Gyaneshwar Agrahari

Ph.D. Candidate in Mathematics

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Research Interests

Theoretical Math: Structural and Extremal Graph Theory Matroid Theory
Applied Math: Graph-based Machine Learning, Geospatial Analysis
Math Education: Inquiry-Based Learning, Alternative Grading, Interactive Learning, AI-assisted Teaching

Education

Ph.D. in Mathematics, Louisiana State University — 2022 – Present
Advisor: Zhiyu Wang — GPA-4.0
Expected Graduation: May 2027
Thesis: Counting Subgraphs in Planar Graphs with Higher Connectivity

B.S. in Mathematics, B.S. in Physics, Youngstown State University — 2018 – 2022
Graduated with Summa Cum Laude, Honors — GPA-3.9

Preprints and In-Preparations

1. G. Agrahari and Z. Wang, *On the number of $K_{1,t}$ and $K_{2,t}$ in 4 or 5-connected planar triangulations*, In preparation.
2. G. Agrahari, C. Bibby. S. Boros, H. Garcia, F. Heidercheit, and Z. Wang *On some structural properties of graphs with non-negative resistance curvature*, In preparation.
3. G. Agrahari, X. Liu, Z. Wang, *On the number of short cycles in 5-connected planar triangulations*, arXiv doi10.48550/arXiv.2507.1809

Publications & Preprints

1. G. Agrahari, K. Bist, M. Pandey, J. Kapita, Z. James, J. Knox, S. Ramirez, S. Heymsfield, P. Wolenski, and N. Drenska, *Predicting anthropometric body composition variables using 3D optical imaging and machine learning*, Frontiers in Bioinformatics, vol. 6, 2026, doi:10.3389/fbinf.2026.1722578.
2. G. Agrahari and D. Froncek, *On Some Classes of Cycles-Related Γ-Harmonious Graphs*, *Utilitas Mathematica*, vol. 120, pp. 75–91, 2024, doi:10.61091/um120-07

Research Assistantship Experience

Summer Research Assistant — 2026
Mentor: Zhiyu Wang, Yu Wang, Xiaonan Liu,
LSU Department of Mathematics[1], Vanderbilt University[2]
Project: Curvature-aware p-Laplacian-based graph neural networks

Summer Research Assistant 2024
Mentor: Nadejda Drenska[1], Peter Wolenski[1], and Steven Heymsfield[2]
LSU Department of Mathematics[1], Pennington Biomedical Research Center[2]
Project: Predicting anthropometric body composition variables using 3D optical imaging and machine learning

Summer Research Assistant 2023
Mentor: Peter Wolenski[1] and Yue Liu[2]
LSU Department of Mathematics[1], Aquatic Germplasm and Genetic Resources Center[2]
Project: Predicting frog eggs count using deep learning

Teaching Experience (Instructor on Record)

Trigonometry	Spring 2026
Differential Calculus with Corequisite (Pilot Section)	Fall 2025
Differential Calculus	Spring 2025
College Algebra with Corequisite	Fall 2024
College Algebra	Fall 2023

Teaching Assistantship Experience

Curriculum Designer, Differential Calculus with Corequiste (Pilot Section)	Summer 2025
Grader, Linear Algebra	Spring 2025
Grader, Calculus III	Fall 2024
Grader, Calculus II	Spring 2024
Grader, Advanced Calculus	Spring 2024
Grader, Calculus III	Fall 2022
Lecture Assistant, Trigonometry	Fall 2022 & Spring 2023
Lab Tutor, Math Lab	Fall 2022, 2023, 2024 & Spring 2023,2025

Invited Talks

Predicting Biometrics using Semi-supervised Learning, March 2025
Spring AMS Southeastern Sectional Meeting, Clemson, SC

Contributed talks (Conferences)

Title	Conference	Location	Month/Year
Counting Subgraphs in Planar Graphs with Higher Connectivity	CombinaTexas	College Station, TX	April 2026
	Southeastern Int'l Conf. on Combinatorics, Graph Theory & Computing	Boca Raton, FL	March 2026
	Fall AMS Southeastern Sectional Meeting	New Orleans, LA	October 2025
Predicting Biometrics using Semi-supervised Learning	SIAM TX-LA Meeting	Austin, TX	September 2025
	Scientific Computing Around Louisiana	New Orleans, LA	March 2025

Title	Conference	Location	Month/Year
Graph Construction in Geospatial Analysis of EV Charging Stations	SIAM Conference on Mathematics of Data Science	Atlanta, GA	October 2024
On Some Classes of Cycles-related Harmonious Graphs	Math for All Conference	New Orleans, LA	April 2024
	Southeastern Int'l Conf. on Combinatorics, Graph Theory & Computing	Boca Raton, FL	March 2024
Colored Percolation in Three Dimensions	Eastern Great Lakes APS Meeting	Youngstown, OH	April 2022
Multiplicative Harmonious Labeling	Southeastern Int'l Conf. on Combinatorics, Graph Theory & Computing	Boca Raton, FL	March 2022
Alternative to Partial Fraction in Integration	Pi Mu Epsilon Conference	Youngstown, OH	February 2019
Economic Model for Environmental Cost of Developmental Projects	Pi Mu Epsilon Conference	Youngstown, OH	February 2019

