Sarah Allred

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Employment

Assistant Professor, University of South Alabama 2023–Present
Postdoctoral Scholar, Vanderbilt University 2022–2023

Education

Ph.D., Mathematics, *Louisiana State University* 2017–2022
Baton Rouge, LA
- Advisor: Bogdan Oporowski
- Dissertation: *Unavoidable Structures in Large and Infinite Graphs*

M.S., Mathematics, Louisiana State University 2016–2017

B.S., Mathematics, Auburn University 2012–2016

Research Interests

General: Combinatorics, Graph Theory
Specific: Structural and Extremal Graph Theory, Graph Coloring

Papers

Published Papers

1. S. Allred, J.A. Mudrock. *Enumerative Chromatic-Choosability*. Electronic Journal of Combinatorics, **33**(4), 2026.

2. S. Allred, C. Erickson, K. Grace, H.T. Hall, A. Jensen. *A Combinatorial Bound on the Number of Distinct Eigenvalues of a Graph*. Australasian J. Combin., **92**(1), 2025.

3. S. Allred, G. Ding, B. Oporowski. *Unavoidable Induced Subgraphs of Infinite 2-Connected Graphs*. Discrete Math., **384**(4), 2025.
https://doi.org/10.1016/j.disc.2024.114346

4. S. Allred, E. Curl, S. Fallat, *et al. The Strong Spectral Property of Graphs: Graph Operations and Barbell Partitions*. Graphs and Combinatorics, **40**(20), 2024.
https://doi.org/10.1007/s00373-023-02745-6

5. S. Allred, G. Ding, B. Oporowski. *Unavoidable Induced Subgraphs of Large 2-Connected Graphs*. SIAM J. Discrete Math., **37**(2), 2023.
https://doi.org/10.1137/21M1447593

6. S. Allred, P. Johnson. *Theta Graphs are Hall t-chromatic for all* $t = 0, 1, 2, \ldots$ Bulletin of the ICA, **81**, 2017.

7. S. Allred, P. Johnson, M. Murphy. *Forbidding Rainbow Cycles with Edge-Colorings of* $K_{m,n}$. Alabama Journal of Mathematics, **38**, 2014.

Preprints

8. S. Allred, M. Ellingham. *Forbidding the Subdivided Claw as a Subgraph or Minor*. arXiv:2510.13718.

9. S. Allred, M. N. Ellingham. *Unavoidable Induced Subgraphs of Large and Infinite 2-Edge-Connected Graphs*. arXiv:2503.21574.

Papers in Preparation

10. S. Allred, M.N. Ellingham. *Vertex Contraction Deletion Minors*.

11. S. Allred, M.N. Ellingham, G. Zvaneweld. *Adding odd holes to chordal graphs*.

Extended Research & Internships

Participant, AMS Mathematics Research Community, *Topic: Approaches to Inverse Problems using Combinatorics and Linear Algebra* Summer 2021

Researcher, *Software Engineering Institute, Carnegie Mellon University* Summer 2020
Pittsburgh, PA
- Developed a prototype framework for format specifications and binary file parsing in Python.
- Represented data at multiple layers of abstraction, from binary encoding to human-readable description.
- Presented findings to groups interested in digital forensics, network security, and machine vision.

Grants & Funding

AMS-Simons Travel Grant, *American Mathematical Society / Simons Foundation* 2026-2028
$6,000

College of Arts and Sciences Support and Devolvement Award, *University of South Alabama* 2026
$1,500

Awards & Honors

College of Arts and Sciences Directed Studies Award, University of South Alabama 2026
Certificate of Teaching Excellence, Louisiana State University 2020
David Oxley Graduate Student Teaching Award, Louisiana State University 2020
Board of Regents Fellow, Louisiana State University 2016–2018

Presentations

Invited Talks

Vertex Contraction-Deletion Minors, AMS Fall Southeastern Section Meeting, Kennesaw, GA 2026
Unavoidable Structures in Large and Infinite Graphs, KdVI DMQI (University of Amsterdam) 2025
Seminar, Amsterdam, Netherlands

