-17: Lead Graduate Teacher for the Math Department

I was selected by the Math Department to receive a Graduate Teacher Program (GTP) appointment as a Lead Graduate Teacher, a role in which I was trained to support developing graduate teachers. As a Lead, I co-taught the Math Department's college pedagogy seminar, conducted video teacher consultations with colleagues, and organized orientation week for first-year math graduate students. I was also responsible for promoting GTP workshops and organizing weekly department teas.

2015-17: Co-teacher for teacher-training courses

As the Lead Graduate Teacher for CU Math I worked with faculty mentors Faan Tone Liu (Fall 2015) and John Martin (Fall 2016, Spring 2017) and graduate students Keli Parker (2015) and Cherry Ng (2016-17) to teach our department pedagogy course for first and second-year TAs. Topics included, among other things, classroom management, facilitating mathematical group work, motivating students, lesson planning, mental health, diversity, and balancing teaching and research. A typical class included group discussions, role-playing, writing and responding to minute-papers. I led roughly one-third of the course sessions.

2014-18: Instructor of record in coordinated courses

During a typical semester at CU Boulder, I was the instructor of record for one 35-student section of a coordinated course that met four days per week. This means that several sections shared a common syllabus and exams, but I had the freedom to develop my own materials and to manage my daily class-periods according to my desire. My out-of-class responsibilities included lesson planning, quiz- and exam-writing, holding weekly office hours, and tutoring in the Math Academic Resource Center. I taught the following courses as the instructor of record.

Calculus II - Summer 2016, Fall 2017, Spring 2018

Introduction to Statistics - Fall 2015, Spring 2016

Calculus for Social Sciences and Business - Summer 2015, Fall 2016

Calculus I - Summer 2014, Fall 2014, Spring 2015

2013-19: Teaching Assistant in coordinated courses

Responsibilities included facilitating projects during weekly recitations of 35 students each, attending a weekly pedagogy and lesson-planning session with undergraduate Learning Assistants, homework, project, and exam grading, exam proctoring, and tutoring in the Math Academic Resource Center. At CU Boulder, I have been a TA for the following courses.

Calculus II - Fall 2018 (1 section), Spring 2019 (1 section)

Precalculus Mathematics - Spring 2017 (4 sections)

Calculus I - Spring 2014 (3 sections)

Finite Mathematics - Fall 2013 (4 sections)

2013-19: Tutor, Mathematics Academic Resource Center (MARC)

I have tutored for several hours per week each semester. In this role, I answer student questions and promote collaboration on mathematics coursework in our tutoring center.

Professional Development in Teaching**2019-20: MAA Project NExT (New Experiences in Teaching) Fellow**

I was selected as one of roughly 100 early career faculty to participate in a year-long professional development opportunity during which I attended week-long teaching workshops and seminars at MAA's Math Fest (July 2019), the JMM (January 2020), and a three-day, synchronous online Project NExT conference (July 2020). By participating in Project NExT, I sought to improve my teaching and to gain a life-long network of mathematical educators across the country with whom I continue to learn and develop evidence-based teaching practices.

May 2019: Certificate in College Teaching, CU Boulder GTP

The Graduate Teacher Program (GTP) seeks to promote exceptional college teaching through professional development workshops and a network of Lead Graduate Teachers in departments across campus. In addition to the teaching activities mentioned earlier in this document, I have attended over 20 GTP workshops, logged 30 hours of discipline specific training, and have been observed in my teaching by faculty and graduate students. For these achievements an accompanying teaching portfolio, I received a GTP Certificate in College Teaching.

July 2015 and August 2016: Inquiry-Based-Learning (IBL) Workshops

I have attended two workshops to learn about student-centered teaching that promotes "active-learning" over traditional lecture. Influenced by the Moore Method, this way of instruction views students as active participants and teachers as facilitators. I was introduced to IBL techniques in July 2015 at a week-long IBL Workshop lead by Stan Yoshinobu and the Academy of Inquiry Based Learning at Caly Poly in San Luis Obispo. In August 2016, CU Boulder invited Dana Ernst and others to lead a three-day IBL workshop specifically designed for the courses and teachers in our department.

