SHIYUE LI

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My current research interest is to study enumerative and intersection problems in algebraic geometry and arithmetic geometry, using techniques from combinatorics and representation theory.

🎓 EDUCATION

2019-	**Brown University**, PhD in progress, advised by Melody Chan
2017-2019	**Yale University**, M.Sc. in Mathematics
2013-2017	**Harvey Mudd College**, B.S. in Mathematics with Honors and Distinction

🎓 RESEARCH

In preparation — Relative Bott-Samelson Varieties, 2019,
> ❯ Bott-Samelson varieties are iterative $\mathbb{P}^1$-bundles over a fixed complete flag variety of a vector space. We recall the definition of *relative Bott-Samelson varieties*, and prove that fiber product of two Bott-Samelson vairieties is the resolution of singularities of *relative Richardson varieties* defined with respect to a fixed vector bundle and versal families of flags. This reflects the local geometry of relative Richardson varieties : their local geometry is governed by the two intersecting relative Schubert varieties. We then generalize geometric and cohomological facts about Bott-Samelson varieties and fiber product of them to the relative setting. Such construction serves as a resolution of singularities of Brill-Noether variety with imposed ramification in the two-pointed case.

Preprint — Chow Ring of Heavy/Light Hassett Spaces via Tropical Geometry, 2019,
> ❯ Joint work with Siddarth Kannan and Dagan Karp
> ❯ We compute the Chow ring of an arbitrary *heavy/light Hassett space* $\overline{M}_{0,w}$. These spaces are moduli spaces of weighted pointed stable rational curves, where the associated weight vector w consists of only *heavy* and *light* weights. Work of Cavalieri et al. exhibits these spaces as tropical compactifications of hyperplane arrangement complements. The computation of the Chow ring then reduces to intersection theory on the toric variety of the Bergman fan of a graphic matroid. Keel has calculated the Chow ring $A^*(\overline{M}_{0,n})$ of the moduli space $\overline{M}_{0,n}$ of stable nodal n-marked rational curves; his presentation is in terms of divisor classes of stable trees of $\mathbb{P}^1$'s having one nodal singularity. Our presentation of the ideal of relations for the Chow ring $A^*(\overline{M}_{0,w})$ is analogous. We show that pulling back under Hassett's birational reduction morphism $\rho_w : \overline{M}_{0,n} \to \overline{M}_{0,w}$ identifies the Chow ring $A^*(\overline{M}_{0,w})$ with the subring of $A^*(\overline{M}_{0,n})$ generated by divisors of w-*stable trees*, which are those trees which remain stable in $\overline{M}_{0,w}$.
> ❯ `https://arxiv.org/pdf/1910.10883.pdf`

Senior thesis — Tropical Derivation of Cohomology Ring of Heavy/Light Hassett Spaces, 2017,
> ❯ Advisor : Dagan Karp, Reader : Dhruv Ranganathan.

🎓 AWARDS

2018-2019	**Robert Willets Carle Scholarship**, Yale University
2017-2018	**Kenneth and Mary Wang Graduate Fellowship**, Yale University
2017-2019	**Lang Fellowship**, Yale University Department of Mathematics
2013-2017	**Harvey S. Mudd Merit Award**, Harvey Mudd College, awarded to students who demonstrate superior academic achievement and ability to contribute to the College community
2013-2017	**Yu Yuen Kit So International Scholarship**, Harvey Mudd College, awarded to one international recipient for each entering class based on superior academic performance as shown in the application for admission
2013	**China National Linguistics Olympiad, Individual 3rd Place**
2013	**China National Linguistics Olympiad, Team 2nd Place**

♦ CONFERENCE TALKS

| Mar 2020 | AMS Spring Eastern Sectional Meeting on Moduli of Curves, Hilbert Schemes, and Tropical Geometry
 Tufts University |

♦ SEMINAR TALKS

Feb 2019	**Moduli Space of Linear Series with Imposed Ramification**, Yale University
Feb 2019	**Moduli Space of Linear Series with Imposed Ramification**, Brown University
Oct 2018	**Schubert Calculus and Young Tableaux**, Yale University
Nov 2018	**Meet the Matroids**, Yale University
May 2017	**Tropical Derivation of Cohomology Ring of Heavy/Light Hassett Spaces**, Harvey Mudd College

