

Current Position

Assistant Professor of Mathematics (tenure-track), Marshall University, Huntington, WV

Citizenship

India (Permanent Resident of the USA)

Education

2009-2014 **Doctor of Philosophy, Mathematics**

University of Wyoming, 2014

Thesis Advisor: Dr. Bryan L. Shader

Title: New Probabilistic, Combinatorial and Algebraic Methods
for Minimum Rank Problems

2005-2007 **Master of Science, Pure Mathematics**

University of Calcutta, 2007

Research Interests

Algebraic and Spectral Graph Theory, Combinatorics, Coding Theory, Linear Algebra, Graph Theory, Combinatorial Matrix Theory.

Publications

23. Hareshkumar Jadav, Sudipta Mallik, Akhilesh Panchangam, and Ranveer Singh, *Stronger spectral bound for clique Number*. (under review)
22. Cole Don Juan and Sudipta Mallik, *Equivalence of incidence matrices and its applications*. (under review)
21. Sasmita Barik, Sudipta Mallik, and Sane Umesh Reddy, *Moore-Penrose inverse of the complex Laplacian of an oriented graph*. (under review)
20. Sudipta Mallik and Sane Umesh Reddy, *Volume of a complex matrix and its applications in oriented graphs*. (under review)
19. Abdullah Alazemi, Milica Andelic, Sudipta Mallik, and Fernando C. Tura, *On signless Laplacian spectrum of threshold graphs*. (under review)
18. Sudipta Mallik and Bahattin Yildiz, *Codes from incidence matrices of hypergraphs*, [Art Discrete Appl. Math.](#) 7 (2024) #P3.10. <https://doi.org/10.26493/2590-9770.1618.4eb>
17. Abdullah Alazemi, Milica Andelic, and Sudipta Mallik, *Signed graphs and inverses of their incidence matrices*, [Linear Algebra and its Applications](#) 694 (2024) 78–100. <https://doi.org/10.1016/j.laa.2024.04.012>
16. Jerad Ipsen and Sudipta Mallik, *Incidence and Laplacian matrices of wheel graphs and their inverses*, [American Journal of Combinatorics](#) 2 (2023) 1-19. <https://doi.org/10.63151/amjc.v2i.9>

15. Sudipta Mallik, *Matrix tree theorem for the net Laplacian matrix of a signed graph*, [Linear and Multilinear Algebra](#) 72(7) (2023) 1138–1152.
<https://doi.org/10.1080/03081087.2023.2172544>
14. Sudipta Mallik, *A new formula for the minimum distance of an expander code*, [J. Algebra Comb. Discrete Appl.](#) 9(2) (2022) 79-84.
<https://doi.org/10.13069/jacodesmath.1111379>
13. Sudipta Mallik, *New formulations of the union-closed sets conjecture*, [American Journal of Combinatorics](#) 1 (2022) 40-46. <https://doi.org/10.63151/amjc.v1i.5>
12. Ryan Hessert and Sudipta Mallik, *The inverse of the incidence matrix of a unicyclic graph*, [Linear and Multilinear Algebra](#) 71 (4) 513-527 (2023).
<https://doi.org/10.1080/03081087.2022.2035307>
11. Sudipta Mallik and Bahattin Yildiz, *Isodual and self-dual codes from graphs*, [Algebra and Discrete Mathematics](#) 32(1) (2021) 49-64. <http://dx.doi.org/10.12958/adm1645>
10. Ryan Hessert and Sudipta Mallik, *Moore-Penrose inverses of the signless Laplacian and edge-Laplacian of graphs*, [Discrete Mathematics](#) 344 (2021) 112451.
<https://doi.org/10.1016/j.disc.2021.112451>
9. Sudipta Mallik and Bahattin Yildiz, *Graph theoretic aspects of minimum distance and equivalence of binary linear codes*, [Australasian Journal of Combinatorics](#) 79(3)(2021) 515-526. https://ajc.maths.uq.edu.au/pdf/79/ajc_v79_p515.pdf
8. Sudipta Mallik and Keivan Hassani Monfared, *An analog of matrix tree theorem for signless Laplacians*, [Linear Algebra and its Applications](#) 560 (2019) 43-55.
<https://doi.org/10.1016/j.laa.2018.09.016>
7. Sudipta Mallik and Keivan Hassani Monfared, *Spectral characterization of matchings in graphs*, [Linear Algebra and its Applications](#) 496 (2016) 407-419.
<https://doi.org/10.1016/j.laa.2016.02.004>
6. Sudipta Mallik and Bryan L. Shader, *On graphs of minimum skew rank 4*, [Linear and Multilinear Algebra](#) 64 (2016) 279-289. <https://doi.org/10.1080/03081087.2015.1034642>
5. Sudipta Mallik and Bryan L. Shader, *Integrally normalizable matrices with respect to a given set*, [Linear Algebra and its Applications](#) 498 (2016) 317-325.
<https://doi.org/10.1016/j.laa.2015.07.001>
4. Sudipta Mallik and Keivan Hassani Monfared, *The maximum multiplicity of an eigenvalue of symmetric matrices with a given graph*, <http://arxiv.org/abs/1601.02760> (2016).
3. Sudipta Mallik and Keivan Hassani Monfared, *Construction of real skew-symmetric matrices from interlaced spectral data, and graph*, [Linear Algebra and its Applications](#) 471 (2015) 241-263. <https://doi.org/10.1016/j.laa.2015.01.001>
2. Sudipta Mallik and Bryan L. Shader, *Classes of graphs with minimum skew rank 4*, [Linear Algebra and its Applications](#) 439 (2013) 3643-3657.
<https://doi.org/10.1016/j.laa.2013.09.022>

