SONG YU

song-yu@tsinghua.edu.cn
https://song-yu-math.github.io

Employment

Caltech-Tsinghua Joint Postdoctoral Fellow

California Institute of Technology, Pasadena, CA, USA — August 2023 – July 2024

Tsinghua University, Beijing, China — October 2024 – Present

Education

Ph.D. in Mathematics, Columbia University, New York, NY, USA — September 2017 – May 2023

Advisor: Chiu-Chu Melissa Liu

Thesis: *Open/closed correspondence and mirror symmetry*

B.A. in Mathematics, Pomona College, Claremont, CA, USA — August 2013 – May 2017

Academic Advisor: Shahriar Shahriari

Thesis Advisor: Erica Flapan

Thesis: *Symmetries of spatial graphs in homology spheres*

Certificate (with distinction), Math in Moscow, Moscow, Russia — September – December 2015

Certificate, Budapest Semesters in Mathematics, Budapest, Hungary — June – August 2015

Honors and Awards

1. Dean's Fellowship, Columbia University — September 2017 – May 2023
2. Hugh J. Hamilton Prize in Mathematics, Pomona College — May 2017
3. Summer Undergraduate Research Program funding, Pomona College — June – August 2016
4. Bruce Jay Levy Prize in Mathematics, Pomona College — May 2016
5. AMS scholarship for Math in Moscow Program — September – December 2015
6. Llewellyn Bixby Mathematics Prize, Pomona College — May 2015
7. Summer Undergraduate Research Program funding, Pomona College — May – July 2014
8. Jaeger Mathematics Prize, Pomona College — May 2014

Research Papers

Preprint

1. *Hodge-theoretic open/closed correspondence*, arXiv:2507.09941.
2. *Remodeling Conjecture with descendants*, with Bohan Fang, Chiu-Chu Melissa Liu, and Zhengyu Zong, arXiv:2504.15696.

3. *Orbifold open/closed correspondence and mirror symmetry*, with Chiu-Chu Melissa Liu, `arXiv:2210.11721`.

Published

1. *The Open Crepant Transformation Conjecture for toric Calabi-Yau 3-orbifolds*, J. Differential Geom. **130** (2025), 27–70.
2. *Open WDVV equations and Frobenius structures for toric Calabi-Yau 3-folds*, with Zhengyu Zong, Forum Math. Sigma **13** (2025), Paper No. e76, 29 pp.
3. *Open/closed BPS correspondence and integrality*, Commun. Math. Phys. **405**, 219 (2024), 34 pp.
4. *Open/closed correspondence via relative/local correspondence*, with Chiu-Chu Melissa Liu, Adv. Math. **410** (2022), Paper No. 108696, 43 pp.
5. *Symmetries of spatial graphs in 3-manifolds*, with Erica Flapan, Fundam. Math. **255** (2021), 289–308.
6. *Avoiding brooms, forks, and butterflies in the linear lattices*, with Shahriar Shahriari, Order **37** (2020), 223–242.

Research Presentations

1. *Remodeling Conjecture with descendants*, Caltech/USC Joint Algebra and Geometry Seminar, University of Southern California, Los Angeles, CA, USA, February 27, 2025.
2. *Remodeling Conjecture with descendants* (5-minute lightening talk), Workshop on Hyperkähler Varieties, Derived Categories, and Moduli Spaces, Columbia University, New York, NY, USA, February 8, 2025.
3. *Integrality in open and closed Gromov-Witten theory*, The 2024 Annual International Congress of Chinese Mathematicians (ICCM2024), Shanghai, China, January 4, 2025.
4. *Integrality in open and closed Gromov-Witten theory*, Symplectic Geometry and Mathematical Physics Seminar, Morningside Center of Mathematics, Chinese Academy of Sciences, Beijing, China, November 27, 2024.
5. *Open/closed correspondence via relative/local correspondence*, Symplectic Geometry and Mathematical Physics Seminar, Beijing International Center for Mathematical Research, Peking University, Beijing, China, November 12, 2024.
6. *Remodeling Conjecture with descendants*, BIRS-IASM Workshop on Noncommutative Geometry Meets Topological Recursion, Hangzhou, Zhejiang, China, September 26, 2024. [Recording]
7. *Integrality structures in open and closed Gromov-Witten theory*, Workshop on Enumerative Geometry, University of Oregon, Eugene, OR, USA, April 13, 2024.
8. *Open/closed correspondence and mirror symmetry*, Mathematics - String Theory Seminar, Kavli Institute for the Physics and Mathematics of the Universe, Kashiwa, Japan, March 28, 2024.
9. *Open WDVV equations and Frobenius structures for toric Calabi-Yau 3-folds*, Hebrew University Topology and Geometry Seminar, virtual, February 20, 2024.

