Himanshu Gupta
Assistant Professor
Department of Mathematics

Indian Institute of Technology Gandhinagar
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https://himanshugupta23.github.io

Research Interests: Algebraic Combinatorics, Combinatorial Matrix Theory, Spectral Graph Theory, Discrete Probability, Markov Chains, and Theoretical Computer Science.

Academic Positions

Indian Institute of Technology Gandhinagar . . . . . Gandhinagar, GJ, India
Assistant Professor . . . . . Oct 2026 - Present

University of Regina . . . . . Regina, SK, Canada
Postdoctoral Fellow . . . . . Aug 2025 - Aug 2026

– Advisors: Shaun Fallat and Sandra Zilles

PIMS Postdoctoral Fellow . . . . . Aug 2023 - Aug 2025

– Advisor: Shaun Fallat

Education

University of Delaware . . . . . Newark, DE, USA
PhD Mathematics . . . . . July 2018 - May 2023

– Advisor: Sebastian Cioabă

MS Mathematics . . . . . July 2018 - May 2020

Indian Institute of Science . . . . . Bangalore, India
MS Mathematics . . . . . Aug 2015 - May 2018

– Advisor: Arvind Ayyer

University of Delhi . . . . . Delhi, India
B.Sc. (Honors) Mathematics . . . . . July 2012 - May 2015

Publications

1. On the second largest eigenvalue of certain graphs in the perfect matching association scheme, *The Electronic Journal of Combinatorics*, Vol. 33, Issue 3, P3.39 (2026), H. Gupta, A. Herman, A. Lacaze-Masmonteil, R. Maleki, and K. Meagher.
(doi.org/10.37236/15092)

2. Entrywise transforms preserving matrix positivity and non-positivity, *Journal of the London Mathematical Society*, Vol. 113, No. 5, e70560 (2026), D. Guillot, H. Gupta, P. K. Vishwakarma, and C. H. Yip.
(doi.org/10.1112/jlms.70560)

3. The weak version of the graph complement conjecture and partial results for the delta conjecture, *Discrete Mathematics*, Vol. 349, Issue 3, 114861 (2026), F. Barioli, S. Fallat, H. Gupta, and Z. Li.
(doi.org/10.1016/j.disc.2025.114861)

4. Inverse eigenvalue problem for Laplacian matrices of a graph, *SIAM Journal on Matrix Analysis and Applications*, Vol. 46, Issue 3, 1866-1886 (2025), S. Fallat, H. Gupta, and J. C.-H. Lin. (doi.org/10.1137/24M1714472)

5. Positivity preservers over finite fields, *Journal of Algebra*, Vol. 684, 479-523 (2025), D. Guillot, H. Gupta, P. K. Vishwakarma, and C. H. Yip. (doi.org/10.1016/j.jalgebra.2025.07.016)

6. Sufficient conditions for total positivity, compounds, and Dodgson condensations, *Linear Algebra and its Applications*, Vol. 709, 189-202 (2025), S. Fallat, H. Gupta, and C. R. Johnson. (doi.org/10.1016/j.laa.2025.01.016)

7. On the eigenvalues of the graphs D(5,q), *Finite Fields and Their Applications*, Vol. 94, 102358 (2024), H. Gupta and V. Taranchuk. (doi.org/10.1016/j.ffa.2023.102358)

8. The least Euclidean distortion constant of a distance-regular graph, *Discrete Applied Mathematics*, Vol. 325, 212-225 (2023), S. Cioabă, H. Gupta, F. Ihringer, and H. Kurihara. (doi.org/10.1016/j.dam.2022.10.014)

9. Constructions of cospectral graphs with different zero forcing numbers, *The Electronic Journal of Linear Algebra*, Vol. 38, 280-294 (2022), A. Abiad, B. Brimkov, J. Breen, T. R. Cameron, H. Gupta, and R. R. Villagran. (doi.org/10.13001/ela.2022.6737)

10. On the eigenvalues of Grassmann graphs, bilinear forms graphs and Hermitian forms graphs, Graphs and Combinatorics, 38, Article number: 30 (2022), S. Cioabă and H. Gupta. (doi.org/10.1007/s00373-021-02445-z)

Conference Proceedings

11. Entrywise transforms and positive definite matrices over finite fields, Séminaire Lotharingien de Combinatoire 93(B), Article #69, 12pp. (2025), D. Guillot, H. Gupta, P. K. Vishwakarma, and C. H. Yip. (Proceedings of the 37th conference on Formal Power Series and Algebraic Combinatorics, Sapporo)

Preprints

12. Burning signed graphs (*Submitted*), S. Fallat, H. Gupta, K. Khodamoradi, and S. Zilles. (arxiv.org/abs/2610.02506)

13. Positivity preservers over finite fields II, D. Guillot, H. Gupta, P. K. Vishwakarma, and C. H. Yip. (arxiv.org/abs/2608.18978)

14. The strong spectral property and the Jacobian method for weighted Laplacian matrices (*Submitted*), M. Catral, S. Fallat, H. Gupta, and J. C.-H. Lin. (arxiv.org/abs/2602.18999)