1. Sudipta Mallik, *Alternative proofs on the indices of cacti and unicyclic graphs with n vertices*, <http://arxiv.org/abs/1110.2571> (2011).

Articles in Progress

1. Sudipta Mallik and Hossein Teimoori, *An extension of determinant and its application to graph theory*.
2. Sudipta Mallik and Hiranmoy Pal, *State transfers on signed graph revisited*.
3. S. Mallik and S. Sivasubramanian, *Generalizing a conjecture of Graham and Lovász concerning unimodality of coefficients of the distance characteristic polynomial*.

Student Research Supervised

- Hareshkumar Jadav (jointly with Dr. Ranveer Singh), Doctoral research on “Graph generation algorithms and algebraic methods”, Computer Science and Engineering, Indian Institute of Technology Indore, India, Fall 2024 - present.
- Scott Alter, Graduate research on “Spectral graph theory and the matching number of a graph”, Northern Arizona University, Fall, 2022.
- Heather Vogler, Undergraduate research on “Spectral study of the chromatic number of a graph”, Northern Arizona University, Fall, 2022.
- Jerad Ipsen, Undergraduate research on “Inverse of the Incidence Matrices of Various Graph Classes”, Northern Arizona University, Fall, 2021 – Spring 2022.
 - Jerad Ipsen and Sudipta Mallik, *Incidence and Laplacian matrices of wheel graphs and their inverses*, American Journal of Combinatorics 2 (2023) 1-19.
- Harlan Heilman, Undergraduate research on “Quantum Walks on Graphs”, Northern Arizona University, Spring – Summer, 2021.
- Ryan Hessert, Graduate research on “Moore-Penrose Inverse of Matrices associated with Graphs”, Northern Arizona University, Fall, 2019 – Spring, 2021.
 - Ryan Hessert and Sudipta Mallik, *The inverse of the incidence matrix of a unicyclic graph*, Linear and Multilinear Algebra 71 (4) 513-527 (2023).
 - Ryan Hessert and Sudipta Mallik, *Moore-Penrose Inverses of the Signless Laplacian and Edge-Laplacian of Graphs*, Discrete Mathematics 344 (2021) 112451.
- Ryan Hessert (LSAMP scholar), Undergraduate research on “Edge-Laplacians of Graphs”, Northern Arizona University, Spring – Summer, 2019.

Books and Lecture Notes

1. *Concise Calculus II*, 2023 (<https://learnmathonline.org/ConciseCalculus2.pdf>)

2. Number Theory (<https://learnmathonline.org/numbertheory.html>)
3. Linear Algebra (<https://learnmathonline.org/LinearAlgebra.html>)
4. Numerical Analysis (<https://learnmathonline.org/numericalanalysis.html>)
5. Discrete Mathematics (<https://learnmathonline.org/DiscreteMath.html>)
6. Differential Equations (<https://learnmathonline.org/diffeq.html>)

