Marcus Robinson

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Research Interests

My research interests are in the intersection of algebraic geometry and commutative algebra. I am particularly interested in the study of singularities using test ideals, big Cohen-Macaulay test ideals and Hilbert-Kunz Multiplicity. I have also contributed to the development of the algebra software Macaulay2.

Education

University of Utah — **Salt Lake City, UT**
(expected May. 2020) PhD in Mathematics — *Aug. 2014 – present*

- Thesis: *Big Cohen-Macaulay Test Ideals of Mixed Characteristic Toric Schemes*, Advisor: Karl Schwede

Reed College — **Portland, OR**
BA in Mathematics — *Aug. 2009 – May 2013*

Publications and Preprints

- *Big Cohen-Macaulay Test Ideals of Mixed Characteristic Toric Schemes* Marcus Robinson , preprint in progress
- *The TestIdeals package for Macaualay2* with A. F. Boix, D. J. Hernández, Z Kadyrsizova, M. Katzman, S. Malec, M. Robinson, D. Smolkin, P. Teixeira, E. E. Witt *arXiv:1810.02770.*
- *Explicit Hilbert-Kunz functions of 2 x 2 determinantal rings* with Irena Swanson Pacific Journal of Mathematics, 2014. Pacific Journal of Mathematics 275 (2015), 433–442.

Teaching Experience

University of Utah — **Salt Lake City, UT**
Graduate Teaching Assistant — *Aug. 2014 – present*

I have been the primary instructor for the following courses:

- Math 3220 - Foundations of Analysis II (Summer 2019, Summer 2018)
- Math 2210 - Calculus III (Fall 2018, Spring 2017, Fall 2016)
- Math 2200 - Discrete Mathematics (Summer 2017)
- Math 1220 - Calculus II (Spring 2016, Spring 2019)
- Math 1100 - Business Calculus (Fall 2017)
- Math 1030 - Introduction to Quantitative Reasoning (Spring 2018, Fall 2015, Spring 2015)

Undergraduate Research Mentoring

- Dylan Johnson - Co-advised with Daniel Smolkin — *May 2018 - Present*
  Diagonally F-regular Cartier Algebras - Mentored an undergraduate on a project to determine when certain toric rings have the universal symbolic topological property. Developed a technique to show certain Hibi rings have USTP.
- Boyana Martinova - Co-advised with Karl Schwede — *Jan. 2019 - Present*
  Fast Linear Algebra Computations in Macaualay2 - Worked with an undergraduate to write improved algorithms for a number of linear algebra functions used in Macaulay2.

Outreach

- High School Number Theory Camp - Counselor *Jun. 2018 - Jul. 2018*
  - Four week program, morning lectures followed by afternoon problem sessions
  - Worked closely with students on a series of problems related to number theory
  - Encouraged students to experiment with math, making conjectures and then justifying them rigorously
- Math Circles - Instructor, TA *Sept. 2018 - Present*
  - Weekly program focused on discovery and open-ended exploration
  - Gave talks on the game of NIM and something else I literally forgot please help
  - Served as a TA for other instructors working with students in small groups
- Directed Reading Program - Mentor *Jan 2019 - Present*
  - Met weekly with a student to help them read through Godel
  - Helped the student prepare a talk on their reading

Organizational Experience

- **Graduate Student Advisory Committee - Co-Chair** *Aug. 2018 - May. 2019*
  - Communicated graduate student needs with the department
  - Organized other graduate student committees
  - Interfaced with GSACs from other departments and the College of Science on shared needs
- **Retention Promotion and Tenure Graduate Committee - Chair** *Aug. 2018 - May. 2019*
  - Reviewed candidates for retention, promotion and tenure
  - Prepared reports for department
- **Directed Reading Program - Founder, Co-Chair** *Aug. 2018 - Present*
  - The directed reading program matches undergraduate students with a graduate student mentor. The pairs then read through a mathematical text throughout the semester. The goal is to give undergraduates opportunities to see math that is outside of the standard curriculum and graduate students experience mentoring
- **Graduate Student Peer Mentoring - Founder, Co-Chair** *Aug. 2018 - May. 2019*
  - Founded and organized a peer mentoring program
  - Assigned senior graduate students to 3-4 first year students to meet and answer questions throughout the semester

Macaulay2

- Contributed to the development and documentation of the TestIdeals Macaualy2 package. The TestIdeals package allows for basic computations of F-singularities. It focuses on computing the test ideal and related objects.
- Contributed to the development and documentation of the FastLinAlg Macaualy2 package. The FastLinAlg package dramatically improves the runtime of important linear algebra algorithms used in many different applications.

Talks and Posters

- University of Utah - Commutative Algebra Seminar - Speaker
- University of Nebraska - KUMUNU 2019 Conference - Presented Poster
- University of Utah - Graduate Algebra Seminar - Speaker