15. The inverse symplectic eigenvalue problem of a graph (*Submitted*), H. Gupta, L. Hogben, B. Shader, and T. Wong. (arxiv.org/abs/2601.11912)

16. Minimum number of distinct eigenvalues of distance-regular and signed Johnson graphs (*Submitted*), S. Fallat, H. Gupta, A. Herman, and J. Parenteau. (arxiv.org/abs/2411.00250)

Theses

1. *Algebraic, Geometric, and Spectral Properties of Regular Graphs*, Ph.D. thesis, University of Delaware, Newark, USA (2023). (Link)

2. *Correlation Functions in the finite Toom Model*, M.S. thesis, Indian Institute of Science, Bangalore, India (2018). (Link)

Awards and Honors

BIRS: Research in Teams Grant . . . . . August 10–17, 2025
The University of British Columbia Okanagan
NCTS-PIMS: Collaborative Research Grant . . . . . June 20–July 11, 2025
National Center for Theoretical Sciences, Taipei, Taiwan
PIMS Postdoctoral Fellowship . . . . . August 2023–August 2025
University of Regina
Baxter Sloyer Teaching Award 2021–2022
University of Delaware
INSPIRE Scholarship for Higher Education 2012–2015
Ministry of Science and Technology, India

Teaching Experience

Instructor at the University of Regina

Stat 160 - Introductory Statistics - (88 students) . . . . . Winter 2026
Math 213 - Vector Calculus - (108 students) . . . . . Fall 2025
Math 110 - Calculus I - (142 students) . . . . . Winter 2025
Math 111 - Calculus II - (104 students) . . . . . Winter 2025
Math 111 - Calculus II - (117 students) . . . . . Winter 2024
Math 122 - Linear Algebra I - (105 students) . . . . . Fall 2023

Instructor at the University of Delaware

Math 242 - Calculus II - (15 students) . . . . . Summer 2023
Math 113 - Contemporary Mathematics - (55 students) . . . . . Spring 2023
Math 242 - Calculus II - (18 students) . . . . . Winter 2023
Math 210 - Discrete Math I - (30 students) . . . . . Fall 2022
Math 241 - Calculus I - (20 students from RISE academy) . . . . . Summer 2022
Math 210 - Discrete Math I - (31 students) . . . . . Spring 2022
Math 242 - Calculus II - (22 students) . . . . . Winter 2022
Math 242 - Calculus II - (58 students) . . . . . Winter 2021
Math 221 - Calculus I - (16 students) . . . . . Winter 2020

Teaching Assistant at the University of Delaware

Math 230 - Finite Mathematics and its Applications . . . . . Fall 2021
Math 241 - Calculus I . . . . . Fall 2020
Math 221 - Calculus I . . . . . Spring 2020
Math 221 - Calculus I . . . . . Fall 2019
Math 221 - Calculus I . . . . . Spring 2019
Math 241 - Calculus I . . . . . Fall 2018

Mini Courses

Expanders, Cayley Graphs, and Representation Theory . . . . . NCTS Taipei, Taiwan, July 4, 2025
An Introduction to Association Schemes . . . . . University of Delaware, November 2022

Mentorship

PIMS First-Year Interest Group on *Polynomial Methods in Combinatorics* 2024-2025
PIMS First-Year Interest Group on *Linear Algebra Methods in Combinatorics* 2023-2024
Directed Reading Program on *Network Theory and Analysis* . . . . . Spring 2023

Research Programs

Invited Research Programs

BIRS: Algebraic Graph Theory and Applications . . . . . Banff, Alberta - Oct 12-17, 2025
BIRS: Movement and Symmetry in Graphs . . . . . Banff, Alberta - Nov 24-29, 2024
AIM: Theory and Applications of Total Positivity . . . . . Pasadena, CA - Jul 24-28, 2023
MSRI Summer School: Random Graphs . . . . . Berkeley, CA - Jul 5-15, 2022
AMS MRC: Models and Methods for Sparse (Hyper) Network Science Java Center, NY - Jun 5-11, 2022
AIM: Spectral Graph and Hypergraph Theory . . . . . Online - Dec 6-10, 2021
Fields Institute: Algebraic Graph Theory and Quantum Information . . . . . Online - Aug 23-27, 2021
AMS MRC: Finding Needles in Haystacks . . . . . Online - Jun 6-12, 2021

Other Research Programs

2026 Graduate Research Workshop in Combinatorics . . . . . Ames, IA - July 27-Aug 6, 2026
NSF-CBMS Conference on Strong Properties and the IEP . . . . . Ypsilanti, MI - May 11-15, 2026
7th Lake Michigan Workshop on Combinatorics and Graph Theory . . . . Chicago, IL - May 14-15, 2022
Erdős Lecture Series . . . . . Memphis, TN - Sep 12-14, 2019
Finite Geometry and Extremal Combinatorics . . . . . Newark, DE - Aug 21-24, 2019
31st Cumberland Conf. on Comb., Graph Theory and Computing . . . . Orlando, FL - May 18-19, 2019
15th Graduate Student Combinatorics Conference . . . . . Philadelphia, PA - Apr 5-7, 2019
AMS Sectional Meeting #1141 . . . . . Newark, DE - Sep 29-30, 2018
Summer school on Representation Theory of Finite Groups . . . . . Chennai, India - Jun 12 - Jul 1, 2017