Professional Activities

- Editor-in-Chief, American Journal of Combinatorics, 2021 - present.
- Founder, learnmathonline.org (a website for mathematics students).
- Referee:
 - Linear Algebra and its Applications
 - Discrete Mathematics
 - Electronic Journal of Linear Algebra
 - Linear and Multilinear Algebra
 - AKCE International Journal of Graphs and Combinatorics
 - Information Processing Letters
 - International Journal of Computer Mathematics
 - Bulletin of the Iranian Mathematical Society
- Organizer, ILAS Special Session on “Algebraic Graph Theory: New Trends” at 2026 Joint Mathematics Meetings (JMM), Washington DC.
- Organizer, Conference in Honor of Bryan Shader, the University of Wyoming, 2022.
- Organizer, AMS Special Session on “Emerging Topics in Graphs and Matrices” at 2018 JMM, San Diego.
- Organizer, AMS Special Session on “Graphs and Matrices” at 2017 JMM, Atlanta.
- Served as the elected Graduate Student Representative, Department of Mathematics, University of Wyoming, 2012 - 2013.
- Organized Graduate Students’ Seminars, University of Wyoming, 2012 - 2013.
- Supervised undergraduate research as a Graduate Mentor, NSF-sponsored Mathematics REU, University of Wyoming, Summer 2011.

Honors, Grants, and Awards

- Featured in **Humans of NAU** by Northern Arizona University in 2024 for the work for open access research journal. <https://news.nau.edu/sudipta-mallik/>

- Elevating Excellence Grant (\$5,000) from the President of Northern Arizona University for creating an OER Calculus textbook, Summer 2023.
- Faculty Mentor Research Grant 2022 (\$1,000), Office of Undergraduate Research, NAU.
- LSAMP Faculty Mentor Research Stipend (\$750), LSAMP grant G1003500, 2019.
- AMS-NSF Travel Grant (\$3,300) to the International Congress of Mathematicians in Rio de Janeiro, Brazil, 2018.
- AMS Travel Grant to the Joint Mathematics Meetings, Baltimore, MD, 2014.
- Catherine Gibbs Shaw Award for Excellence in Teaching and Research at University of Wyoming, 2012.
- Virindra & Gail Sehgal Award for Excellence in Teaching and Research at University of Wyoming, 2012.
- CSIR NET: Junior Research Fellowship and Assistant Professorship at Universities and Colleges in India, June 2009.
- National Scholarship (India) for Excellence in Higher Secondary Education, 2002.
- National Scholarship (India) for Excellence in Secondary Education, 2000.

Teaching Experience

Marshall University, 2024 - present

Courses taught with full teaching and grading responsibilities:

- Graduate Modern Algebra I MTH 450/550, Fall 2024.
- Graduate Modern Algebra II MTH 452/552, Spring 2025.
- Elementary Linear Algebra MTH 329, Fall 2025; Spring 2025.
- Foundations of Statistics STA 150, Fall 2025, 2024; Spring 2025.
- Applied Calculus Honors MTH 140H, Fall 2025.

Northern Arizona University, 2014 - 2024

- 13 courses taught with full teaching and grading responsibilities:
 - Graduate Linear Algebra MAT 516, Fall 2022.
 - Algebraic Graph Theory MAT 697, Spring 2015.
 - Graduate Research MAT 685, Fall 2022, 2020, 2019; Spring 2020.
 - Undergraduate Research MAT 485, Fall 2022, 2021; Spring 2022, 2019.
 - Mathematics Capstone MAT 486C, Spring 2024, Fall 2023.
 - Real Analysis MAT 431, Fall 2018.

- Numerical Analysis MAT 362 (Total 19 sections).
- Foundations of Mathematics MAT 320 (Total 2 sections)
- Number Theory MAT 318, Spring 2018.
- Linear Algebra MAT 316 (Total 13 sections).
- Differential Equations MAT 239 (Total 16 sections).
- Differential Equations MAT 239 (online) Summer 2022.
- Calculus III MAT 238 (Total 3 sections).
- Calculus II MAT 137 (Total 7 sections).
- Discrete Mathematics MAT 226 (Total 10 sections).
- Algebra for Precalculus MAT 108, Fall 2021.

University of Wyoming, 2009 - 2014

- 6 courses taught with full teaching and grading responsibilities:
 - Linear Algebra, Summer 2013.
 - Calculus III (Total 2 sections).
 - Calculus II (Total 2 sections).
 - Calculus I (Total 4 sections).
 - Trigonometry, Summer 2010.
 - College Algebra (Total 2 sections).
- Courses supervised as TA:
 - Calculus III, Fall 2013 (TA and Discussion Instructor).
 - College Algebra, Spring 2011 and Fall 2010 (TA and Supplemental Instructor).
- Tutor in Math Lab, 2009 - 2014.
 - Helped undergraduate students in all areas of Mathematics.