Tutoring and Grading at UWEC**2010-13: Tutor in the UWEC Math Lab**

I answered student questions on math coursework in our undergraduate resource center.

2010-13: Grader for undergraduate courses

I graded undergraduate student work, including homework assignments and term projects, for Professors Manda Riehl and Michael Penkava for the following courses.

Abstract Algebra II - Spring 2013

Discrete Mathematics - Fall 2010, Spring 2013

Abstract Algebra I - Fall 2012

A Short Course in Calculus - Summer 2010, Summer 2011

Research Projects as an Undergraduate

Research with Drs. Manda Riehl and Abra Brisbin, UWEC - fall 2010 to summer 2013: *The Deletion-Insertion Model Applied to the Genome Rearrangement Problem.*

Research with Dr. Simei Tong, UWEC - summer 2011 to spring 2012: *Inequalities and Isomorphisms in L_p Spaces, $p > 2$, with the Alspach Norm.*

Research with Dr. Manda Riehl, UWEC - fall 2009 to summer 2010: *Distinct Minimal Sequences in Genome Arrangements using the Double Cut and Join Model.*

Academic Honors and Awards, 2008–2013

UWEC Exceptional Achievement in Mathematics by a Senior Student Award - 2013

UWEC Outstanding Senior Award - 2013

Score of 20 on the 2012 William Lowell Putnam Mathematical Exam

UWEC Exceptional Achievement in Mathematics by a Junior Student Award - 2012

Honorable mention for Barry M. Goldwater Scholarship Competition - Spring 2012

Philip S. Zivnuska Scholarship, UWEC - Spring 2012

Gale Crouse Scholarship for Service Learning in Pau, France - Awarded Fall 2011

Honorable mention for Barry M. Goldwater Scholarship Competition - Spring 2011
 Dolly Rounds award for study abroad in Pau, France - Spring 2011
 Lawrence and Dorothy Wahlstrom Mathematics Scholarship, UWEC - 2010
 UWEC Blugold Fellowship Award (two year award) - 2009
 Wisconsin Academic Excellence Scholarship (four year award) - 2009
 Wisconsin Education Association Council Scholarship (three year award) - 2009
 Rolland Mathematics Talent Scholarship, UWEC - 2009
 Member, National Mathematics Honor Society (KME) - admitted 2009
 Dean's list, UWEC - Fall 2009 to Spring 2013
 First place, individual & team events, UWEC Math Meet (scholarship prize) - 2009
 Finalist, Wisconsin Mathematics, Engineering & Science Talent Search - 2008

Contributed Talks

Pairing between Zeros and Critical Points of Polynomials with Random Roots, Contributed paper, Joint Mathematics Meetings, Baltimore, MD, Jan. 19, 2019

Mathematics and the Genome Rearrangement Problem, graduate student STEMinar, CU Boulder, September 2, 2014

The Deletion-Insertion Model Applied to the Genome Rearrangement Problem, Permutation Patterns 2013, Paris, France, July 5, 2013

Distribution of Genome Rearrangement Distance under Double Cut and Join, UWEC Provost's Honors Symposium, May 1, 2013
The Deletion-Insertion Model Applied to the Genome Rearrangement Problem, undergraduate talk, Joint Mathematics Meetings, San Diego, CA, Jan 11, 2013

The Deletion-Insertion Model Applied to the Genome Rearrangement Problem, poster presentation, Joint Mathematics Meetings, Boston, MA, Jan 6, 2012

Inequalities and Isomorphisms in L_p Spaces, $p > 2$, with the Alspach Norm, poster presentation, Joint Mathematics Meetings, Boston, MA, Jan 6, 2012

Inequalities and Isomorphisms in L_p Spaces, $p > 2$, with the Alspach Norm, UWEC Mathematics Retreat, Eau Claire, WI, May 1, 2012

