Nicholas Triantafillou

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RESEARCH INTERESTS

Arithmetic Geometry, Computational Number Theory, Sphere Packing, Modular Forms, anything related to Rational Points, among other things.

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
Doctoral Candidate
Degree expected in May 2019

Cambridge University, Cambridge, CB, UK — June 2014
Master of Advanced Study in Mathematics, with Distinction

University of Michigan, Ann Arbor, MI — May 2013
Bachelor of Science, With Highest Distinction, GPA 4.0/4.0
Concentrations: Highest Honors in Mathematics and High Honors in Computer Science
Honor Societies: Phi Beta Kappa, Phi Kappa Phi

HONORS AND ACTIVITIES

- National Science Foundation Graduate Fellowship (2012)
- Churchill Scholarship Recipient (2013)
- Astronaut Scholarship Recipient (2012)
- Goldwater Scholarship Recipient as a Sophomore (2011)
- Gates-Cambridge Scholarship Finalist, Declined Interview (2013)
- University of Michigan Nominee, Marshall Scholarship (2012)
- Eight-Term James B. Angell Scholar (2013)
- Sidney Fine Teaching Award for one University of Michigan student with the potential to become an inspiring teacher and scholar in any discipline.
- Honorable Mention on Putnam Math Competition (2012, 2013)
- 14th place Nationally on United States of America Math Olympiad (2008)

PUBLICATIONS

- H. Cohn, and N. G. Triantafillou, *Limitations from Modular Forms on LP-Bounds for Sphere Packing*, Preprint (2017).
- O. Beckwith, V. Luo, S. J. Miller, K. Shen, and N. G. Triantafillou, *Distribution of Eigenvalues of Weighted, Structured Matrix Ensembles*, `arXiv: 1112.3719`, Volume 15 *Integers* (2015).
- A. Godbole, C. Lim, V. Lyzinski, and N. G. Triantafillou, *Sharp Threshold Asymptotics for the Emergence of Additive Bases*, `arXiv: 1110.1745`, Volume 13 *Integers* (2013).
- K. Banks, A. Godbole, and N. G. Triantafillou, *Omnimosaics*, Preprint, `arXiv: 1009.4626`.

- G. Iyer, S. J. Miller, and N. G. Triantafillou, *Moment Formulas of Classical Compact Groups*, Preprint (2014).
- S. J. Miller, and N. Triantafillou, *Determinantal Expansions in Random Matrix Theory and Number Theory*, Preprint (2014).

RESEARCH TALKS

- *The Szpiro Conjecture for Hyperelliptic Curves* (based on joint work with S. Anni and S. Schiavone), PhD Summer school "Curves, L-functions, and Galois Representations", ICTP Trieste (2017).
- *Limitations from Modular Forms on LP-Bounds for Sphere Packing* (based on joint work with H. Cohn), Workshop Arithmetic Geometry and Computer Algebra, Carl von Ossietzky Universität (2017).
- *Determinantal Expansions in Random Matrix Theory and Number Theory*, Joint Meetings of the American Mathematical Society, San Diego, CA, January 2013.
- *Determinantal Expansions in Random Matrix Theory and Number Theory*, Maine-Quebec Number Theory Conference, Quebec City, QC, September 2012.
- *Distributions of Eigenvalues of Variations of Hermitian Toeplitz Matrix Ensembles*, Young Mathematicians Conference, Columbus, OH, July 2012.
- *Omnimosaics*, Joint Meetings of the American Mathematical Society, New Orleans, LA, January 2011.
- *Omnisequences and Omnimosaics*, Undergraduate Math Club, University of Michigan, Ann Arbor, MI, January 2011.

EXPOSITORY TALKS

- *Cyclotomic Units and Iwasawa's Theorem*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Iwasawa Theory), MIT, Cambridge, MA, October 2017.
- *Representations associated to weight 1 forms: end of the proof, and applications* Seminar on Topics in Arithmetic, Geometry, Etc. (on Modular Representations of $\mathrm{Gal}(\overline{\mathbb{Q}}/\mathbb{Q})$), MIT, Cambridge, MA, February 2017.
- *Advances in Sphere Packing*, Pure Math Graduate Student Seminar, MIT, Cambridge, MA, November 2016.
- *Skeleton of the Jacobian: overview and uniformization*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Tropical Geometry), MIT, Cambridge, MA, October 2016.
- *The Siegel Modular Variety*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Shimura Varieties), MIT, Cambridge, MA, March 2016.
- *Dual abelian varieties.*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Abelian Varieties), MIT, Cambridge, MA, October 2015.
- *Isogeny Volcanoes*, Pure Math Graduate Student Seminar, MIT, Cambridge, MA, March 2015.
- *Finite flat group schemes.*, Seminar on Topics in Arithmetic, Geometry, Etc. (on Abelian Varieties), MIT, Cambridge, MA, February 2015.
- *Initial results on multiple zeta values..*, Seminar on Topics in Arithmetic, Geometry, Etc. (on the Projective Line Minus Three Points), MIT, Cambridge, MA, November 2014.
- *Modular Polynomials and Complex Multiplication*, Part III Seminar Series, Cambridge University, Cambridge, CB, March 2014.

