

Current Position

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

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, Coding Theory, Combinatorics, Linear Algebra, Graph Theory, Combinatorial Matrix Theory.

Publications

18. Sudipta Mallik and Bahattin Yildiz, *Codes from incidence matrices of hypergraphs*, [arXiv:2210.06733](https://arxiv.org/abs/2210.06733). *Art Discrete Appl. Math.* (accepted 2024)
17. Abdullah Alazemi, Milica Andelic, and Sudipta Mallik, *Signed graphs and inverses of their incidence matrices*, [Linear Algebra and its Applications](https://doi.org/10.1016/j.laa.2024.04.012) 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](https://ajcombinatorics.org/Volume2/V2.01.pdf) 2 (2023) 1-19.
<https://ajcombinatorics.org/Volume2/V2.01.pdf>
15. Sudipta Mallik, *Matrix tree theorem for the net Laplacian matrix of a signed graph*, [Linear and Multilinear Algebra](https://doi.org/10.1080/03081087.2023.2172544) (2023).
<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.](https://doi.org/10.13069/jacodesmath.1111379) 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](https://ajcombinatorics.org/Volume1/V1.03.pdf) 1 (2022) 40-46. <https://ajcombinatorics.org/Volume1/V1.03.pdf>
12. Ryan Hessert and Sudipta Mallik, *The inverse of the incidence matrix of a unicyclic graph*, [Linear and Multilinear Algebra](https://doi.org/10.1080/03081087.2022.2035307) 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](http://dx.doi.org/10.12958/adm1645) 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. S. Barik, S. Mallik, S. U. Reddy, *Complex Laplacians and their Moore-Penrose inverses*.
2. Sudipta Mallik and Hiranmoy Pal, *State transfers on signed graph revisited*.
3. M. Rajesh Kannan, Iswar Mahato, and Sudipta Mallik, *On maximum spectral radius of the eccentricity matrix of a tree*.
4. S. Mallik and S. Sivasubramanian, *Generalizing a conjecture of Graham and Lovász concerning unimodality of coefficients of the distance characteristic polynomial*.

Student Research Supervised

- 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, Conference in Honor of Bryan Shader, the University of Wyoming, 2022.
 - Organizer, AMS Special Session on “Emerging Topics in Graphs and Matrices” at 2018 Joint Mathematics Meetings (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/>
- NSF DMS Combinatorics Research Grant (\$52,101) for *Combinatorial aspects of the Moore-Penrose inverse* (declined 2024).
- 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.
- Foundations of Statistics STA 150, Fall 2024.

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, BBLearn, WebAssign, WeBWorK, MyLabMath, Hawkes, ALEKS.
- Publishing: \LaTeX , Beamer, MS Office.
- Programming: Python, SageMath, R, C, Matlab, Maple.

Institutional Services

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.

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

- 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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