AJC Bose College, India, 2008

Course taught with full teaching responsibilities:

- Abstract Algebra.

Gokhale Memorial Girls' College, India, 2007 - 2008

5 courses taught with full teaching responsibilities:

- 2D-3D Geometry
- Abstract Algebra
- Metric Spaces
- C Programming

– Complex Analysis

Technology Used for Teaching & Research

- Teaching Tools: Canvas, Blackboard, WebAssign, WeBWorK, MyLabMath, Hawkes, ALEKS.
- Publishing: L^AT_EX, Beamer, MS Office.
- Programming: Python, SageMath, R, C, Matlab, Maple.

Institutional Services

Marshall University

- Member, Undergraduate Committee/ Curriculum Committee, Dept. of Mathematics & Physics, Fall 2024 - present.

Northern Arizona University

- Chair, Curriculum Committee, Dept. of Mathematics & Statistics, Fall 2022 - Spring 2023, Fall 2020 - Spring 2021.
- Member, Curriculum Committee, Dept. of Mathematics & Statistics, Spring 2024.
- Mentor, two junior mathematics lecturers, 2022-present, 2019-2020.
- Contributing Member, Tenure-track Assistant Professor Search Committee, Dept. of Physics, 2021 - 2022.
- Member, Assessment Committee, Dept. of Mathematics & Statistics, Fall 2021 - Spring 2022.
- Member, Grade Appeal Hearing Committee, College of CEFNS, Fall 2019.
- Member, Curriculum Committee (Chair, Math Capstone Subcommittee), Dept. of Mathematics & Statistics, Fall 2018 - Spring 2021.
- Member, Scholarships & Nominations Committee, Dept. of Mathematics & Statistics, Fall 2018 - Spring 2021.
- Elected Member, Lecturer Search Committee, Dept. of Mathematics & Statistics, 2017 - 2018.
- Elected Member, Annual Review Committee (Service), Dept. of Mathematics & Statistics, 2017 - 2018.
- Coordinator, Problem of the Week, Dept. of Mathematics & Statistics, 2016 - 2018.

- Member, Math Contest/Outreach Committee, Dept. of Mathematics & Statistics, 2015 - 2016.
- Member, Discrete Mathematics Textbook Selection Committee, Dept. of Mathematics & Statistics, 2015 - 2016.
- Member, Honors Week Committee, Dept. of Mathematics & Statistics, 2014 - 2015.

Outreach

- Contributor, SUnMaRC Problem Contest, SUnMaRC (Southwestern Undergraduate Mathematics Research Conference) 2017.
- Co-organizer, Coconino County Math Contest 2016.
- Co-organizer, Yavapai County Math Contest 2016.
- Co-organizer, High School Math Day at NAU 2015.

Professional Membership

- International Linear Algebra Society, 2013 - 2016, 2023 - present.
- American Mathematical Society, 2009 - 2014, 2025 - present.

Talks

1. *Combinatorial aspects of the Moore-Penrose inverse*, Invited Talk at New York Combinatorics Seminar, CUNY, March 22, 2024. <https://youtu.be/1SwGyyhMYWw?si=2k0-mIuymIo8t5fV>
2. *Fantastic incidence matrices and how to invert them*, Conference in honor of Bryan Shader, the University of Wyoming, July 28, 2022.
3. *Binary Linear Codes from Graphs*, ACGT Seminar, Northern Arizona University, January 14 & 21, 2020.
4. *Applications of Linear Algebra to Graph Theoretic Problems*, Invited Talk at RKM Vidyamandira, University of Calcutta, India, July 2, 2019.
5. *ICM in Rio de Janeiro: My Experiences*, Northern Arizona University, Friday Afternoon Mathematics Undergraduate Seminar, April 19, 2019.
6. *An Analogue of Matrix Tree Theorem*, ICM Satellite Conference LAAW 2018, UFF, Rio de Janeiro, Brazil, July 31, 2018.
7. *Matrix Tree Theorem and Beyond*, Northern Arizona University, Mathematics Colloquium, January 23, 2018.
8. *Spectral Decomposition of a Matrix*, Invited Talk at University of Calcutta, India, July 27, 2017.