Research Talks

Conference and Workshop Talks

27th Conference of the International Linear Algebra Society . . . . . Virginia, USA - May 18 - 22, 2026
26th Conference of the International Linear Algebra Society . . . Kaohsiung, Taiwan - June 23 - 27, 2025
CanaDAM 2025 . . . . . Ottawa, ON - May 20 - 23, 2025
CMS 2024 Winter Meeting . . . . . Vancouver, BC - Nov 29-Dec 01, 2024
Graphs and Groups, Complexity and Convexity G2C2 . . . . . Shijiazhuang, China - Aug 11-25, 2024
CMS 2024 Summer Meeting . . . . . Saskatoon, SK - June 1-3, 2024
10th PhD Summer School in Discrete Mathematics . . . . . Rogla, Slovenia - Jun 27, 2022

Invited Seminars and Departmental Talks

University of Wisconsin-Madison . . . . . Online - Mar 23, 2026
University of Lethbridge . . . . . Lethbridge, AB, CA - Feb 23, 2026
University of South Carolina . . . . . Online - Feb 06, 2026
Atlantic Graph Theory Seminar . . . . . Online - Nov 26, 2025
Indian Institute of Technology Bombay . . . . . Mumbai, India - Aug 01, 2025
Indian Institute of Science Bangalore . . . . . Bengaluru, India - Jul 29, 2025
Binghamton University . . . . . Online - Mar 04, 2025
05C50 Online Seminar . . . . . Online - Feb 14, 2025
Boise State University . . . . . Online - Nov 22, 2024
University of Illinois Chicago . . . . . Chicago, IL - Nov 04, 2024
University of South Carolina . . . . . Online - Oct 25, 2024
Illinois Institute of Technology . . . . . Online - Oct 18, 2024
PIMS Postdoctoral Fellow Seminar . . . . . Online - Oct 25, 2023
University of Waterloo . . . . . Online - Jul 17, 2023
Algebraic Graph Theory International Webinar . . . . . Online - Nov 15, 2022
Illinois State University . . . . . Online - Oct 20, 2022
Rutgers University . . . . . New Brunswick, NJ - Oct 10, 2022
Carnegie Mellon University . . . . . Pittsburgh, PA - Oct 6, 2022
Princeton University . . . . . Princeton, NJ - Sep 29, 2022
University of South Carolina . . . . . Columbia, SC - Sep 23, 2022
University of Wisconsin-Madison . . . . . Online - Sep 19, 2022
Arizona State University . . . . . Tempe, AZ - Sep 16, 2022
University of Delaware . . . . . Newark, DE - Oct 7, 2021

Academic Service

M.Sc. Thesis Committee Member for Layne Burns . . . . . April 2026
University of Regina
Co-organizer, Special Session on Inverse Eigenvalue Problems and Matrix Theory . . . . . June 2024
Canadian Mathematical Society, Summer Meeting at the University of Saskatchewan
Co-organizer, Special Session on Models and Methods for Sparse (Hyper) Network Science . . Jan 2023
American Mathematical Society, Joint Mathematics Meeting (JMM)
Co-organizer, Hallenbeck Graduate Student Seminar 2020-2022
Department of Mathematical Sciences, University of Delaware

President UD SIAM Chapter 2020-2021
University of Delaware Chapter of SIAM
Secretary UD SIAM Chapter 2019-2020
University of Delaware Chapter of SIAM
Newsletter Coordinator IISc SIAM Chapter 2017-2018
Indian Institute of Science Chapter of SIAM
AWM Peer Student Mentor 2019-2020
Department of Mathematical Sciences, University of Delaware
GEMS Undergraduate Student Mentor . . . . . Summer 2019
Department of Mathematical Sciences, University of Delaware

Refereed 20+ articles for the following journals: *Discrete Mathematics*, *Finite Fields and Their Applications*, *Linear Algebra and its Applications*, *Operators and Matrices*, *The Electronic Journal of Linear Algebra*, *Discrete Applied Mathematics*, *Journal of Algebraic Combinatorics*, *Designs, Codes and Cryptography*, *Linear and Multilinear Algebra*, *Australasian Journal of Combinatorics*, and *AMS Mathematical Reviews*.

Relevant Coursework

- **During MS:** Probability Models, Graph Theory, Probability Theory, Topics in Graph Theory, Topics in Statistical Methods, and Combinatorics.
- **During PhD:** Combinatorics I, Introduction to Stochastic Processes, Theory of Probability, Information Theory, Combinatorics II, Algorithm Design and Analysis, Topics in Artificial Intelligence, and Introduction to Network Science.

Computer Skills and Training

- LaTeX, SageMath, Python, and Wolfram Mathematica.
- Training in Python Coding, Statistical Learning, Data Science, and Optimization, INMAS, Spring 2021.

— Last updated on October 26, 2026.