Contributed Talks(LSU Seminars)

Seminar	Talk	Month/Year
LSU Combinatorics Seminar	Counting $K_{1,t}$ and $K_{2,t}$ in planar graphs with higher connectivity	April 2026
Discussion and Training in Combinatorics	Graph Labelings	April 2026
	Crapo's Beta Invariant	February 2026
	The Necklace Problem	October 2025
LSU AI Journal Club	How Graph Construction Impacts GNNs' performances	March 2025

Contributed Posters

Predicting ALM, BFP, and BMD using Semi-supervised Learning, September 2025
SIAM TX-LA Sectional Meeting, Austin TX

Invited Summer Schools and Workshops

Distributed Open Education Network (DOENET) Workshop, June 2026
University of Minnesota, Twin Cities
Graduate Research Workshop in Combinatorics, June 2025
Iowa State University
Mathematical foundations of sampling connected balanced graph partitions, June 2025
American Institute of Mathematics
Topological Methods in Combinatorics, May 2025
Iowa State University

Other Workshops and Learning Communities

Virtual Workshop in Digital Accessibility — April 2026
Mathematical Association of America, Ohio Section
2026 Virtual Summer Workshop Series, — May-August 2026
Center for Inquiry Based Learning, University of Michigan
Motivators Learning Community, — 2025-2026
Motivate Lab, University of Virginia

Fellowships, Honors & Awards

Certificate of Teaching Excellence — Spring 2026
Arthur K. Barton Superior Graduate Student Scholarship — 2025
Graduate Student Association Travel Award — 2025
Corequisite Meaxutivator Fellowship — 2025
David Oxley Graduate Student Teaching Award — Spring 2025
SIAM Travel Award, SIAM Mathematics of Data Science Conference — 2024
Certificate of Teaching Excellence — Fall 2023
Meritorious Honor, COMAP's MCM/ICM — 2022
Frank M Clark Physics Award — 2021
Paul M Bancoczi Memorial Scholarship — 2021
Honorable Mention, COMAP's MCM/ICM — 2020
Meritorious Honor, COMAP's MCM/ICM — 2019
YSU Honors College Scholarship — 2018–2022
YSU International Scholar Award — 2018–2022

Services

Founder and Co-organizer, Discussion and Training in Combinatorics — 2025-2026
Session Co-organizer, Graphs and Networks, SIAM TX-LA Sectional Meeting — 2025
Co-organizer, LSU AI Journal Club — 2024–2025
Vice-President, SIAM LSU Chapter — 2024–2025
Session Co-organizer, Graphs and Networks, SIAM Conference on MDS — 2024
President, Nepalese Student Association, Youngstown State University — 2019-2020

Volunteering

Session Assistant, Math Circle — March-April 2026
Research Panelist, LSU Math Graduate Student Orientation — August 2025
Campus Tour Guide, Prospective Graduate Students Visit — February 2025
Teaching Panelist, LSU Math Graduate Student Orientation — August 2024

Professional Membership

American Mathematical Society
Society for Industrial and Applied Mathematics
Mathematical Association of America

Mentorship Experience

Predicting Biometrics using 3D Optical Imaging and Machine Learning January–August 2024

- Mentored nine undergraduates and five graduates in collaboration with Pennington Biomedical Research Center, guiding students through the full research pipeline including workshops on NumPy, supervised algorithms, and p-Laplacian methods, with task allocation managed via a structured GitHub workflowand achieving 90%+ accuracy in predicting biometrics such as lean mass and bone mineral density. (GitHub), (Slides)

Error-Correcting Codes Arising from Combinatorial Objects August–December 2023

- Mentored one graduate and two undergraduates in researching error-correcting codes from combinatorial objects including projective planes, block designs, and Latin squares, coordinating milestones while guiding students through both theoretical development and Python implementation of the codes.(PDF)

Graduate Projects

Geospatial Equity Analysis of School District Redistricting: Louisiana June 2026–

- Modeled 1,000+ hypothetical school district plans for East Baton Rouge Parish using GerryChain ReCom; computed Hansen gravity-based access scores weighted by car-ownership burden and school quality (SPS), and benchmarked actual district boundaries against the ensemble to quantify access gaps in low-mobility communities.

Geospatial Equity Analysis of EV Charging Infrastructure : Dallas, TX August 2025–

- Conducted multi-scale geospatial equity analysis of EV charging infrastructure in Dallas County, TX using OLS regression, spatial autocorrelation, and spatial lag/error models; identified 204 infrastructure-desert block groups and a 3× income-based equity gap across quintiles.