Genome Rearrangements with Insertions and Deletions, poster presentation (third place), UWEC Student Research Day, May 2, 2011

Distinct Minimal Sequences in Genome Arrangements using the Double Cut and Join Model, Wisconsin Section of the Mathematical Association of America Meeting, Oshkosh, WI, April 17, 2010

Distinct Minimal Sequences in Genome Arrangements using the Double Cut and Join Model, UWEC Mathematics Retreat, Eau Claire, WI, April 9, 2010

Conference and Workshop Participation

Upcoming: "Random Polynomials and their Applications," ICERM, August 4–8, 2025

Joint Mathematics Meetings, online synchronous, April 6–9, 2022

NC Network of Math Teachers' Circles Summer Camp, Cullowhee, NC - Jul. 8-10, 2021

AAC&U Institute: High-Impact Practices & Student Success, online, Jun 15–18, 2021

MAA Project NExT Sessions, online synchronous, July 29–31, 2020

Joint Mathematics Meetings, Denver, CO - January 2020

MAA Math Fest, Cincinnati, Ohio - July 2019

Joint Mathematics Meetings, Baltimore, Maryland - January 2019

	<p>Graduate Summer School at Park City Mathematics Institute - June, July 2017</p> <p>AMS Fall Western Sectional Meeting - October 2016</p> <p>Permutation Patterns 2013, Paris, France - July 2013</p> <p>Joint Mathematics Meetings, San Diego, CA - January 2013</p> <p>Joint Mathematics Meetings, Boston, MA - January 2012</p> <p>Wisconsin Section of the MAA Meeting, Oshkosh, WI - April, 2010</p>
Department Service	<p>Course Convener for “Intro. to Mathematics,” ASU Math Sci. Dept., Fall 2021-present</p> <p>Appalachian State University Math Club Co-Advisor, Fall 2021-present</p> <p>Co-organizer w/ Nii Okine, ASU Math Sci. Student Scholarship Day, April 26, 2024</p> <p>2023–2024 Actuarial Science Search Committee Member (Holly Hirst, chair)</p> <p>Co-organizer w/ Nii Okine, ASU Math Sci. Student Scholarship Day, April 21, 2023</p> <p>2021–2022 Department Personnel Committee member</p>
College/University Service	<p>College of Arts & Sciences Outstanding Teachers Award Committee member Fall 2024</p> <p>Abstract reviewer for student posters, Annual Celebration of Student Research, 2023</p> <p>Co-facilitator, “Building Reflection into STEM Classrooms,” AppLC, 2021–2022</p>
Professional Service	<p>Editorial Board Member, PUMP Journal of Undergraduate Research, 2020-present</p> <p>Organizer, AMS Special Session: <i>Random Polynomials & Related Models</i>, JMM 2022</p>
Community Involvement	<p>Organizer/Participant, NC High Country Math Teachers’ Circle, Summer 2021-present</p> <p>Member, Mathematical Association of America, Summer 2019 – July 2022</p> <p>Organizer, weekly CU Boulder Math Department Tea, 2017-18</p> <p>Violinist, CU Boulder Campus Orchestra - Spring 2014 - Fall 2018</p> <p>Organizer, CU Boulder Math Welcome Weekend - Springs 2015, 2016, 2017</p> <p>Organizer, CU Boulder Math First-Years’ Orientation - Falls 2015, 2016</p> <p>Member, UWEC Math Club - Fall 2009 to Spring 2013</p> <p>Volunteer, UWEC Math Club book sale - Fall 2012</p> <p>Volunteer, UWEC Math Meet - Spring 2010, Spring 2012</p> <p>Student assistant, UWEC bridge and probability course - Fall 2011</p>
Languages	<p>English - Native speaker</p> <p>French - Intermediate (DELAF level B2)</p> <p>L^AT_EX</p> <p>Python/Sage</p> <p>R</p>