♦ OUTREACH TALKS

Mar 2020	**Johns Hopkins University Center for Talented Youth** Brown University
Nov 2019	**Yale Undergraduate Mathematical Society Seminar** Yale University
Oct 2019	**Brown Math and AMPA Department Undergraduate Group Seminar** Brown University

♦ TEACHING

Summer 2019 Summer 2018	Canada/USA Mathcamp, MENTOR,
	› 2019 courses : Introduction to Group Theory, Young tableaux and Representation Theory, Young tableaux and Combinatorics, Young tabeaux and Probability.
	› 2018 courses : Algebraic Number Theory, Geometric Group Theory, Modular Forms, Tropical Plane Curves and Rational Points on Elliptic Curves.
2017-2019	Yale University, TEACHING ASSISTANT,
	› Math 225 Linear Algebra and Matrix Theory, Fall 2018
	› Math 112 Calculus, Spring 2018
2014-2017	Harvey Mudd College, TEACHING ASSISTANT,
	› Math 147 Topology, Spring 2017
	› Math 132 Anaysis 2, Fall 2016
	› Math 171 Abstract Algebra, Fall 2016
	› Physics 51 Electricity Theory and Optics, Fall 2015
	› Physics 23 Special Relativity, Fall 2015
	› Physics 24 Mechanics, Spring 2015
	› Math 30 Calculus, Fall 2014,
	› Math 35 Statistics and Probability, Fall 2014

♦ MENTORING

Summer 2019 Summer 2018	Canada/USA Mathcamp Projects, MENTOR,
	› Research. Mentee : Ilaria Seigal .
	› Enumerative Geometry. Mentees : Alice Jenkins, Jeremy Zhou.
	› Primes of the Form $x^2 + ny^2$. Adivisee : Reed Jacobs.
	› Schubert Calculus. Mentees : Simran Khunger, Rupert Li.
	› Group action and Sylow's Theorems. Mentees : Serena An.
2018	Women in Science at Yale, GRADUATE MENTOR,
	› Undergraduate mentee : Alara Değirmenci
Fall 2018	Brown Math Directed Reading Project, GRADUATE MENTOR,
	› Foundations of Algebraic Geometry. Mentees : Dominick Joo, Elliott Lehrer, Joshua Lebo.

🎓 Other Professional Experience

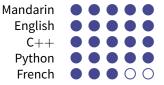|	
Summer 2016 Intern	Google Research and Machine Intelligence, Mountain View, California, › Advisors : Caroline Pantofaru, Malcolm Slaney. › Research on Machine Learning algorithms using TensorFlow to solve an audio/video syncing problem involving computer vision and human saliency event detection.
Summer 2014 Researcher	Howard Hughes Medical Institute Undergraduate Research, Claremont, California, › Mathematical Modeling on DNA Segregation. Implemented Gillespie algorithms and Next Sub-volume Method to simulate diffusion and reactions of ParA and ParB proteins
Summer 2012	Summer Science Program, Socorro, New Mexico, › Research on orbit determination of solar-system body. Implemented programs in Python using iterative Gaussian method to determine the orbit elements based on the observation data of Asteroid 1998QS52 in Etscorn Observatory over six weeks › Paper and results archived in Harvard-Smithsonian Center for Astrophysics.

🎓 Service

2019-2020	**Brown Math Diversity and Inclusiveness Committee**, Committee Member
2019-2020	**Advisory Committee on Corporate Responsibility in Investment Policies**, Grad student representative
2019-2020	**AMS Graduate Conferences**, Coorganizer
2019	**Brown Math Directed Reading Program**, Coorganizer
2018	**Intersections : Women and Gender Minority Groups in Mathematics at Yale**, Coorganizer
2018	**Yale Math Directed Reading Program**, Organizer
2018-2019	**Yale Graduate and Professional Student Senate**, Senator
2016-2017	**Harvey Mudd College Math Club**, President
2015-2016	**Caltech Harvey Mudd Math Competition**, Organizer

</> Languages

Mandarin	●●●●●
English	●●●●●
C++	●●●●●
Python	●●●●●
French	●●●○○

💡 Fun Stuff

Piano	studied with Gayle Blankenberg (Los Angeles), Carol Morgan (Vienna), Fantee Jones (Yale), Maxwell Foster (Yale)
Classical Guitar	studied with Jack Sanders (Los Angeles); member of Pomona College Guitar Quartet
Go	3 Dan at age of 10
Sports	running, rock climbing, cycling