Sylvester W. Zhang
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Personal Info

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Research

I work on algebraic combinatorics, and my research interest often lies in the intersection of algebra, combinatorics, geometry, and statistical physics. In particular, I am interested in the following topics.

- Cluster algebras and its generalizations, and related integrable systems.
- Tableaux combinatorics, especially for the affine symmetric group.
- Combinatorics of flag varieties and Schubert calculus.

Education

University of Minnesota, Twin Cities — Minneapolis, MN
Ph.D. in Mathematics — Sep 2020 – In Progress
Advisor: Pavlo Pylyavskyy
B.S. in Mathematics — Sep 2016 – May 2020
B.A. in Quantitative Economics — Sep 2016 – May 2020

Publications

1. **Double Dimer Covers on Snake Graphs from Super Cluster Expansions.**
with G. Musiker & N. Ovenhouse.
J. Algebra Vol 608 (2022) pp. 325-381. arXiv:2107.14785
2. **Rowmotion Orbits of Trapezoid Posets.**
with J. Wellman, Q. Dao, & C. Yost-Wolff.
Electron. J. Comb. 29-2 (2022) arXiv:2002.04810
3. **Arborescence of Covering Graphs.**
with S. Chepuri, C. Dowd, A. Hardt, G. Michel, & V. Zhang.
Algebr. Comb. Vol. 5 (2022) arXiv:1912.01060
4. **An Expansion Formula for Decorated Super-Teichmüler Spaces.**
with G. Musiker & N. Ovenhouse.
SIGMA 17 (2021) 080. arXiv:2102.09143

Preprints

5. **Matrix Formulae for Decorated Super Teichmüler Spaces.**
with G. Musiker & N. Ovenhouse.
arXiv:2208.13664, 2022. submitted to J. Geom. Phys.
6. **A Lattice Model for Super LLT Polynomials.**
with M. Curran, C. Frechette, C. Yost-Wolff, & V. Zhang
arXiv:2110.07597, 2021. submitted to Algebr. Comb.
7. **Rooted Clusters for Graph LP Algebras.**

with E. Banaian, S. Chepuri, & E. Kelley.
arXiv:2107.14785, 2021. submitted to SIGMA.

In Progress

8. **Affine Greene-Kleitman Correspondance.**
   with P. Pylyavskyy.
9. **Snake Graphs and Positivity for Graph LP Algebras.**
   with E. Banaian, S. Chepuri, & E. Kelley.
10. **Higher Dimer Covers on Snake Graphs.**
    with G. Musiker, N. Ovenhouse, & R. Schiffler.

Invited Talks

The Greene-Kleitman Correspondence November 2022
Student Algebra and Representation Seminar, SUNY Rutgers.

Super Cluster Algebras from Surfaces. September 2022
Combinatorics Seminar, University of Minnesota.

Combinatorial Formulas for Graph LP algebras. April 2022
Student Combinatorics and Algebras Seminar, University of Minnesota

Cluster Structures from Decorated Super-Teichmüller Spaces. April 2022
Workshop on supergeometry and bracket structures, Fields instutute.

Super Cluster Algebras from Surfaces. September 2022
Combinatorics Seminar, University of Minnesota.

Schur and LLT Polynomials from Lattice Models. March 2021
Graduate Online Combinatorics Colloquium (GOCC)

T-paths Formula for Decorated Super-Teichmüller Spaces. Feb 2021
Combinatorics Seminar, University of Minnesota

Activities

The LA Workshop on Representation Theory and Geometry. June 2022
University of Southern California.

MN Research Workshop in Algebraic Combinatorics. May 2022
Co-organized at University of Minnesota.

Open Problems in Algebraic Combinatorics. May 2022
University of Minnesota.

Workshop on Supergeometry and Bracket Structures. March 2022
Fields Institute, University of Toronto.

Teaching

Teaching assistant, University of Minnesota
Math 2263 (multivariable calculus): Spring 2021 Fall 2022
Math 1372 (calculus 2): Fall 2021
Math 1271 (calculus 1): Fall 2020 Spring 2021
Math 1051 (pre-calculus): Fall 2019 Spring 2020

Mentoring

Algebra and Combinatorics REU at the University of Minnesota

- Classification for Divides of Finite Mutation Type. (TA) Summer 2022
- Minimal Matching for dP_3 cluster algebras. (TA) Summer 2022
- Kazhdan-Lusztig immanants and %-immanants. (TA) Summer 2021

Skills

Programming

Python, Mathematica, SageMath, HTML, LaTeX. (fluent)

C++, JavaScript, Julia, R. (intermediate)

Languages

Chinese Mandarin (native), English (fluent)