

Institute of Mathematics
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Research Interests

Representation Theory Algebraic Groups, Cohomology, Iwahori-Hecke Algebras,
 q -Schur Algebras, Quantum Groups.
Combinatorics Association Schemes, Design Theory, Graph Theory,
Symbolic Dynamics, Phylogenetic Combinatorics.
Number Theory Diophantine equations, finiteness of integral points,
variable separated curves.

Employment

Jul. 2020 - Research Scholar at Institute of Mathematics, Academia Sinica.
Oct. 2019 - Jun. 2020 Postdoc at Institute of Mathematics, Academia Sinica.
Host: Ching Hung Lam

Education

Aug. 2014 - May 2019 Ph.D. in Mathematics, University of Georgia.
Advisor: Daniel K. Nakano, Secondary Advisor: Chun-Ju Lai
Sep. 2010 - Jun. 2014 B.Sc. in Computer Science, Shanghai Jiao Tong University.
Advisor: Yaokun Wu, Secondary Advisor: Eiichi Bannai

Publications

- [1] *On q -Schur algebras corresponding to Hecke algebras of type B* (with Chun-Ju Lai and Daniel Nakano), Transformation Groups, 2020.
- [2] Chapter 4 of *Introduction to Soergel bimodules* (by Ben Elias, Shotaro Makisumi, Ulrich Thiel, Geordie Williamson), RSME Springer Series 5, 2020.
- [3] *Classification of spherical 2-distance $\{4, 2, 1\}$ -designs by solving Diophantine equations* (with Eiichi Bannai, Etsuko Bannai, Wei-Hsuan Yu and Yan Zhu), Taiwanese Journal of Mathematics, 2020.
- [4] *The lit-only σ -game: some mathematics behind a puzzle for kids* (with Yaokun Wu), The Mathematics Student, 88(3-4), 67-90, 2019.
- [5] *Rational designs* (with Zhen Cui and Jiacheng Xia), Advances in Mathematics, 352, 541-571, 2019.
- [6] *Support varieties for Hecke algebras* (with Daniel Nakano), Homology, Homotopy and Applications, 21(2), 59-82, 2019.
- [7] *Nonexistence of nontrivial tight 8-designs*, Journal of Algebraic Combinatorics, 47(2), 301-318, 2018.
- [8] *Hamiltonian decomposition of prisms over cubic graphs* (with Moshe Rosenfeld), Discrete Mathematics & Theoretical Computer Science, 16(2):111-124, 2014.

- [9] *A Fisher type inequality for weighted regular t -wise balanced designs*,
Journal of Combinatorial Theory A, 119(7), 1523-1527, 2012.

Papers Submitted

The preprints are available on my personal homepage.

- [10] *Explicit spherical designs*, Jul. 2018.

Preprints

- [11] *Integral points on variable separated curves* (with Dino Lorenzini), Sep. 2018.

Papers in Preparation

Some abstracts are available on my personal homepage.

- [12] *Majorana representation of complex vectors, Temperley-Lieb category, and two variable hypergeometric series* (with Shaoshi Chen, Mikio Nakahara, Yan Zhu).
- [13] *Finiteness of tight combinatorial designs*.
- [14] *New lower bound on the sizes of designs*.
- [15] *Hamiltonian thickness and spanning topological minors* (with Yaokun Wu and Yinfeng Zhu).
- [16] *Lit-only σ -game* (with Yaokun Wu).
- [17] *Inferring phylogenies from incomplete metric information* (with Yaokun Wu, Zeying Xu and Yinfeng Zhu).
- [18] *Positive matrices, primitive matrices, scrambling matrices, contractible matrices* (with Xinmao Wang and Yaokun Wu).
- [19] *Fiber products of P -polynomial association schemes*.
- [20] *On s -distance sets in real hyperbolic space*.
- [21] *Hyperbolicity of the product graphs*.

Conference Talks

The slides are available on my personal homepage.

- Nov. 8, 2020 *Finiteness of tight combinatorial designs*,
Workshop on Combinatorics,
Shanghai Jiao Tong University (online).
- Sep. 2, 2020 *On q -Schur algebras of classical type*,
2020 Taipei Workshop on Representation Theory and Related Topics,
Academia Sinica.
- Jun. 28, 2020 *Graph orientations and the matrix-tree theorem*,
 2π day,
Shanghai Jiao Tong University (online).

