

Rhea Palak Bakshi

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Work Experience

- **Institute for Theoretical Studies, ETH Zurich**
Junior Fellow Fall 2021 - Present
- **The George Washington University**
Graduate Teaching Assistant Fall 2016 - Spring 2021

Education

- **The George Washington University**
Ph.D. in Mathematics, GPA: 4.0, Advisor: Józef H. Przytycki Fall 2016 - Spring 2021
Thesis Title: Skein Modules, Skein Algebras, and Their Ramifications
- **University of Mumbai**
M.Sc. in Mathematics, GPA: 3.8 (First Class) Fall 2014 - Spring 2016
- **Lady Shri Ram College for Women, University of Delhi**
B.Sc. (Honours) in Mathematics, GPA: 4.0 (Distinction) Fall 2011 - Spring 2014

Research Interests

Low-Dimensional Topology, Algebraic and Quantum Invariants of Manifolds, Knot Theory

Refereed Research Publications and Preprints

- **A counterexample to Marché's generalisation of Witten's conjecture**
e-print: arXiv:2205.01653 [math.GT]
- **Kauffman bracket skein module of the connected sum of handlebodies: a counterexample**
With J. H. Przytycki
Manuscripta Math. 167 (2022), no. 3-4, 809–820, e-print: arXiv:2005.07750 [math.GT]
- **On framings of links in 3-manifolds**
With D. Ibarra, G. Montoya-Vega, J. H. Przytycki, and D. Weeks
Canad. Math. Bull. 64 (2021), no. 4, 752–764, e-print: arXiv:2001.07782 [math.GT]
- **A generalization of the Gram determinant of type A**
With D. Ibarra, S. Mukherjee, and J. H. Przytycki
Topology Appl. 295 (2021), Paper No. 107663, 15 pp., e-print: arXiv:1905.07834 [math.GT]
- **Schur multipliers and second quandle homology**
With D. Ibarra, S. Mukherjee, T. Nosaka, and J. H. Przytycki
J. Algebra 552 (2020), 52–67, e-print: arXiv:1812.04704 [math.GT]
- **On multiplying curves in the Kauffman bracket skein algebra of the thickened four-holed sphere**
With S. Mukherjee, J. H. Przytycki, M. Silvero, and X. Wang
J. Knot Theory Ramifications, 30 (2021), no. 14, Paper No. 2141001, 29 pp. e-print: arXiv:1805.06062 [math.GT]

Scholarly Books and Encyclopedia Articles

- **Chapter 63: Skein modules of 3-manifolds and Chapter 69: Kauffman bracket skein modules of 3-manifolds**
With J. H. Przytycki and Helen Wong
Encyclopedia of Knot Theory, Chapman and Hall/CRC Press (2020), pp. 617-623 and pp. 657-666, ISBN 9781138297845

- **Lectures in knot theory: An exploration of contemporary topics**
With J. H. Przytycki, D. Ibarra, G. Montoya-Vega, and D. Weeks
(Under contract with Springer Universitext - Manuscript submitted)

Research Papers in Preparation

- **Kauffman bracket skein module of the connected sum of two solid tori**
With T. T. Q. Lê and J. H. Przytycki (Draft available on request)
- **Khovanov homology and the third Jones-Wenzl idempotent**
With J. H. Przytycki and M. Silvero (in preparation)

Awards and Honors

- **James H. Taylor Graduate Mathematics Prize**
Department of Mathematics, The George Washington University 2020
(Awarded for excellence in graduate research and overall accomplishments)
- **Graduate Student Teaching Award for Excellence in Teaching**
Department of Mathematics, The George Washington University 2019
- **Joint Mathematics Meeting Graduate Student Travel Grant**
American Mathematical Society 2020
- **Rodica Simion Memorial Fund for Conference Travel**
Department of Mathematics, The George Washington University 2020
- **Graduate Student Travel Grant**
American Mathematical Society 2018
For AMS Fall Southeastern Sectional Meeting, Fayetteville, Arkansas
- **CCAS Dean's Graduate Conference Travel Grant**
The George Washington University 2018
- **Innovation in Science Pursuit for Inspired Research (INSPIRE) Scholarship**
Department of Science and Technology, Government of India 2011 - 2016
For bachelor's and master's level education

Teaching Experience

- **Principal Lecturer for Lecture Series on Skein Modules, Jilin University, Changchun, China** Spring 2022

