William Lewis Craig IV

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Education

- **University of Virginia, 2019-current**

  Program: Mathematics Ph.D

- **Virginia Polytechnic Institute and State University, 2015-2019**

  Major: Mathematics Honors Program GPA: 3.81 (3.94 in mathematics)
  Minor: Computer Science

Awards and Honors

- **Honorable Mention for NSF Graduate Research Fellowship, 2021**
- **David P Roselle Scholarship, $1588, 2018-2019**
- **Pi Mu Epsilon MathFest Student Speaker Award, August 2018**
  - "Quiver Hall-Littlewood Functions and Kostka-Shoji Polynomials."
- **Inducted into Pi Mu Epsilon Honor Society, May 2018**
- **Mathematical Association of America MD-DC-VA Section Undergraduate Essay Competition, April 2018**
  - Second place winner, essay published in spring 2018 MAA newsletter.
- **Byron M. Brumback & Helen S. Brumback Scholarship, $2000, 2017-2018**
- **Virginia Tech Regional Mathematics Competition**
  - Virginia Tech winner, 2018
- **William Lowell Putnam Competition**
  - Virginia Tech Team Member (2017, 2018)
  - Ranking: 122nd (2017) and 400.5th (2018)
- **Harry New Jones II Scholarship, $1000, 2016-2017**
- **Computer Science Resources Consortium Scholarship, $1500, 2016-2017**

- **College of Engineering Scholarship, $1500, Spring 2016**
- **Alumnus of North Carolina Governor's School East in Mathematics, July 2014**

Publications

- Craig W, Saad H. *Vanishing Coefficients in Certain q-Expansions.* In preparation.
- Bringmann K, Craig W, Ono K. *Distributions on Partitions Arising from Hilbert Schemes and t-hooks.* Submitted for publication.
- Balakrishnan J, Craig W, Ono K, Wei-Lun T. *Variants of Lehmer's speculation for newforms.* Submitted for publication.
- Craig W, Pun A. *Distribution Properties for t-hooks in Partitions.* Annals of Combinatorics. 2021; 25(3); 677-695.
- Craig W, Linnell P. *Unique product groups and congruence subgroups.* Journal of Algebra and Its Applications, 2021.
- Balakrishnan J, Craig W, Ono K. *Variations of Lehmer's Conjecture for Ramanujan's tau-function.* J. Number Theory (JNT PRIME), 2020.
- Craig W, Pun A. *Note on the higher order Turán inequalities for k-regular partitions*, Research in Number Theory, Volume 7 Issue 1, 2021.
- Craig W. *Ketchup Science*, Math Horizons (April 2018), 16-17.

Presentations

- March 2021, "Research in Number Theory." UVA Open House.
- March 2021, "Lightning Talk on Research in Number Theory." UVA Undergraduate Math Club.
- November 2020, "Variants of Lehmer's Conjecture." Vanderbilt University Number Theory Seminar.
- October 2020, "Distribution of t-hooks in Partitions." AMS Eastern Sectional Meeting, Special Session in q-Series and Related Areas in Combinatorics and Number Theory.
- July 2020, "Higher order Turán inequalities for k-regular partitions." International conference series on Formal Power Series and Algebraic Combinatorics (Poster).

- December 2019, "Summing up to 2019." UVA Undergraduate Math Club.
- November 2019, "Introduction to Peter Sarnak's Virginia Mathematical Lectures" (with Spencer Martin). UVA Graduate Student Seminar.
- August 2018, "Quiver Hall-Littlewood Functions and Kostka-Shoji Polynomials." MAA MathFest 2018, Denver, Pi Mu Epsilon Speaker Sessions.
- August 2018, "Unique Product Groups and the Zero Divisor Conjecture." MAA MathFest 2018, Denver, MAA Undergraduate Student Paper Sessions.
- March 2018, "On Repeated Prime Divisors of Trinomial Discriminants." Southeastern Regional Meeting on Numbers, East Tennessee State University.

