Matthew Tai

Curriculum Vitae

Personal Information

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Research Interests

Representation Theory, Lie Algebras, Differential Geometry

Education

University of Pennsylvania: PhD. in Mathematics University of Pennsylvania, 2014

Ph.D. Thesis: Family Algebras and the Isotypic components of $\mathfrak{g} \otimes \mathfrak{g}$
Advisor: Alexandre Kirillov

Harvard University: BA in Mathematics, Harvard University, 2009

Senior Thesis: The Topology of the Energy-Momentum Level Sets for the Lagrange Top
Advisor: Shlomo Sternberg

Publications

"Lectures on Family Algebras", with A. A. Kirillov. Book, to be published by World Scientific. In preparation.

"Tensor Invariants for the Classical Groups" In preparation.

Talks

–"Introduction to Family Algebras" Algebraic Lie Theory Seminar
University of Colorado, Boulder, October 21, 2014

–"Family Algebras and the Cayley-Hamilton Identity" Algebra Seminar
Temple University, October 6, 2014

–" On the Absence of Strictly Semiregular Euclidean Polytopes in Rank 9 and Above" Graduate Student Colloquium
University of Pennsylvania, January 31, 2014

–"Introduction to Family Algebras" Representation Theory Seminar
Rutgers University, October 4, 2013

–"Generalized Exponents of $sl(n)$, Graduate Representation Theory Seminar
University of Pennsylvania, April 2, 2013

–"Generalized Twisting Puzzles and Rubik's Surfaces" Graduate Student Colloquium
University of Pennsylvania, November 9, 2012

–"On the Vogel Plane" Graduate Representation Theory Seminar
University of Pennsylvania, October 22, 2012

–"Generating Functions for Generalized Exponents" Graduate Representation Theory Seminar
University of Pennsylvania, September 24 , 2012

–"Group Theory for the Rubik's Cube" Undergraduate Math Society Colloquium
University of Pennsylvania, February 28, 2012

–"On S^2V for the Defining Rep of $sl(n)$" Graduate Representation Theory Seminar
University of Pennsylvania, October 5, 2011

–"Introduction to Orbifolds, II" Graduate Differential Geometry Seminar
University of Pennsylvania, March 24, 2011

–"Diagrammatic Notation for Simple Lie Groups" Graduate Student Colloquium
University of Pennsylvania, November 5, 2010

Teaching

University of Pennsylvania (2009-2014)

Fall 2010: Math 104: Calculus, Part I. TA.
Held four recitations and graded homework, quizzes and exams.

Spring 2011: Math 104: Calculus, Part I. TA.
Held four recitations and graded homework, quizzes and exams.

Fall 2011: Math 240: Calculus, Part III. TA.
Held four recitations, graded homework, quizzes and exams.

Spring 2012: Math 203: Proving Things: Algebra. TA.
Held two recitations and graded homework and exams.

Summer 2012: Math 114: Calculus, Part II. Lecturer.
Designed syllabus, assigned and graded home-work, quizzes and exams.

Fall 2013: Math 500: Geometry-Topology (M.A. level course). Grader.

Graded homework and exams of masters level students.

Spring 2014: Math 501: Differential Geometry (M.A. level course). Grader.
Graded homework and exams of masters level students.

Spring 2014: Math 601: Algebraic Topology (Ph.D. level course). Grader.
Graded homework and exams of first-year Ph.D. students.

Fall 2014: Math 114: Calculus, Part II. Postdoctoral Teaching Fellow.
Held two recitations and graded quizzes and exams.

Fall 2014: Math 170: Ideas in Mathematics. Postdoctoral Teaching Fellow.
Held four recitations and graded homework, quizzes and exams.

Fall 2014: Math 602: Algebra (Ph.D. level course). Postdoctoral Teaching Fellow.
Graded homework and exams of first-year Ph.D. students.

Spring 2015: Math 104: Calculus, Part I (SAIL). Postdoctoral Teaching Fellow.
Administered and assisted in-class work, graded exams.

Spring 2015: Math 260: Honors Calculus. Postdoctoral Teaching Fellow.
Held two recitations and graded homework and exams.

Spring 2015: Math 603: Algebra (Ph.D. level course). Postdoctoral Teaching Fellow.
Graded homework and exams of first-year Ph.D. students.

Harvard University (2005-2009)

Fall 2006: Math 25a: Honors Linear Algebra and Real Analysis I. Undergraduate TA
Held one recitation and graded homework and exams.

Spring 2007: Math 23b: Linear Algebra and Real Analysis II. Undergraduate TA
Held one recitation and graded homework, quizzes and exams.

Spring 2009: Math 118: Dynamical Systems (advanced course). Undergraduate TA
Held one recitation and graded homework and exams.

Boston-Area Math Circle (2007-2008)

Designed and taught semester long units aimed at middle-school and high-school students on:

–Paul Sally's Four Numbers Game, Fall 2007
–Metric Completions of the Rationals, Fall 2007
–The Cayley-Klein Geometries, Spring 2008
–Group Theory for the Rubik's Cube, Spring 2008

Professional Activities

Member of the American Mathematical Society

Employment

University of Pennsylvania: Teaching Postdoctoral Fellow. 2014-2015

Held recitations and graded homework, quizzes and exams.

The MathWorks, intern, 2008

Designed examples for the MATLAB Symbolic Tool-box and MuPAD engine, performed quality control checks on MuPAD software and documentation

Computer Language Experience

Experience with Python, Java, Maple, MATLAB, Magma and Sage.