Vertex Contraction-Deletion Minors, Georgia State Discrete Math Seminar, Atlanta, GA 2025
Unavoidable Structures in Large and Infinite Graphs, Troy University 2024
Enumerative Chromatic Choosability, Illinois Institute of Technology Discrete Mathematics Seminar 2024
Vertex Contraction-Deletion Minors, University of Mississippi, Oxford, MS 2024
Vertex Contraction-Deletion Minors, AMS Fall Southeastern Section Meeting, Mobile, AL 2023
Unavoidable Induced Subgraphs, Georgia Tech Graph Theory Seminar, Atlanta, GA 2023
Unavoidable Induced Subgraphs, AMS Spring Southeastern Sectional Meeting, Atlanta,GA 2023
Unavoidable Induced Subgraphs, Joint Mathematics Meetings, Boston, MA 2023
Unavoidable Induced Subgraphs, Auburn Combinatorics Seminar 2022
Unavoidable Induced Subgraphs, Vanderbilt/MTSU Joint Seminar 2022
Unavoidable Induced Subgraphs, Virtual Women in Combinatorics Seminar 2022
Unavoidable Induced Subgraphs, Joint Mathematics Meetings, virtual 2022
Unavoidable Induced Subgraphs, University of Waterloo Combinatorics Seminar 2020
Theta Graphs are Hall t-chromatic, Auburn REU 2018

Other Talks

Enumerative Chromatic Choosability, 34th Cumberland Conference on Combinatorics, Graph Theory, and Computing, Auburn University 2026
Forbidding the Subdivided Claw as a Subgraph or Minor, 75th Meeting of the Alabama Association of College Teachers of Mathematics, University of South Alabama 2026
Unavoidable Induced Subgraphs of Large Graphs, 39th Summer Conference on Topology and Its Applications, University of South Alabama 2025
Forbidding the Subdivided Claw, 33rd Cumberland Conference on Combinatorics, Mississippi State University 2024
Unavoidable Induced Subgraphs, LSU Combinatorics Seminar 2022
Unavoidable Induced Subgraphs, LSU Combinatorics Seminar 2020
Unavoidable Induced Subgraphs, 7th Mississippi Discrete Math Workshop, University of Mississippi 2019
Unavoidable Induced Subgraphs, 31st Cumberland Conference, University of Central Florida 2019
Combinatorics Introduction Talk, GEAUX Program, LSU 2018
Theta Graphs are Hall t-chromatic, 49th Southeastern Conference, Florida Atlantic University 2018

Teaching

Instructor of Record with sole responsibility for lectures, exams, and grades.

University of South Alabama

Course	Semesters
Graph Theory	Sp24, Sp25, Sp26
Discrete Math Structures	Fa23, Sp24, Fa24, Sp25, Fa25, Sp26, Fa26
Calculus I	Fa24, Fa25, Fa26
Calculus II	Su24
Finite Mathematics	Fa23

Vanderbilt University

Course	Semesters
Error-Correcting Codes and Cryptography	Fa22, Sp23
Methods of Linear Algebra	Sp23

Louisiana State University

Course	Semesters
Honors Calculus I	Fa20, Fa21
Honors Calculus II	Sp21
Calculus I	Sp19, Fa19
Calculus II	Su19
Differential Calculus	Su21
College Algebra	Sp20

Service & Outreach

Professional Service

Referee Discrete Mathematics Journal
Banff International Research Station Workshop Proposal

University of South Alabama

Finance Committee Member, Ashland Place United Methodist Church 2026–Present
School Mentor, Big Brothers Big Sisters of the Central Gulf Coast 2025–Present
Board of Directors and Finance Committee Member, USA Wesley Foundation 2025–Present
Instructor, Math Corps 2024
Plenary Speaker, Girls in Math Day 2024
Member, Graduate Committee 2023–Present
Member, Library Committee 2023–2024

Vanderbilt University

Math Tutor, Community Achieves at H.G. Hill Middle School 2023

Louisiana State University

Chair, G.E.A.U.X Orientation Program for New Math Graduate Students 2021
Organizer, LSU Combinatorics Seminar 2020–2022

Organized and ran the LSU Combinatorics Seminar as a virtual seminar with participants from multiple different countries.

Founder & Coordinator, Mathematics Graduate Student Mentor Program — Fall 2020
Started a tiered mentoring program for mathematics graduate students, pairing first-year graduate students with more advanced students for support.

Mentor, Communicating Math Graduate Course — Fa19, Sp20, Sp21, F21
Mentored a first year graduate student. I met with the student several times throughout the semester as they observed my class, and guided them through writing and presenting a lecture in my Calculus I course.

Department Representative, Graduate Student Association — Fall 2019–2022
Represented the mathematics graduate students in the Graduate Student Association and presented any concerns graduate students had to the GSA.

Speaker, Math with Middle and High School Students — 2019
Gave a talk on assorted topics in Graph Theory to both a middle school and a high school math class.

Committee Member, G.E.A.U.X Orientation Program — 2017–2020

Mentor, KIDS HOPE — 2017–2022
Mentored an elementary student in reading, mathematics, and life skills.

Proctor and Grader, High School Math Contest — 2017

Professional Memberships

- American Mathematical Society
- Association for Women in Mathematics