10. *Knot invariants, Gromov-Witten invariants, and integrality conjectures*, Claremont Topology Seminar, Claremont, CA, USA, January 30, 2024.
11. *Open/closed correspondence and mirror symmetry*, Caltech/USC Joint Algebra and Geometry Seminar, California Institute of Technology, Pasadena, CA, USA, October 5, 2023.
12. *Open/closed correspondence and mirror symmetry*, Western Hemisphere Virtual Symplectic Seminar, virtual, February 17, 2023. [Recording]
13. *Open/closed correspondence and mirror symmetry*, Geometry and Physics Seminar, Boston University, Boston, MA, USA, December 7, 2022.
14. *Open Crepant Transformation Conjecture for toric Calabi-Yau 3-orbifolds*, Algebra Seminar, University of Oregon, Eugene, OR, USA, October 11, 2022.
15. *Orbifold open/closed correspondence*, Integrability, Enumerative Geometry and Quantization, Simons Center for Geometry and Physics, Stony Brook, NY, September 20, 2022. [Recording]
16. *Open/closed correspondence via relative/local correspondence*, MAP Meeting, Boston College, virtual, February 26, 2022. [Recording]
17. *Open/closed correspondence via relative/local correspondence*, Online Geometry and Physics Seminar, Institute for Advanced Study in Mathematics, Zhejiang University, virtual, January 4, 2022. [Recording]
18. *The Open Crepant Transformation Conjecture for toric Calabi-Yau 3-orbifolds*, Informal Mathematical Physics Seminar, Columbia University, virtual, May 11, 2020. [Recording]
19. *Symmetries of graphs in homology spheres*, AMS Session for Contributed Papers on Undergraduate Research, 2017 Joint Math Meetings, Atlanta, GA, USA, January 5, 2017.
20. *Symmetries of graphs in homology spheres*, International Workshop on Spatial Graphs (IWSG 2016), Waseda University, Tokyo, Japan, August 5, 2016.
21. *Forbidden configurations in the linear lattices*, Claremont Colleges Algebra, Number Theory, and Combinatorics Seminar, Claremont, CA, USA, March 1, 2016.
22. *Forbidden configurations in the linear lattices*, Budapest Semesters in Mathematics Colloquium, Budapest, Hungary, July 22, 2015.

Teaching and Mentoring

Tsinghua

1. Qiuzhen Yiyou Mentor — Fall 2024, Spring 2025

Instructor, Caltech

1. Algebraic geometry C — Spring 2024
2. Algebraic geometry A — Fall 2023

Instructor, Columbia

1. Linear algebra — Summer 2021
2. Calculus II — Summer 2020

3. Topics in graph theory (undergraduate seminar) Fall 2019
4. Elementary applied topology (undergraduate seminar) Spring 2019

Teaching Assistant, Columbia

1. Introduction to algebraic topology Spring 2023
2. Topology Fall 2022
3. Linear algebra Spring 2022
4. Calculus II Fall 2021, Spring 2021, Summer 2019
5. Modern algebra Fall 2020
6. Calculus III Spring 2020
7. Calculus I Fall 2018

Seminars Co-organized

Tsinghua

1. Caltech-Tsinghua Joint Colloquium Fall 2023 – Present

Caltech

1. Southern California Algebraic Geometry Seminar April 6, 2024
2. Learning seminar on quasimap theory Winter 2024
3. Caltech/USC Joint Algebra and Geometry Seminar 2023–24

Columbia

1. Learning seminar on intersection theory Fall 2018