Fan Zhou

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Undergraduate Education

Harvard College **August 2017 – May 2021**
Math Concentrator GPA: 3.968/4.000 Math GPA: 4.000/4.000 *Cambridge, MA*

- Selected undergraduate math courses: 55a/b (Honors Linear Algebra, Honors Real/Complex Analysis), 137 (Algebraic Geometry), 114 (Real/Functional Analysis), 132 (Differential Topology), 155r (Representation Theory of Symmetric Groups)
- Selected graduate math courses: 221 (Commutative Algebra), 229x (Analytic Number Theory), 213a (Complex Analysis and Riemann Surfaces), 230a (Differential Geometry), 231a (Algebraic Topology), 231br (Further Algebraic Topology), 222 (Lie Groups and Lie Algebras), 269 (Schubert Calculus), 18.706 (Noncommutative Algebra), 18.725 (Scheme-theoretic Algebraic Geometry)
- Miscellaneous other classes: Physics 16, Physics 151 (Advanced Classical Mechanics), Physics 143a (Quantum Mechanics), CS 121 (Introduction to Theoretical Computer Science)

Research Experiences

Minimal Additive Complements and Eventually Periodic Sets **Summer 2020**
Duluth REU (funded by NSF and NSA) *University of Minnesota at Duluth*

- Studied the subject of minimal additive complements and proved various conditions for eventually periodic sets to arise as minimal additive complements; for example, showed that all eventually periodic sets are eventually minimal additive complements; generalized the framework to one of "patterns"; developed a formalism of formal power series to reduce some of the proving process to routine calculation; derived various properties of such series; generalized a result of Burcroff and Luntzlara and answered an open question of theirs in a large class of cases

Representation Theory and Combinatorial Species **Summer 2019**
PRISE *Harvard University, Cambridge*

- Worked on a combinatorial model for the BGG-esque resolution (given by Kaan Akin and Andrei Zelevinsky) of the irreducible representations of S_n which categorifies the Jacobi-Trudi determinant formula; derived, in the case of partitions of length 3, the generating series for the coefficients in the differential maps and saw that they were closely tied to Catalan-like generating series; progress at `here`

Volumes of Hyperbolic Simplices **Summer 2018**
Indiana REU (funded by NSF) *Indiana University at Bloomington*

- Gave an iterated integral formula for the volume of a spherical/hyperbolic simplex in terms of the length matrix (literature gave the Gram matrix); gave an alternative proof of Tuynman's formula; gave another power series for the volume of a spherical/hyperbolic simplex with a different radius of convergence than the one in literature; generalized a theorem of Haagerup and Munkholm which determined the limit of the ratio of the volume of a hyperbolic simplex to that of its Euclidean projection as the dimension goes to infinity

Selected Publications/Presentations/Honors

"On Eventually Periodic Sets As Minimal Additive Complements" **Summer 2020**

- Preprint at `arxiv.org/abs/2010.12162`; submitted to *Electronic Journal of Combinatorics*

Presenter at American Mathematical Society Fall Western Sectional Meeting **October 2020**

- Preprint at `arxiv.org/abs/2010.12162`

Presenter at Harvard Summer Undergraduate Research Village Conference **July 2019**

Presenter at Indiana Undergraduate Mathematics Research Conference **July 2018**

PRISE (Program for Research in Science and Engineering) Fellowship **Summer 2019**

- under Professor Arnav Tripathy

Research Partner at Radcliffe Institute for Advanced Study **Fall 2020 – Spring 2021**

- Cluster Algebras, under Professor Lauren Williams: proofreading a preprint for a book on cluster algebras

John Harvard Scholarship **Fall 2019 – Spring 2020**

Selected Achievements/Awards

USA Mathematical Olympiad (USAMO) Qualifier **Spring 2016**

- Roughly top 300 contestants nation-wide

USA Physics Olympiad (USAPhO) Gold Medalist **Spring 2017**

- Roughly top 40 contestants nation-wide

USA Physics Olympiad (USAPhO) Honorable Mention ($\times 2$) **Spring 2016, Spring 2015**

USA Computing Olympiad (USACO) Gold **Spring 2017**

Physics Bowl 14th Place Internationally, 9th Place Nationally **Spring 2017**

Work Experience

Course Assistant **Spring – Fall 2019, Fall 2020**
Math 130, Math 122, Math 155r *Harvard University, Cambridge*

- Worked as a Course Assistant: graded psets, wrote official solutions, held office hours, taught sections, etc.. Classes taught: Math 130 (Classical Geometry) in Spring 2019, Math 122 (Algebra I: Theory of Groups and Vector Spaces) in Fall 2019, and Math 155r (Combinatorics) in Fall 2020

Teaching Assistant **Summer 2017**
AwesomeMath Summer Program *University of Texas, Dallas*

- Worked as a Teaching Assistant for high-level competition math classes at the AwesomeMath Summer Program

Instructor **2016 – 2017**
MomentumLearning *Houston*

- Taught competitive math and physics classes, specifically AIME, MathCounts Advanced/AMC 10, MathCounts Intermediate, and Physics ($F=ma$ Exam) classes

Extracurricular Activities

Problem Committee Member **2017 – 2019**
Harvard-MIT Mathematics Tournament (HMMT) *Cambridge*

- Design problems for the contest; test-solve problems proposed by others; write official solutions to problems; proctor during the contest (both at HMMT and at PUMaC, the Princeton University Mathematics Competition)

Others

I am a USA citizen. I am natively fluent in English and Mandarin.