Instructor Positions at GWU

- **Single Variable Calculus 2: MATH 1232** Summer 2020
- **Mathematics and Politics: MATH 1007** Summer 2019
- **Calculus with Pre-Calculus II: MATH 1221** Summer 2018

Teaching Assistant Positions at GWU

- **Mathematics and Politics: MATH 1007** + weekly Calculus labs Spring 2021
- **Introduction to Mathematical Reasoning: MATH 2971** + weekly Calculus labs Fall 2020
- **Linear Algebra: MATH 2184** + weekly Calculus labs Spring 2020
- **Single Variable Calculus 2: MATH 1232** + weekly Calculus labs Fall 2019
- **Multivariable Calculus: MATH 2233** + weekly Calculus labs Spring 2019
- **Single Variable Calculus 2: MATH 1232** + weekly Calculus labs Fall 2018
- **Calculus with Pre-Calculus II: MATH 1221** + weekly Calculus labs Spring 2018
- **Single Variable Calculus I: MATH 1231** + weekly Calculus labs Fall 2017

- **Calculus with Pre-Calculus II: MATH 1221** + weekly Calculus labs Spring 2017
- **Calculus with Pre-Calculus I: MATH 1220** + weekly Calculus labs Fall 2016

Invited Talks, Conferences, Posters, and Workshops

- **AMS-SMF-EMS Joint International Meeting, Université de Grenoble-Alpes, Grenoble, France**
Special Session on Inverse Problems (upcoming) July 2022
- **Topology Seminar, ETH Zurich**
(upcoming) June 2022
- **Spring Topological School on Witten's Finiteness Conjecture for Skein Modules, Matemale, France**
Title: Basics of skein modules (upcoming) May 2022
- **Braids in Low-Dimensional Topology, ICERM, Brown University** April 2022
- **Knots in Washington 49.75, The George Washington University, Washington DC**
Title: Chebyshev representation of handle sliding relations in the KBSM April 2022
- **Claremont Topology Seminar, Claremont California**
Title: Kauffman bracket skein modules and their structure March 2022
- **Seminar on Knots and Representation Theory**
Title: On torsion in skein modules March 2022
- **Knots in Washington 49.5**
Title: On the KBSM of the connected sum of two solid tori December 2021
- **Oberwolfach Seminar: Combinatorial and Geometric Knot Theory, Oberwolfach, Germany**
Title: On the structure of the Kauffman bracket skein module November 2021
- **Talks in Mathematical Physics, ETH Zurich**
Title: Skein modules and algebras November 2021
- **ITS Fellows' Seminar, Zurich**
Title: A survey of skein modules November 2021
- **AMS Fall Western Sectional Meeting (formerly at University of New Mexico, Albuquerque)**
Special Session on Inverse Problems
Title: On the structure of Kauffman bracket skein modules October 2021
- **Remote Rendezvous for Quantum Topologists**
Title: Framing changes of links in 3-manifolds and torsion in skein modules August 2021
- **Nearly Carbon Neutral Geometric Topology Conference**
Special Topics Session on Knots and Braids in Dimensions 3 and 3.5
Title: Structure of the KBSM of the connected sum of handlebodies June 2021
- **Banff International Research Station for Mathematical Innovation and Discovery Workshop**
Perspectives on Knot Homology (Online) May 2021
- **Stanford Topology Seminar**
Title: On the structure of the Kauffman bracket skein module of 3-manifolds March 2021
- **Joint Mathematics Meetings (formerly in Washington, District of Columbia)**
Special Session on Algebraic Structures Related to Knot Theory
Title: Counterexamples at Kauffman bracket skein modules of 3-manifolds January 2021
- **Quantum Algebra and Topology Seminar, University of California, Santa Barbara**
Title: Understanding the structure of the Kauffman bracket skein module and the framing skein module December 2020
- **Research Workshop, University of Texas, Dallas**
Title: Kauffman bracket skein module of Seifert-fibered manifolds November 2020
- **Geometry and Topology Seminar, CUNY Graduate Centre**
Title: On the structure of skein modules November 2020