- Aug. 15, 2019 *Root systems over \mathbb{F}_2 ,*
Groups and Graphs, Designs and Dynamics,
Three Gorges Mathematical Research Center.
- Jul. 11, 2019 *On q -Schur algebras of classical type,*
International Conference on Representation Theory VIII,
Harbin Engineering University.
- May 13, 2019 *Isomorphism theorem between q -Schur algebras of classical type,*
Southeastern Lie Theory Workshop XI,
Louisiana State University.
- Mar. 15, 2019 *Isomorphism theorem between q -Schur algebras of type B and type A,*
Spring Southeastern Sectional Meeting,
Auburn University.
- Oct. 19, 2018 *Diophantine equations related to tight designs,*
Design Theory from the Viewpoint of Algebraic Combinatorics,
Three Gorges Mathematical Research Center.
- Oct. 19, 2018 *New lower bound on the sizes of designs,*
Design Theory from the Viewpoint of Algebraic Combinatorics,
Three Gorges Mathematical Research Center.
- Oct. 16, 2018 *Existence of rational designs,*
Design Theory from the Viewpoint of Algebraic Combinatorics,
Three Gorges Mathematical Research Center.
- Oct. 16, 2018 *Explicit constructions of designs,*
Design Theory from the Viewpoint of Algebraic Combinatorics,
Three Gorges Mathematical Research Center.
- Jun. 11, 2018 *Support varieties for Hecke algebras,*
Southeastern Lie Theory Workshop X, University of Georgia.
- Nov. 25, 2017 *An explicit construction of spherical designs,*
International Workshop on Bannai-Ito Theory, Zhejiang University.
- Apr. 25, 2015 *The lit-only σ -game,*
2015 Workshop on Combinatorics and Applications at SJTU,
Shanghai Jiao Tong University.
- Apr. 24, 2015 *Spherical designs over a number field,*
2015 Workshop on Combinatorics and Applications at SJTU,
Shanghai Jiao Tong University.
- Oct 27, 2014 *Tight block designs,*
Sphere Packings, Lattices, and Designs, Erwin Schrödinger International Institute.
- Nov. 19, 2013 *Product of P -polynomial association schemes,*
Workshop on Algebraic Combinatorics, Hebei Normal University.
- Jun. 24, 2013 *Lit-only σ -game,*
The 2nd Pacific Rim Mathematical Association Congress, Shanghai Jiao Tong University.
- Nov. 21, 2012 *Some s -distance set in hyperbolic space,*
Mini-Workshop on Spherical Designs and Related Topics, Shanghai Jiao Tong University.

- Nov. 11, 2012 *Incidence matrix and cover matrix,*
The 2nd Japan-Taiwan Conference on Combinatorics and its Applications,
Nagoya University.
- Aug. 18, 2012 *Nonexistence of nontrivial tight 8-design,*
2012 Shanghai Conference on Algebraic Combinatorics, Shanghai Jiao Tong University.
- Sep. 16, 2011 *Fisher type inequality,*
Workshop on Algebraic Combinatorics, Shanghai Jiao Tong University.

Other Talks

- Sep. 29, 2020 *Majorana representation of complex vectors, Temperley-Lieb category, and two variable hypergeometric series,*
Colloquium, National Chiao Tung University.
- Sep. 25, 2020 *Cactus skeleton: a generalization of wheels within wheels theorem,*
Seminar on Combinatorics, Academia Sinica.
- Sep. 18, 2020 *Solving Diophantine equations arising from algebraic combinatorics,*
Seminar on Combinatorics, Academia Sinica.
- Sep. 11, 2020 *A matrix-tree theorem on mixed graphs,*
Seminar on Combinatorics, Academia Sinica.
- Jul. 31, 2020 *Some mathematics behind the lights out game,*
Seminar on Combinatorics, Academia Sinica.
- Mar. 26, 2020 *On q -Schur algebras of classical types,*
Colloquium, National Cheng Kung University.
- Mar. 18, 2020 *An invitation to spherical designs,*
Taipei Postdoc Seminar, National Center for Theoretical Sciences.
- Nov. 6, 2019 *Support varieties for Iwahori-Hecke algebras,*
Seminar in Representation Theory, Academia Sinica.
- Jun. 21, 2019 *Support varieties for Iwahori-Hecke algebras,*
Algebra Seminar, Henan University.
- Apr. 1, 2019 *On q -Schur algebras of classical type,*
Algebra Seminar, University at Buffalo.
- Mar. 18, 2019 *Representation theory for Iwahori-Hecke algebras and Schur algebras of classical type,*
Algebra Seminar, University of Georgia.
- Jul. 27, 2018 *Good subsets of the unit circle,*
Graduate Student Summer Conference, University of Georgia.
- Feb. 5, 2018 *Support varieties for Hecke algebras,*
Algebra Seminar, University of Georgia.
- Nov. 6, 2017 *An introduction to Soergel bimodules,*
Algebra Seminar, University of Georgia.
- Jul. 26, 2017 *Dimensions of Specht modules,*
Graduate Student Summer Conference, University of Georgia.
- May 29, 2017 *An explicit construction of spherical designs,*
Combinatorics Seminar, Shanghai Jiao Tong University.