9. *Spectral Characterization of Matchings in Graphs*, Joint Mathematics Meetings, Seattle, January 8, 2016.
10. *Structured Inverse Eigenvalue Problems*, Northern Arizona University, Mathematics Colloquium, September 14, 2015.
11. *Let's Prove the Four Color Theorem in One Line: Colin de Verdière Conjecture*, Northern Arizona University, Mathematics Colloquium, September 16, 2014.
12. *Probabilistic methods for minimum skew rank of graphs*, Joint Mathematics Meetings, Baltimore, January 16, 2014.
13. *Let's Prove the Four Color Theorem in One Line: Colin de Verdière Conjecture*, Invited Talk at Discrete Mathematics Seminar, University of Colorado, Denver, Oct 28, 2013.
14. *New Techniques for Finding Minimum Skew Rank of Graphs*, Rocky Mountain Mathematics Consortium, University of Wyoming, June 21, 2013.
15. *Classes of Graphs with Minimum Skew Rank 4*, AMS Central Sectional Meeting, Iowa State University, April 28, 2013.
16. *Average Minimum Skew Rank of Graphs*, Rocky Mountain Discrete Mathematics Days, Denver University, October 27, 2012.
17. *On the Characterization of Graphs with Minimum Skew Rank 4*, MIGHTY LIII Conference, Iowa State University, September 22, 2012.
18. *On the Characterization of Graphs with Minimum Skew Rank 4*, Rocky Mountain Discrete Mathematics Days, CSU, Colorado, May 19, 2012.
19. *On the Characterization of Graphs with Minimum Skew Rank 4*, MAA Rocky Mountain Section Meeting, UC Denver, April 14, 2012.

Conferences Attended

- Conference in honor of Bryan Shader, the University of Wyoming, July 28, 2022.
- International Congress of Mathematicians, Rio de Janeiro, Brazil, August 1-7, 2018.
- ICM Satellite Conference LAAW 2018, UFF, Rio de Janeiro, Brazil, July 30-31, 2018.
- Joint Mathematics Meetings, San Diego, January 12-13, 2018.
- Joint Mathematics Meetings, Atlanta, January 4-7, 2017.
- Joint Mathematics Meetings, Seattle, January 6-10, 2016.
- Joint Mathematics Meetings, Baltimore, January 15-18, 2014.
- Rocky Mountain Mathematics Consortium (RMMC 2013), Laramie, Wyoming.
- AMS Central Sectional Meeting, Iowa State University, April 27-28, 2013.

- Rocky Mountain Discrete Mathematics Days, Denver University, Oct 27, 2012.
- MIGHTY LIII Conference, Iowa State University, September 21-22, 2012.
- Rocky Mountain Discrete Mathematics Days, CSU, Colorado, May 19, 2012.
- MAA Rocky Mountain Section Meeting, UC Denver, April 13-14, 2012.
- AMS Fall Central Section Meeting, University of Nebraska-Lincoln, Oct 14-16, 2011.
- Rocky Mountain Mathematics Consortium (RMMC 2011), Laramie, Wyoming.
- 2010 NSF-CBMS Regional Conference, Iowa State University, Ames, Iowa.
- MAA Regional Conference, CSU, Fort Collins, Colorado, 2010.

Employment History

- *Marshall University*
Tenure-track Assistant Professor (Fall 2024 - present)
- *Northern Arizona University (2014 - 2024)*
Associate Teaching Professor (2022 - 2024), Senior Lecturer (2020 - 2022), Lecturer (2017 - 2020), Instructor (2014 - 2017).
- *University of Wyoming*
Graduate Teaching Assistant (Fall 2009 - Summer 2014).
- *Taki Govt. High School, India (02.13.2009 - 08.07.2009)*
Assistant Master of Mathematics, Group-A service, WB State Government of India.
- *Howrah Rabindra Vidyamandir, India*
Assistant Teacher of Mathematics (10.03.2008 - 02.12.2009).
- *AJC Bose College, Kolkata, India*
Part-time Lecturer of Mathematics (03.03.2008 - 09.30.2008).
- *Gokhale Memorial Girls' College, Kolkata, India*
Guest Lecturer of Mathematics (11.13.2007 - 09.30.2008).

Contact Information

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Webpage: <http://sudiptamallik.com/>