- **Geometry and Topology Student Seminar, CUNY Graduate Centre**
Title: Skein modules November 2020
- **AMS Fall Western Sectional Meeting (formerly at University of Utah, Salt Lake City)**
Special Session on Inverse Problems October 2020
Title: The Kauffman Bracket Skein Module of the Connected Sum of Two Handlebodies: A Counterexample
- **Low-Dimensional Topology and Number Theory, Oberwolfach Workshop**
(canceled due to the COVID-19 pandemic) August 2020
- **Knots Through Web (Online), International Center for Theoretical Sciences, Bangalore, India**
Title: A tour of skein modules August 2020
- **Classical Knots + Virtual Knots + Algebraic Structures Related to Knots (CKVK*)**
Title: Skein modules and framing changes of links in 3-manifolds June 2020
- **AMS Spring Western Sectional Meeting, California State University, Fresno**
Special Session on Inverse Problems (canceled due to the COVID-19 pandemic) May 2020
- **GW Research Showcase**
Poster Title: A counterexample to Marché's generalisation of Witten's conjecture April 2020
(canceled due to the COVID-19 pandemic)
- **AMS Spring Central Sectional Meeting, Purdue University, West Lafayette**
Special Session on Knots and Links in 3-Manifolds (canceled due to the COVID-19 pandemic) April 2020
- **Trends in Knot Theory, International Center for Theoretical Sciences, Bangalore, India**
Discussion Meeting Speaker (canceled due to the COVID-19 pandemic) March 2020
- **Knots in Washington XLIX, The George Washington University, Washington DC**
Title: Skein modules through the ages February 2020
- **Joint Mathematics Meeting, Denver, Colorado**
Special Session on Applications and Computations in Knot Theory, January 2020
Title: Categorification of the KBSM of the projective space and lens spaces
- **AMS Fall Western Sectional Meeting, University of California, Riverside**
Special Session on Inverse Problems, Title: A generalisation of Lickorish's bilinear form November 2019
- **AMS Fall Eastern Sectional Meeting, Binghamton University, Binghamton**
Special Session on Invariants of Knots, Links and Low-Dimensional Manifolds October 2019
Title: Gram determinants in knot theory
- **StReeTs (Student Research Talks), George Mason University, Fairfax**
Title: Gram determinants arising in knot theory October 2019
- **Knots in Washington XLVIII, The George Washington University, Washington DC**
Distinguished Graduate Student Speaker, Title: Gram determinants motivated by knot theory May 2019
- **Association for Women in Mathematics (AWM) Research Symposium, Rice University, Houston**
Poster Title: On the KBSA of the thickened T-shirt April 2019
- **GW Research Days**
Poster Title: Schur Multipliers and second quandle homology April 2019
- **AWM Workshop: Graduate Student Poster Session, Joint Mathematics Meetings, Baltimore**
Poster Title: Multiplying curves in the thickened T-shirt January 2019
- **StReeTs (Student Research Talks), George Mason University, Fairfax**
Title: The thickened T-Shirt and its Kauffman bracket skein algebra November 2018
- **AMS Fall Southeastern Sectional Meeting, University of Arkansas, Fayetteville**
Special Session on Non-associative Algebraic Structures and their (Co)homology Theories November 2018
Title: On the skein algebra of the thickened four holed sphere
- **Knots in Washington XLVI, The George Washington University, Washington DC**
Title: On the Kauffman bracket skein algebra of the thickened T-shirt May 2018

- **GW Research Days**
Poster Title: Multiplying curves in the thickened T-shirt April 2018
- **AMS Spring Western Sectional Meeting, Portland State University, Portland**
Special Session on Inverse Problems, Title: Multiplying links in the thickened sphere with four holes April 2018