Resistance Curvature and Sprawling Graphs January–May 2026

- Wrote a SageMath program to investigate the sprawling property of graphs. Co-proved the following results: Hamiltonian graphs, are sprawling, Sprawling graphs are 2-connected and are closed under edge addition. (PDF)

Minimal Flag Triangulations of Torus August–December 2025

- Contributed to the proof of the main result: The diameter of minimal flag triangulations of a torus is between 2 and 4 by constructing several examples and investigating their graph properties. (PDF)

Counting Frog Eggs with Deep Learning May–August 2023

- Collected and annotated frog eggs images and adapted the StarDist segmentation model for an automated frog-egg counting pipeline at AGGRC, achieving 95% accuracy. (GitHub)

Undergraduate Projects

Three-dimensional colored percolation (Undergraduate Thesis) August–May 2022

- Designed a MATLAB program to calculate the percolation threshold of cubic lattices using the data collapsing technique within a two percent error of the known results. Extended conventional percolation systems to multi-colored using up to 100 colors.(Slides)

Multiplicative Harmonious Labeling August 2021–May 2022

- Introduced a new graph labeling by replacing the additive group in classical harmonious labelings with the multiplicative group $U(n)$ and identified classes of graphs that admit or fail such labelings. (PDF), (Slides)

Portfolio Management, COMAP's MCM/ICM February 2022

- Built an R-based LSTM time series model to predict gold and bitcoin prices, and designed a risk minimization algorithm with a client-facing recommendation system for optimal investment decisions.(PDF)

Reducing Single-Use Plastic Waste, COMAP's MCM/ICM February 2020

- Built a three-part policy model (Cobb-Douglas demand optimization, linear-programming waste management, and an alternative recycling process) with a tax-and-subsidy scheme projected to cut single-use plastic waste by 11.33% annually. (PDF)

Environmental Cost of Development: An Economic Model, COMAP's MCM/ICM January 2019

- Built an ecological services valuation model for land-use cost-benefit analysis; identified factory pollution as the dominant cost factor and wetlands as the most environmentally costly development sites. (PDF)

Internships

Session Assistant, Center For Talented Youth, Johns Hopkins University, Summer 2022

- Prepared evaluation reports on 23 high-school students across two sessions on their day-to-day progress and class behavior Organized math-focused evening sessions featuring fun, hands-on activities to reinforce key concepts.

- Advised students on crafting clear, structured, and professional solutions. Supervised the students on their final presentations on advanced topics in math logic and combinatorics.

Data Intern, Zoning Department, Government of Youngstown City Summer 2021

- Updated the approved projects as per the new regulations of the city. Studied the zoning applications to check the requirements before the approval of the zoning officer

Skills

Computational Tools: Python, SageMath, Mathematica, MATLAB, R, Excel, ArcGIS
Educational Tools: LaTeX, Doenet, PreTeXt, PreFigure

Conference Attended (In-Person)

Conference	Location	Month/Year
CombinaTexas	College Station, TX	April 2026
Southeastern Int'l Conf. on Combinatorics, Graph Theory & Computing	Boca Raton, FL	March 2026
Fall AMS Southeastern Sectional Meeting	New Orelans, LA	October 2025
SIAM TX-LA Meeting	Austin, TX	September 2025
Scientific Computing Around Louisiana	New Orleans, LA	March 2025
Spring AMS Southeastern Sectional Meeeting	Clemson, SC	March 2025
SIAM Conference on Mathematics of Data Science	Atlanta, GA	October 2024
SIAM Annual Meeting/ Discrete Mathematics	Spokane, WA	July 2024
Cumberland Conference	Starksville, MS	May 2024
Math for All Conference	New Orleans, LA	April 2024
Southeastern Int'l Conf. on Combinatorics, Graph Theory & Computing	Boca Raton, FL	March 2024
Atlanta Lecture Series in Combinatorics and Graph Theory	Atlanta, GA	November 2023
Eastern Great Lakes APS Meeting	Youngstown, OH	April 2022
Southeastern Int'l Conf. on Combinatorics, Graph Theory & Computing	Boca Raton, FL	March 2022
Pi Mu Epsilon Conference	Youngstown, OH	February 2019

Conference Attended (Virtual)

Conference	Organizer	Month/Year
Summer Spark	American Mathematical Association of Two-Year Colleges	June 2026
The Grading Conference	Center for Grading Reforms	June 2026
AI in the Classroom: What's Working (and What's Not)	Mathematical Association of America	May 2026

References

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Relation: Advisor

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Relation: Research Collaborator

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Relation: Teaching, Career, and Communication Mentor

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Relation: Calculus Coordinator

Stephen Shipman
Professor
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Relation: Graduate Mentor (2022-2026)

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Relation: Mentor for Differential Calculus Pilot Section

Christin Bibby
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Relation: Research and Teaching Mentor

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Relation: Research Collaborator

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Relation: Research Mentor