

Shubham Sinha

CONTACT INFORMATION

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EMPLOYMENT

International Centre for Theoretical Physics, Trieste, Italy

Postdoctoral Fellow, Mathematics, 2023-till date

- Mentor: Prof. Alina Marian

EDUCATION

University of California San Diego, San Diego, USA

Ph.D., Mathematics, 2023

- Advisor: Prof. Dragos Oprea

Indian Institute of Science, Bangalore, India

B.S., Mathematics, 2017

- Advisor: Prof. Arvind Ayyer

PAPERS

- [1] Shubham Sinha and Ming Zhang, *Quantum -invariants via Quot schemes I*, arXiv:2406.12191
- [2] Dragos Oprea and Shubham Sinha, *Euler characteristics of tautological bundles over quot schemes of curves*, *Advances in Mathematics* 418, 108943 (2023)
- [3] Shubham Sinha, *The virtual intersection theory of isotropic quot schemes*, *Journal of Geometry and Physics* 198, 105128 (2024).
- [4] Arvind Ayyer and Shubham Sinha, *Cores of partitions in rectangles*, *Electronic Journal of Combinatorics* 31 (1) (2024).
- [5] Shubham Sinha and Soumya Ganguly, *Bergman-Einstein metrics on two-dimensional Stein spaces*, *Michigan Mathematical Journal* (accepted).
- [6] Arvind Ayyer and Shubham Sinha, *The size of t -cores and hook lengths of random cells in random partitions*, *Annals of Applied Probability* 33, 85-106 (2023).
- [7] Arvind Ayyer and Shubham Sinha, *Random t -cores and hook lengths in random partitions*, *Sém. Lothar. Combin.*, **84B** (2020), Art. 58, 11.
- [8] Sindhana Pannir-Sivajothi, Jorge A Campos-Gonzalez-Angulo, Luis A Martínez-Martínez, Shubham Sinha, and Joel Yuen-Zhou, *Driving chemical reactions with polariton condensates*, *Nature Communications* **13** (2022), 1–9.

AWARDS and FELLOWSHIPS

Powell Dissertation award, UC San Diego, 2023

Best Poster Award, Richmond Geometry Festival, 2022

James B.Ax Graduate Fellowship, UC San Diego, 2017-18

KVPY (young scientist) Fellowship, India, 2012-2017

International Mathematical Olympiad (silver medal), Colombia, 2013

PRESENTATIONS

Research presentations:

- *Quantum K-Invariants via Quot scheme*, Moduli stacks and enumerative geometry (VBAC), Isaac Newton Institute, Cambridge, 2024
- *Quantum K-theory of Grassmannian via Quot scheme*, International center for Theoretical Physics (ICTP), 2023
- *Schur bundles over Quot schemes of \mathbb{P}^1* , University of Pennsylvania, 2023
- *Tautological bundles over Quot schemes on curves*, International center for Theoretical Physics (ICTP), 2023
- *The virtual intersection theory of isotropic Quot schemes*, Indian Institute of Science 2023
- *Numerical invariants of Quot schemes on curves*, Virginia Tech 2022
- *Tautological bundles over Quot scheme of curves*, Western Algebraic Geometry Symposium (WAGS) 2022, UC Riverside
- *Tautological bundles over Quot scheme of curves*, VBAC 2022, University of Warwick, (virtual) poster presentation
- *Tautological bundles over Quot scheme of curves*, Richmond Geometry Festival 2022, (virtual) poster presentation
- *Isotropic Quot schemes*, UC San Diego, 2020
- *Random t-cores and hook lengths in random partitions*, FPSAC 2020
- *Random t-cores and hook lengths in random partitions*, IMSc 2020

Expository talks:

- *Counting maximal subbundles over smooth projective curves*, RTG Colloquim, UC San Diego, 2020
- *Edidin-Graham's characteristic classes*, Enumerative Geometry Zoominar, UC San Diego, 2020
- *Stable quasimaps to GIT quotients*, Enumerative Geometry Zoominar, UC San Diego, 2020
- *Quantum cohomology of Grassmannian*, Enumerative Geometry Zoominar, UC San Diego, 2020
- *Journey to the core of partitions*, Indian Institute of Science, 2019
- *Geometric Invariant Theory*, graduate student workshop, UC San Diego, 2019
- *Birch Swinnerton-Dyer Conjecture*, Indian Institute of Science, 2018

TEACHING

Instructor (at UC San Diego):

- Math 10 A: Calculus 1, Summer Session 2, 2023
- Math 10 B: Calculus 2, Summer Session 1, 2022
- Math 10 B: Calculus 2, Summer Session 2, 2021

Graduate Teaching Assistant (at UC San Diego):

- Math 220 A-B-C: Complex Analysis (graduate), 2022-2023 and 2020-2021
- Math 158, Extremal Combinatorics and Graph Theory, Winter 2023
- Math 120 A-B: Applied Complex Analysis, Winter-Spring 2022
- Math 109: Mathematical Reasoning, Fall 2021

- Math 154: Discrete Math and Graph Theory, Spring 2023, Fall 2022, Spring 2021 and Winter 2018
- Math 103 A-B: Modern Algebra, 2019-2020
- Math 104 A-B: Number Theory, 2018-2019
- Math 184 : Enumerative Combinatorics, Spring 2018
- Math 20 E: Vector Calculus, Spring 2019-20
- Math 20A: Calculus 1: Winter 2019
- Math 10A: Calculus1: Fall 2017

OUTREACH

- RTG graduate directed reading for undergraduates, *Algebraic curves and Riemann surfaces*, UC San Diego, Spring 2021
- RTG graduate directed reading for undergraduates, *27 lines on a cubic surface*, UC San Diego, Spring 2020
- Served as TA for the lecture series “Vafa-Witten invariants of projective surfaces” by Richard Thomas at ‘Summer school on Enumerative Geometry, Physics and Representation Theory’, IHES, July 2021.
- Teaching at India national training camp for IMO, 2013-2017 and 2021.

COMPUTER LANGUAGES

Sage, Python, C, LaTeX, Mathematica