

Sarah Allred

Curriculum Vitae

Department of Mathematics and Statistics
University of South Alabama
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USA

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Employment

- 2023-present **Assistant Professor**, University of South Alabama.
2022-2023 **Postdoctoral scholar**, Vanderbilt University.

Education

- 2017–2022 **Ph.D., Mathematics**, Louisiana State University.
Advisor: Bogdan Oporowski
Dissertation: *Unavoidable Structures in Large and Infinite Graphs*
2016–2017 **M.S., Mathematics**, Louisiana State University.
2012–2016 **B.S., Mathematics**, Auburn University.

Research Interests

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

Papers

Published papers

1. S. Allred, C. Erickson, K. Grace, H.T. Hall, A. Jensen, *A Combinatorial Bound on the Number of Distinct Eigenvalues of a Graph* Austral. J. Combin., **Vol 92 Part 1**. (2025).
2. S. Allred, G. Ding, B. Oporowski, *Unavoidable Induced Subgraphs of Infinite 2-Connected Graphs*. Discrete Math., **Vol. 384 Iss. 4** (2025). <https://doi.org/10.1016/j.disc.2024.114346>
3. S. Allred, E. Curl, S. Fallat, S. Nasserar, H. Schuerger, R. R. Villagrán, and P. K. Vishwakarma, *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>
4. S. Allred, G. Ding, B. Oporowski, *Unavoidable Induced Subgraphs of Large 2-Connected Graphs*, SIAM Discrete Math, **Vol. 37, Iss. 2 2023**. <https://doi.org/10.1137/21M1447593>
5. S. Allred, P. Johnson, *Theta Graphs are Hall t -chromatic for all $t = 0, 1, 2, \dots$* Bulletin of the ICA, **Vol. 81 2017**.
6. S. Allred, P. Johnson, M. Murphy, *Forbidding Rainbow Cycles with Edge-Colorings of $K_{m,n}$* . Alabama Journal of Mathematics, **Vol. 38 2014**.

Preprints

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

Papers in preparation

8. S. Allred, M. Ellingham, *Forbidding Y as a Subgraph or Minor*.

9. S. Allred, M. Ellingham, *Vertex Contraction Deletion Minors*.
10. S. Allred, M.N. Ellingham, G. Zvaneweld, *C_4 -free-VCD minors*.

Extended Research Travel

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

Internships

Summer 2020 **Software Engineering Institute, Carnegie Mellon University**

- Participated in ongoing research into investigating alterations to compressed archives:
 - Developed a prototype framework for format specifications
 - Represented data at multiple layers of abstraction, from binary encoding to human-readable description
- Work product consisted of:
 - A series of technical presentations to a group with interests that include digital forensics, network security, and machine vision
 - A binary file parsing code in Python to read data and construct a higher-order representation of the file data

Awards, Honors, and Distinctions

Louisiana State University

2020 **Certificate of Teaching Excellence**
 2020 **David Oxley Graduate Student Teaching Award**
 2016–2018 **Board of Regents Fellow**

Presentations

Invited Talks

2025 **Vertex Contraction-Deletion Minors**, Georgia State Discrete Math Seminar, *Georgia State University*.

2024 **Unavoidable Structures in Large and Infinite Graphs**, Trojan Math Seminar, *Troy University*.

2024 **Enumerative Chromatic Choosability**, IIT Discrete Mathematics Seminar, *Illinois Institute of Technology*.

2024 **Vertex Contraction-Deletion Minors**, University of Mississippi Combinatorics Seminar, *University of Mississippi*.

2023 **Vertex Contraction-Deletion Minors**, AMS Fall Southeastern Section Meeting.

2023 **Unavoidable Induced Subgraphs of Large and Infinite 2-connected graphs**, Georgia Tech Graph Theory Seminar, *Georgia Institute of Technology*.

2023 **Unavoidable Induced Subgraphs of Infinite 2-connected graphs**, AMS Spring Southeastern Sectional Meeting.

2023 **Unavoidable Induced Subgraphs of Infinite 2-connected graphs**, Joint Mathematics Meetings.

2022 **Unavoidable Induced Subgraphs of Large and Infinite 2-connected graphs**, Auburn Combinatorics Seminar, *Auburn University*.

