

# SONG YU

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🏠 <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

### In Preparation

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

3. *Topological recursion, Crepant Transformation Conjecture, and holomorphic anomaly equations*, with Bohan Fang, Chiu-Chu Melissa Liu, and Zhengyu Zong.

## Preprint

1. *Open WDVV equations and Frobenius structures for toric Calabi-Yau 3-folds*, with Zhengyu Zong, [arXiv:2312.06160](#).
2. *Orbifold open/closed correspondence and mirror symmetry*, with Chiu-Chu Melissa Liu, [arXiv:2210.11721](#).
3. *The Open Crepant Transformation Conjecture for toric Calabi-Yau 3-orbifolds*, [arXiv:2002.08524](#), to appear in J. Differential Geom.

## Published

1. *Open/closed BPS correspondence and integrality*, Commun. Math. Phys. **405**, 219 (2024), 34 pp.
2. *Open/closed correspondence via relative/local correspondence*, with Chiu-Chu Melissa Liu, Adv. Math. **410** (2022), Paper No. 108696, 43 pp.
3. *Symmetries of spatial graphs in 3-manifolds*, with Erica Flapan, Fundam. Math. **255** (2021), 289–308.
4. *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. *Integrality in open and closed Gromov-Witten theory*, The 2024 Annual International Congress of Chinese Mathematicians (ICCM2024), Shanghai, China, January 4, 2025.
3. *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.
4. *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.
5. *Remodeling Conjecture with descendants*, BIRS-IASM Workshop on Noncommutative Geometry Meets Topological Recursion, Hangzhou, Zhejiang, China, September 26, 2024. [Recording]
6. *Integrality structures in open and closed Gromov-Witten theory*, Workshop on Enumerative Geometry, University of Oregon, Eugene, OR, USA, April 13, 2024.
7. *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.
8. *Open WDVV equations and Frobenius structures for toric Calabi-Yau 3-folds*, Hebrew University Topology and Geometry Seminar, virtual, February 20, 2024.

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

## TEACHING AND MENTORING

### Tsinghua

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|-------------------------|-----------|
| 1. Qiuzhen Yiyou Mentor | Fall 2024 |
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### Instructor, Caltech

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|-------------------------|-------------|
| 1. Algebraic geometry C | Spring 2024 |
| 2. Algebraic geometry A | Fall 2023   |

### Instructor, Columbia

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|-------------------|-------------|
| 1. Linear algebra | Summer 2021 |
| 2. Calculus II    | Summer 2020 |

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

**Teaching Assistant, Columbia**

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|---------------------------------------|-------------------------------------|
| 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**

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|--------------------------------------|---------------------|
| 1. Caltech-Tsinghua Joint Colloquium | Fall 2023 – Present |
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**Caltech**

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|---|---------------|
| 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**

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| 1. Learning seminar on intersection theory | Fall 2018 |
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