- Jul. 28, 2016 *Support varieties of Iwahori-Hecke algebras of type A*,
Graduate Student Summer Conference, University of Georgia.
- Apr. 13, 2016 *Sphere packings, spherical codes and spherical designs*,
Number Theory Seminar, University of Georgia.
- Jan. 28, 2015 *Nonexistence of tight 8-design*,
Number Theory Seminar, University of Georgia.
- Jul. 9, 2014 *Structure of strongly connected digraphs*,
Combinatorics Seminar, Shanghai Jiao Tong University.
- Apr. 12, 2014 *Laplacians*,
Combinatorics Seminar, Shanghai Jiao Tong University.
- Jun. 13, 2013 *Relative designs, totally positive sequence and zero distribution*,
Combinatorics Seminar, Shanghai Jiao Tong University.
- Nov. 21, 2012 *Some s-distance sets in hyperbolic space*,
Combinatorics Seminar, Shanghai Jiao Tong University.
- Jun. 6, 2012 *On the nonexistence of nontrivial tight 8-design*,
Combinatorics Seminar, Shanghai Jiao Tong University.
- Apr. 22, 2012 *Rational spherical t-semidesign*,
Combinatorics Seminar, Shanghai Jiao Tong University.
- Mar. 4, 2012 *A glimpse at P-polynomial association schemes*,
Combinatorics Seminar, Shanghai Jiao Tong University.

Teaching

- Fall 2020 Algebraic Combinatorics,
National Center for Theoretical Sciences.
- Spring 2018 Precalculus - MATH 1113 - Sections 20571,
University of Georgia.
- Fall 2017 Precalculus - MATH 1113 - Sections 15369 and 29605,
University of Georgia.
- Spring 2017 Calculus I - MATH 2250 - Section 40630,
University of Georgia.
- Fall 2016 Precalculus - MATH 1113 - Section 15218,
University of Georgia.
- Summer 2012 Computational Number Theory,
Shanghai Jiao Tong University.
- Spring 2011 Real Analysis,
Shanghai Jiao Tong University.
- Fall 2010 Calculus,
Shanghai Jiao Tong University.

Awards and Fellowships

- William Armor Wills Memorial Scholarship, University of Georgia, Apr. 2018.
- RTG fellowship, University of Georgia, Oct. 2014 - Jul. 2016.
- Chun-Tsung Program, Shanghai Jiao Tong University, Sep. 2013 - Jun. 2014.

Service - Referee

- Applicable Analysis and Discrete Mathematics
- Ars Mathematica Contemporanea
- Advances in Mathematics
- Graphs and Combinatorics
- Journal of Pure and Applied Algebra

Conference Organization

- Oct. 2018 Design Theory from the Viewpoint of Algebraic Combinatorics,
Three Gorges Mathematical Research Center.
Chair, in charge of schedule and website.
- Jun. 2018 Southeast Lie Theory X, University of Georgia.
Member of the organization committee.
- Apr. 2015 2015 Workshop on Combinatorics and Applications at SJTU,
Shanghai Jiao Tong University.
Chair, in charge of schedule and website.
- Apr. 2014 Minisymposium on Combinatorics, Shanghai Jiao Tong University.
Member of the organization committee.
- Nov. 2012 Mini-Workshop on Spherical Designs and Related Topics, Shanghai Jiao Tong University.
Chair, in charge of schedule and website.
- Aug. 2012 2012 Shanghai Conference on Algebraic Combinatorics, Shanghai Jiao Tong University.
Chair, in charge of badges, program book, schedule and website.

Technical Skills

Programming languages C, C++, Haskell, Lisp, Java, Python.

Other languages CSS, HTML, Javascript, PHP, VHDL.

Mathematics tools Mathematica, MATLAB, Sage.