- 2022 **Unavoidable Induced Subgraphs of Large and Infinite 2-connected graphs**, Joint Vanderbilt/MTSU Graph Theory and Combinatorics Seminar, *Vanderbilt University*.
- 2022 **Unavoidable Induced Subgraphs of Large and Infinite 2-connected graphs**, Virtual Women in Combinatorics Seminar.
- 2022 **Unavoidable Induced Subgraphs of Large 2-connected graphs**, Joint Mathematics Meetings.
- 2020 **Unavoidable Induced Subgraphs of Large 2-connected graphs** Matroid Union Seminar, *University of Waterloo*.
- 2018 **Theta Graphs are Hall t -chromatic**, Auburn REU, *Auburn University*.

Other talks

- 2024 **Forbidding the Subdivided Claw**, 33rd Cumberland Conference on Combinatorics, Combinatorics, Graph Theory, and Computing, *Mississippi State University*.
- 2022 **Unavoidable Induced Subgraphs of Large and Infinite 2-connected graphs** LSU Combinatorics Seminar, *Louisiana State University*.
- 2020 **Unavoidable Induced Subgraphs of Large 2-connected graphs** LSU Combinatorics Seminar, *Louisiana State University*.
- 2019 **Unavoidable Induced Subgraphs of Large 2-connected graphs** 7th Mississippi Discrete Math Workshop, *University of Mississippi*.
- 2019 **Unavoidable Induced Subgraphs of Large 2-connected graphs** 31st Cumberland Conference on Combinatorics, Graph Theory and Computing, *University of Central Florida*.
- 2018 **Combinatorics Introduction Talk**, GEAX Program, *Louisiana State University*.
- 2018 **Theta Graphs are Hall t -chromatic**, Southeastern International Conference on Combinatorics, Graph Theory, and Computing, *Florida Atlantic University*.

Teaching

I was the instructor of record, where I had the sole responsibility of preparing and presenting lectures, assigning and grading tests, and assigning the overall course grade for the following courses.

University of South Alabama

- Spring 2025 **Graph Theory**
- Spring 2025 **Discrete Math Structures**
- Fall 2024 **Calculus I**
- Fall 2024 **Discrete Math Structures**
- Spring 2024 **Graph Theory**
- Spring 2024 **Discrete Math Structures**
- Fall 2023 **Finite Mathematics**
- Fall 2023 **Discrete Math Structures**

Vanderbilt University

- Spring 2023 **Error-Correcting Code and Cryptography**
- Spring 2023 **Methods of Linear Algebra**
- Fall 2022 **Error-Correcting Codes and Cryptography**

Louisiana State University

- Fall 2021 **Honors Calculus I**
- Summer 2021 **Differential Calculus**
- Spring 2021 **Honors Calculus II**
- Fall 2020 **Honors Calculus I**
- Spring 2020 **College Algebra**
Taught students with ACT score less than 19 using the R2R format. Classes met twice a week for 50 minutes. The students were required to spend 4.5 hours in a tutoring computer lab in addition to class. All assignments were given using the MyMathLab software.
- Fall 2019 **Calculus I**
- Summer 2019 **Calculus II**
Homework assignments were given using the WebAssign software.
- Spring 2019 **Calculus I**
Homework assignments were given using the WebAssign software.

Service and Outreach

University of South Alabama

- 2024. **Instructor**, Math Corps.
- 2024 **Plenary Speaker**, Girls in Math Day at the University of South Alabama.
- Fall Graduate Committee member.
- 2023-Present

Vanderbilt University

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

Louisiana State University

- 2021 **Chair**, G.E.A.U.X Orientation Program for New Math Graduate Students, *Louisiana State University*.
- 2020-2022 **Organizer**, LSU Combinatorics Seminar, *Louisiana State University*
Organized and ran the LSU Combinatorics Seminar as a virtual seminar with participants from multiple different countries.
- Fall 2020 **Mathematics Graduate Student Mentor Program** Started a tiered mentoring program for mathematics graduate students, pairing first-year graduate students with more advanced students for support.
- Spring 2020 **Mentor for the Communicating Math Graduate Course** *Louisiana State University*.
- Fall 2019 **Mentor for the Communicating Math Graduate Course I** 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. *Louisiana State University*.
- Fall 2019-2022 **Department Representative to the Graduate Student Association**
Represented the mathematics graduate students in the Graduate Student Association and presented any concerns graduate students had to the GSA. *Louisiana State University*
- 2019 **Math with Middle and High School Students** Gave a talk on assorted topics in Graph Theory to both a middle school and a high school math class.

2017–2020 **Committee Member**, G.E.A.U.X Orientation Program for New Math Graduate Students, *Louisiana State University*.

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

2017 **Proctor and Grader**, High School Math Contest, *Louisiana State University*

Professional Memberships

American Mathematical Society

Association for Women in Mathematics