Participation at Other Conferences and Scientific Meetings

- **From Subfactors to Quantum Topology, University of Geneva, Geneva, Switzerland**
In memory of Vaughan Jones (upcoming) June 2022
- **Quantum Topology and Geometry Conference, Institut Henri Poincaré, Paris, France**
In honour of Vladimir Turaev (upcoming) June 2022
- **39th Annual Workshop on Geometric Topology**
(upcoming) June 2022
- **Winter Braids XI, Dijon, France**
Title: Kauffman bracket skein module of the connected sum of two solid tori December 2021
- **Tech Topology Conference (Online)**
Title: On the Kauffman bracket skein module of the connected sums of 3-manifolds December 2021
- **Trends in Low-Dimensional Topology**
Title: Skein modules and framing changes of links in 3-manifolds July 2020
- **Topology Students Workshop**
Title: Framing of links in 3-manifolds and torsion in skein modules July 2020
- **Graduate Online Anything Topology Series**
Title: Skein modules and framings of links in 3-manifolds June 2020
- **Knot Online Seminar (K-OS)** Spring 2020
- **Quantum Topology and Geometry (Topologie quantique et géométrie), CIRM-Luminy, France**
(cancelled due to the COVID-19 pandemic) May 2020
- **Graduate Student Topology and Geometry Conference, Indiana University, Bloomington**
(cancelled due to the COVID-19 pandemic) April 2020
- **Swiss Knots, ETH Zurich, Switzerland** July 2019
- **Young Topologists Meeting, Laussane, Switzerland**
Talk Title: The KBSA of the thickened four-holed sphere
Poster Title: Schur multipliers and second quandle homology July 2019
- **Knots and Braids in Norway, Trondheim, Norway**
Title: The skein algebra of the thickened four-holed sphere May 2019
- **AMS Spring Eastern Sectional Meeting, University of Connecticut, Hartford**
Special Session on Invariants of Knots, Links, and Low-dimensional Manifolds
Special Session on Knot Theory, the Colored Jones Polynomial, and Khovanov Homology April 2019
- **Knots in Washington XLVII, The George Washington University, Washington DC** January 2019
- **Graduate Student Conference in Algebra, Topology, and Geometry, Temple University, Philadelphia**
Title: Multiplicative structure of the Kauffman bracket skein algebra of a sphere with four holes June 2018
- **Cornell Topology Festival, Cornell University, Ithaca** May 2018
- **Graduate Student Topology and Geometry Conference, University of Illinois, Chicago** April 2018
- **AMS Spring Central Sectional Meeting, Ohio State University, Columbus**
Special Session on Algebraic, Combinatorial, and Quantum Invariants of Knots and Manifolds March 2018
- **Joint Mathematics Meetings, San Diego, California** January 2018
- **Knots in Washington XLV, The George Washington University, Washington DC** December 2017
- **No Boundaries: Groups in Algebra, Geometry, and Topology, University of Chicago** October 2017

- **AMS Fall Central Sectional Meeting, University of North Texas, Denton** September 2017
Special Session on Invariants of Links and 3-Manifolds
- **Cornell Topology Festival, Cornell University, Ithaca** May 2017
- **Knots in Washington XLIV, The George Washington University, Washington DC** May 2017
- **AMS Spring Western Sectional Meeting, Washington State University, Pullman** April 2017
Special Session on Combinatorial and Algebraic Structures in Knot Theory
Special Session on Inverse Problems
- **Graduate Student Topology and Geometry Conference, Michigan State University, East Lansing** April 2017
- **Knots in Washington XLIII, The George Washington University, Washington DC** December 2016
- **AMS Fall South Eastern Sectional Meeting, North Carolina State University, Raleigh** November 2016
Special Session on Algebraic Structures Motivated by and Applied to Knot Theory

Software Skills

Mathematica | MATLAB | LaTeX | C++

Professional Affiliations and Services

- Journal Referee 2022 - present
Journal of Knot Theory and Its Ramifications, International Journal of Mathematics
- Organiser of the AMS Special Session on Skein Theory and Quantum Algebra April 2022
Joint Mathematics Meetings (formerly at Seattle, Washington)
- Organiser of the Greater Washington Topology Seminar 2020 - 2021
- Judge for MAA Undergraduate Student Poster Session, Joint Mathematics Meetings 2020
- Member of the Association for Women in Mathematics 2019 - present
- Member of the American Mathematical Society 2016 - present
- Student co-organizer of the biannual NSF-funded Knots in Washington conferences at GWU 2016 - present

Extra Curricular Activities

- President of the Student Mathematics Association, Lady Shri Ram College for Women 2013 - 2014
- Winner of Manju Bharat Ram Award for Cultural Sensitivity and Aesthetics, Lady Shri Ram College for Women 2014
- Sitar player, College Orchestra, Lady Shri Ram College for Women 2011 - 2014
- Black Belt (Shodan) in Karate 2008
- Represented India at the Commonwealth Karate Championship, Scotland, and World Youth Camp and Cup, Greece 2008

References

- Józef H. Przytycki, przytyck@gwu.edu
- Charles Frohman, charles-frohman@uiowa.edu
- Valentina Harizanov, harizanv@gwu.edu
- Hao Wu, haowu@gwu.edu
- Frank E. Baginski (teaching), baginski@gwu.edu
- Hugo Junghenn (teaching), hdj@gwu.edu