RESEARCH POSITIONS

Research Intern May 2016 - August 2016
Microsoft Research New England, Cambridge, MA

- Studied Linear programming Bounds for Sphere Packing (Project is on-going).

Mathematics Researcher June 2012 - August 2012
Williams College, Williamstown, MA

- Developed effective formulas for the n-level density of holomorphic cusp forms for test functions with large support using techniques from analytic number theory.
- Proved Katz-Sarnak correspondence between random matrix theory and number theory for test functions with largest known support.
- Disproved several conjectures about structured ensembles of random matrices.

Researcher - Department of Defense May 2011 - August 2011

- Developed and optimized algorithms in computational algebraic geometry.
- Developed an efficient implementation of a new cryptologic.

Mathematics Researcher June 2010 - August 2010
East Tennessee State University, Johnson City, TN

- Utilized probabilistic and constructive approaches to discover new results in combinatorics and additive number theory.

TEACHING EXPERIENCE

Instructor - 18.01 IAP (Intensive Calculus I and II Review Class) January 2017 February 2017
Massachusetts Institute of Technology, Cambridge, MA

- Four weeks of lecture to review all of 18.01 (Calculus I and II) for students who almost passed during the year.
- Worked with individual students to fill weaknesses in background knowledge, test taking strategies, etc.

Teaching Assistant - Project Lab in Mathematics February 2016 - May 2016
Massachusetts Institute of Technology, Cambridge, MA

- Mentored teams of students on short-term research projects.
- Provided concrete suggestions for improving overall paper structure and general mathematical writing.

Instructor - Art of Problem Solving (various classes) 2015 - present

- Taught mathematical problem-solving based online classes to bright middle and high-school students

Instructor - Games and Puzzles September 2012 - December 2012
University of Michigan, Ann Arbor, MI

- Designed and taught course on games and puzzles for Honors freshmen.
- Taught mathematical problem solving skills as related to economics, computer science, psychology, and education.
- Held weekly office hours.

Course Assistant - Honors Analysis I, II September 2012 - May 2013
University of Michigan, Ann Arbor, MI

- Prepared and gave weekly lectures as discussion section leader.
- Evaluated and suggested improvements to students' proof writing and solution

methods.

Course Assistant - Honors Mathematics I, II September 2011 - May 2012
University of Michigan, Ann Arbor, MI

- Prepared and gave weekly lectures as discussion section leader.
- Held weekly office hours to explain important concepts of introductory analysis and various other topics.
- Graded all homework assignments.

Course Assistant - Explorations in Randomness January 2011 - May 2011
University of Michigan, Ann Arbor, MI

- Explained important concepts of combinatorics and probability to students in twice-weekly office hours.
- Graded all homework assignments and assisted with exam grading.

Grader Summer 2010
Mathematical Olympiad Summer Program, Lincoln, NE

- Worked with small groups of the nation's best mathematics students to teach creative problem solving in combinatorics.
- Evaluated and suggested improvements to students' mathematical rigor and proof-writing style.

SERVICE

2017-2018

- MIT Institute Working Group on Graduate Housing
- MIT Graduate Student Council, Housing and Community Affairs Co-chair

2016-2017

- Mentored high school student on research project counting points on superelliptic curves through PRIMES program
- President of Sidney-Pacific Graduate Community
- Founder and co-organizer of Sidney-Pacific Graduate Student Seminar
- Graduate Student Representative to MIT Math Visiting Committee (an evaluation body for the department).

2015-2016

- Organizer of MIT Pure Math Graduate Student Seminar

2014

- Volunteer in Middle School Classrooms through STIMULUS Program

2013

- Chair of Contributed Talk Session on Number Theory at Joint Math Meetings

2010 - 2013

- Undergraduate Assistant, Michigan Math Circle (MMC) - MMC provides area middle and high school students who enjoy mathematics with the opportunity to learn exciting topics that fall outside of the standard curriculum.

- Grader, United States of America Math Olympiad

2012

- Assistant Coach, Michigan team for American Regional Mathematics League
- Reviewer for MathSciNet

2011

- Chair of Contributed Talk Session on Combinatorics at Joint Math Meetings

2005 - 2009

- Coach, Saginaw Arts and Sciences Academy MATHCOUNTS Team