Nico Courts

Graduate Student
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RESEARCH INTERESTS

I am a student of Prof. Julia Pevtsova studying the representation theory of group schemes and other algebraic structures using tools from geometry, category theory, and homological algebra. While my thesis is likely to be of a highly theoretical character, it requires that I be skilled in many different areas of math and I am conversant in the languages of combinatorics, topology, analysis, and optimization.

What's more, I am always looking for ways to ground what I am learning in the real world. Applications that make me particularly excited are that of artificial general intelligence and interpretability of mathematical models which, I believe, can serve a vital role in the realization of AGI.

EDUCATION

Ph.D., Mathematics — June 2022 (expected)
University of Washington, Seattle, WA

Master of Science, Mathematics — June 2020 (expected)
University of Washington, Seattle, WA
Thesis Topic: Schur Duality and Strict Polynomial Functors

Bachelor of Science, Mathematics — May 2016
Magna Cum Laude, Phi Beta Kappa, Dean's List, Departmental Honors
University of Southern California, Los Angeles, CA

Budapest Semesters in Mathematics — Fall 2015
Algebraic Topology, Conjecture & Proof, Cryptography, Differential Geometry
Budapest, Hungary

Associate of Science, Mathematics — June 2013
Key of Knowledge, Dean's list, Honors Program
Citrus College, Glendora, CA

RESEARCH EXPERIENCE

Current Focus

In the recent past, my studies have been focusing on understanding the rational representations of GL_n as established by Schur in his thesis and later work (and later translated and elucidated by Green). More recently, Friedlander, Suslin, Krause, and others have found equivalent categories that more readily afford monoidal structure in the interest of establishing the monoidicity of the Schur-Weyl functor and examining the interactions between different forms of duality. My current goal is to understand this functor better and to explore how it relates the structures of two different categories while keeping an eye towards how this fits into a broader context.

Graduate Reading Courses

University of Washington, Seattle, WA

- Group Schemes and Algebraic Groups – Prof. Julia Pevtsova – *Autumn 2018*
- Abelian Categories – Prof. James Zhang – *Spring 2018*
- Representation Theory – Prof. Julia Pevtsova – *Winter/Spring 2017*
- (Simplicial) Cohomology – Prof. Steve Mitchell – *Autumn 2016*

TEACHING EXPERIENCE

Graduate Teaching Assistant Autumn 2016 – Present
University of Washington, Seattle, WA

- **As an instructor:**
  - Math 124 – Calculus I (Summer 2018)

    I put my own twist on the standard Calc I curriculum by deciding to focus on high-level understanding along with cultivating problem-solving techniques and a mathematical mindset. This idea was loosely based on that of the flipped classroom; students were encouraged using quizzes to read the textbook before any material was discussed in class and large portions of contact time with instructors were dedicated to working on challenging problem sets and presenting solutions to the class. Technology was used frequently and liberally as a way to both bolster understanding through visual aids and as a means to solicit frequent feedback from students to monitor their understanding and progress.

  - Math 308 – Matrix Algebra (Spring 2019)

    My focus during this quarter was on developing the students' ability to solve problems they hadn't seen before. In service of this, we dedicated a third of our contact time to solving problems in small groups with my oversight. My initial course structure wasn't adequately meeting the needs of the class (which I determined from soliciting feedback), so after the first midterm we pivoted to having more worked-out examples in class, for which the students were thankful. In order to encourage students to investigate how linear algebra was used in the real world, the students were assigned a poster project. Topics included applications of linear algebra in medical imaging, computer graphics, and in the social sciences.

- **As a teaching assistant:**
  - Math 120 – Precalculus (Autumn 2017)
  - Math 124 – Calculus I (Winter 2017, Winter 2019)
  - Math 125 – Calculus II (Autumn 2016, Spring 2017)
  - Math 126 – Calculus III (Summer 2017, Winter 2018, Spring 2018)
  - Math 327 – Introductory Real Analysis (Summer 2019)
  - Math 381 – Discrete Mathematical Modeling (Autumn 2018)
  - Math 403 – Group Theory (Winter 2020)

Lead Teaching Assistant and Instructor Summer 2016
SCS Noonan Scholars (previously South Central Scholars), Los Angeles, CA

- Independently developed and delivered approximately 50 hours of instruction and five exams to gifted university-bound students in calculus 2 and 3.
- Total of 100 contact hours, including daily supevised worksheet sessions.
- Took the initiative to deliver weekly lectures in higher mathematics (number theory, knot theory, differential equations, etc.) along with entry-level problems that allowed students to get a sense of the "flavor" of these fields.

Various Teaching and Mentorship Positions Spring 2012 – Summer 2013
Citrus College, Glendora, CA

- **PAGE Program Tutor** Assisted a licensed teacher in the education of a class of middle school children intended to reinforce the previous year's learning and to prevent "backsliding". Personally instructed a small group of students who were prepared to learn more advanced topics in intermediate algebra.

- **SIGMA Mentor** Took on a small group of students each semester utilizing a holistic approach to education – supplementing standard tutoring with more in-depth educational guidance and planning.
- **Math Tutor** Instructed students in the fast-paced Math Success Center where I provided homework help in all math classes through linear algebra and differential equations.

LEADERSHIP & SERVICE

Graduate Student Representative
University of Washington, Seattle
Summer 2019 - Spring 2020

- Planned and organized a variety of events and lectures for the graduate students as well as the department at large.
- Served as an advocate for the graduate students in several capacities.
- Worked on promoting better communication between the students and faculty.
- Empowered students to make changes to the department while promoting respect for the wishes of the faculty and administration.

Washington Directed Reading Program
Co-organizer and mentor

- Ran the program along with other graduate students in the 2019/2020 year, focusing on procuring funds and encouraging participation of under-represented groups.
- Supervised an undergraduate student in a reading course based around Rebecca Weber's book *Computability Theory* (Autumn 2018).

Math Hour Olympiad
Volunteer Judge
University of Washington, Seattle
Spring 2018

Math Day
Volunteer
University of Washington, Seattle
2017 and 2018

EVENTS ATTENDED

Conference on Lie and Jordan Algebras and their Representations
Sichuan University
Chengdu, Sichuan Province, P.R. China
January 2020

Triangulated Categories in Representation Theory and Geometry
University of Sydney
Sydney, NSW, Australia
June 2019

MSRI Summer School
The Mathematics of Machine Learning
University of Washington, Seattle
July 29 - August 9, 2019

ABC Workshop
Geometric and Cohomological Methods in Algebra
University of Washington, Seattle
November 11, 2018

Joint Mathematical Meetings
Seattle, WA
January 2016

SKILLS & HOBBIES

Languages:

- *English* – This is my native language.
- *German* – Ich kann ziemlich gut Deutsch sprechen, lesen, und verstehen!
- *Hungarian* – Csak egy kicsit beszélek magyarul.
- *Programming* – **Go**, **Haskell**, Java, **LaTeX**, PHP, **Python**, Typescript.

Computer Skills: Web/Application Development, Server Administration, Sage, Windows, Linux, FreeBSD.

Life Skills: Critical Thinking, Abstract Reasoning, Communication, Objectivity, Empathy.

Hobbies: Hiking, Jogging, Rollerskating, Appreciating the Wonders of the PNW.