Refereeing

- Acta Arithmetica
- Advances in Mathematics
- Annals of Combinatorics
- Archiv der Mathematik
- Research in the Mathematical Sciences
- Research in Number Theory

Employment

- **Undergraduate Research Assistant, June-August 2017**
  - Worked as an assistant under professor Megan Wawro. Reviewed and analyzed several years of data on student learning from introduction to linear algebra curriculum at Virginia Tech with the objective of improving teacher resources.
- **Tutor for Virginia Tech Athletics Department, 2016 -2019**
  - Provided one-on-one a small group tutoring services to student athletes at Virginia Tech. Tutored primariliy mathematics courses, but also tutored some computer science and statistics courses.
- **Resident Advisor, Johns Hopkins Center for Talented Youth, July-August 2016**

- Resident advisor for second session at the Carlisle, PA site. Responsible for ensuring wellbeing of campers, enforcing camp rules, planning weekday afternoon activities and one large weekend activity.

Teaching Experience

- Fall 2021, Instructor for Math 1210, Survey of Calculus 1.
- Summer 2021, TA for UVA REU in Number Theory.
- Spring 2021, Instructor for Math 1220, Survey of Calculus 2.
- Fall 2020, Instructor for Math 1210, Survey of Calculus 1.
- Summer 2020, TA for UVA REU in Number Theory.
- Sping 2020, Teaching Assistant for Math 3000, Transition to Higher Mathematics.
- Fall 2019, Teaching Assistant for Math 1190, Survey of Calculus 1 with Algebra.

Extracurricular Activities

- **Mentor in Directed Reading Program for University of Virginia Math Department, 2020-Present**
  - Served as mentor for undergraduate students reading higher level mathematics, developing skills in reading and presenting higher level mathematics.
- **Mathematical Apologetics Blog**
  - Blog where I write about mathematics for a general audience as well as other topics I am interested in, which include philosophy, religion, science, mental health, and general critical thinkings skills.
  - Link: https://mathematicalapologist.com/
- **Contributing Editor, Bearings Journal at the University of Virginia, 2019-2021**
  - As a member of the editorial board, I seek out qualified authors for articles, edit submitted articles, and occasionally write an article for the semesterly publication of the Bearings Journal.
- **Peer Assistants for Learning Program Volunteer, 2018-2019**

  - The Peer Assistants for Learning (PAL) program is a student organization coordinated by the Cook Counseling Center dedicated to increasing awareness of mental health issues and counseling resources on the Virginia Tech campus. As a volunteer, I helped plan and operate campus-wide events and deliver presentations about mental health issues to student organizations and classes on request.

- **InterVarsity Christian Fellowship, Small Group Leader, 2017-2019**
  - As a small group leader, I prepared, organized, and led weekly discussion groups about faith-related topics. As a member of the broader leadership team, I helped mentor future leaders, provide emotional support and care for the members of the chapter, and helped plan social and outreach events.

- **Marching Virginians and Hokies Basketball Pep Band, Sousaphone, 2016-2019**

Undergraduate Research Experience

- **Honors Faculty Student Agreement, Galois Theory, Virginia Tech, 2018**
  - Research Advisor: Daniel Orr
  - Engaged in self-guided study of Galois theory in addition to coursework for Introduction to Abstract Algebra in the fall semester of 2018. The project concluded with an expository paper which explains the origins, motivations, and important results of Galois theory.

- **Unique Product Groups and Zero Divisor Conjecture, Virginia Tech, 2018**
  - Research Advisor: Peter Linnell
  - Studied the zero divisor conjecture, unique product groups, and congruence subgroups. Formulated and studied a new generalization of the Hantzsche-Wendt groups.

- **Coefficients of Quiver Kostka-Shoji Polynomials, Virginia Tech, 2017-2019**
  - Research Advisor: Mark Shimozono
  - Studied a special case of the quiver Kostka-Shoji polynomials and Hall-Littlewood functions, and formulated and worked on a conjectural explicit formula for these structures for a particular quiver, and am continuing work towards proving the conjecture.

- **Expository Writing, Virginia Tech, 2017**
  - Research Advisor: Ezra Brown
  - Composed an expository article about research in the Virginia Tech math department on non-Newtonian fluid dynamics. The article was published in Math Horizons in 2018.

- **Unpublished Research Paper**
  - *Cubefree Trinomial Discriminants*