Aakash **Gurung**

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Education

Expected Dec 2026	M.A. in Mathematics, The University of Alabama, Tuscaloosa, AL
Expected May 2026	B.S. in Mathematics; Minor: Digital, Public, and Professional Writing, The University of Alabama, Tuscaloosa, AL

∞ Research Interests

I am broadly interested in **Algebraic Combinatorics**, **Applied Mathematics**, and **Geometry**.

∑ Research Experience

Present, Jan 2026 — **Stochastic Pairing Dynamics, University of Alabama,**
Advisor: Professor Chuntian Wang
- Investigating stochastic pairing dynamics through random walk and probabilistic transition models.

Stochastic Modeling | Random Walks

Present, Feb 2025 — **Structural Properties of Flagpole Partitions, University of Alabama,**
Advisor: Professor Kyungyong Lee
- Learned about q, t Catalan numbers, Dyck vectors, and their connection to integer partition structures.
- Working on finalizing the proof of conjecture on second-order tail initiators via explicit inverse mappings between flagpole partitions and flag types.

Algebraic Combinatorics | Catalan Numbers | Integer Partitions

Dec 2025, May 2025 — **Finite-Size Effects in Epidemic Models, University of Alabama Mathematics Summer REU,**
Advisors: Professors Chuntian Wang, Yuanyuan Song, Yuanzhen Shao
- Co-developed agent-based and mean-field SIHRS models incorporating immunity waning to capture recurrent epidemic waves.
- Employed a martingale-based early-time-step method to identify non-linear amplification of finite-size effects.
- Validated theoretical predictions via numerical simulations calibrated to county-level COVID-19 data.

Applied Mathematics | Epidemic Modeling | Stochastic Analysis

June 2024, Feb 2024 — **Game of Cycles on Maximal Plane Graphs, CUNY Research Scholars Program,**
Advisor: Professor Malgorzata Marciniak
- Defined "IO Maximal Plane Graphs" and analyzed invariant properties to determine the game outcome.
- Established that the winning strategy is determined by the parity of the graph's vertices.

Combinatorial Game Theory | Graph Theory

Aug 2023, June 2023 — **Method of Brackets and Bessel Function Integrals, Polymath Jr 2023,**
Advisor: Professor Victor H. Moll
- Applied the "Method of Brackets" to provide rigorous proofs for entries involving Bessel functions of the first and second kind from the Gradshteyn and Ryzhik tables.

Special Functions | Integral Calculus | Bessel Functions

Aug 2023, Mar 2023 — **Continued Fractions, a-Fibonacci Numbers, and Middle b-Noise, Independent Project,**
Advisor: Professor Cheng Han Pan
- Generalized palindromic continued fractions $[1, \ldots, 1, 3, 1, \ldots, 1]$ to $[a, \ldots, a, b, a, \ldots, a]$ using a-Fibonacci sequences.
- Showed that the a-th metallic ratio limit is invariant under the middle noise term b.

Number Theory | Continued Fractions | Fibonacci Sequences

Publications

Under Review — **A. Gurung**, S. Wagle, A. Carr, C. McCann, K. Kodatt, Y. Song, Y. Shao, C. Wang. "An exploration of finite-size effects in the dynamics of epidemic compartmental modelling."

2024 — **A. Gurung** and C.-H. Pan. "Continued Fractions, a-Fibonacci numbers, and the middle b-noise," *Mathematics Exchange*, 18(1), 77–87.

2024 — (with the Polymath Jr. Group). "The integrals in Gradshteyn and Ryzhik. Part 34: Bessel functions," *Scientia Series A: Mathematical Sciences*, 34, 109–129.

Conferences & Workshops

March 2026	AMS Southeastern Sectional Meeting, **Presenter**
May 2024	CUNY Undergraduate Research Day 2024, **Presenter**
Aug 2024	MathFest 2024, **Presenter**
Sept–Nov 2024	Preliminary Arizona Winter School 2024: Symmetries of Root Systems, Attendee

Honors & Awards

2025	ASSURE Grant, University of Alabama
2024	Best Poster Award, CUNY Undergraduate Research Day
2023	Samuel J. Steinberger, Jr. Memorial Award, Juniata College
2021	USA Astronomy & Astrophysics Competition (National Qualifier)
2020	Nepal Mathematical Olympiad (Top 10); Nepal Astronomy Olympiad (Rank 1)

Work Experience

Present – Aug 2025 | **IT Service Desk Student Assistant, University of Alabama, Tuscaloosa, AL**

- Provide timely software and technology support to resolve user issues efficiently.

IT Support | Technical Support

May 2025 – Sept 2024 | **Peer Tutor, Mathematics Technology Learning Center, Tuscaloosa, AL**

- Drop-in tutor for Calculus 1, 2, and 3.
- Run recitation classes for Calculus 1.

Calculus | Mathematics Education | Tutoring

Skills

Programming	Python (NumPy, Pandas, SciPy), Julia, MATLAB, JavaScript, HTML, CSS
Tools	PowerQuery, LaTeX, Git
Other	Grant Writing