Arham Lodha

Citizenship: United States   **Date of Birth:** March 17, 2004

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Education

University of Texas at Austin, BS in Mathematics   Expected May 2026
- GPA: 3.9565/4.0000
- **Relevant Coursework:** Differential Equations, Multivariable Calculus, Advanced Calculus, Discrete Mathematics, Probability I, Numerical Analysis, Algebraic Structures I and II, Real Analysis I, Complex Analysis, Computer Graphics, Harmonic Analysis and Representation Theory
- **Currently in:** Representation Theory, Riemann Surfaces, Honors Thesis Course
- **Exchange Program ETH Zurich (Spring 2025):** Introduction to Modular Forms, Algebraic Topology II, and Applied Stochastic Processes.

Research Experience

DIMACS REU Participant, Rutgers University   May 2025 – July 2025
Principal Investigator: Professor Feng Luo

- Conducted research in discrete conformal geometry, focusing on circle packings, to investigate two core problems: the Rigidity of Circle Packings and the Discrete Schwarz-Pick Lemma.
- Proved the Discrete Schwarz-Pick Lemma for a broader class of inversive distances, extending prior results limited to tangent cases. Established that the space of admissible radii remains convex and curvature remains monotonic under these weaker conditions.
- Designed Python experiments to systematically test boundary configurations; utilized these simulations to construct a counterexample that disproved the conjecture for disjoint circle packings.
- Presented findings at the DIMACS REU End-of-Program Presentations. Authored a manuscript summarizing these results (available on arXiv); currently preparing the paper for publication.

Research Fellow, University of Texas at Austin   May 2023 – January 2025
Mentor: Dr. Wenrui Chai

- Researched the performance of global optimization algorithms that find global minimum potential energy configurations of complex chemical systems. Evaluating and comparing the performance of Basin Hopping and Minimum Hopping optimization algorithms and various hybrids.
- Co-authoring a manuscript detailing algorithm performance and key scientific findings for publication.

Independent Study

UT Directed Reading Program - Fourier Analysis   June 2024 - July 2024
- Completed intensive study of Fourier Analysis through text "Fourier Series and Integrals" by H. Dym and H.P. McKean mentored by Ph.D. student William Winston.
- Presented original talk connecting Fourier Analysis to the Heisenberg-Weyl Uncertainty Principle in the UT Directed Reading Program Symposium.

UT Directed Reading Program - Matroid Theory   Sept 2023 - Nov 2023
- Studied Matroid Theory under guidance of Ph.D. student Jayden Wang using "Matroid Theory: A Geometric Perspective" by Gary Gordon.
- Applied matroid theory to solve combinatorial problem: determined minimum verification checks for Sudoku puzzles
- Presented findings at UT Directed Reading Program Symposium, demonstrating matroid applications in Sudoku verification

Teaching Experience

Undergraduate Course Assistant for Business Calculus, UT Austin   Aug 2025 – December 2025
- Instructed biweekly discussion sections, delivering supplemental lectures and guiding collaborative problem-solving sessions.
- Hosted office hours and provided tutoring in the UT CalcLab to clarify core concepts and exam strategies.
- Developed supplemental worksheets and practice problems to reinforce students' analytical and problem-solving skills.

Undergraduate Course Assistant, Probability I, UT Austin   Aug 2024 – Dec 2024
- Conducted office hours multiple times a week to provide targeted support, helping students master challenging problem sets and prepare for exams.
- Clarified complex probability concepts and reinforced effective problem-solving techniques to improve student comprehension.
- Authored supplementary review materials to distill key topics and aid in student learning.

Tutor, Tutor for AP Calculus AB/BC and AP Physics I/II/C   Nov 2022 – Jun 2023
- Personally tutored 10 high school students in AP Calculus AB/BC and AP Physics I/II/C.
- Drove exceptional student outcomes, achieving a 95% average final grade and perfect 5/5 AP exam scores across all clients.

Leadership Experience

Cofounder, Hit Fantasy   Aug 2024 – Present
- Led a cross-functional team of 5 developers and designers to build and launch a bootstrapped fantasy cricket application from concept to deployment. Architected and oversaw the implementation of a full-stack solution, leveraging Figma for UI/UX design and a modern tech stack (Firebase, Next.js, TypeScript). Acquired and retained over 550 active users during the Indian Premier League season, demonstrating strong product-market fit.

Preprints

- **Lodha, Arham Rajendra**. "The Discrete Schwarz-Pick Lemma For Circle Packings Revisited." *arXiv preprint* arXiv:2511.10703 (2025). (In preparation)

Projects

Black Hole Raytracer   github.com/arham-lodha/Black-Hole-Renderer
- Inspired by Interstellar, developed a high-fidelity Black Hole Renderer in Unity using Compute Shaders and advanced ray marching techniques
- Simulated relativistic effects with precision by integrating the Schwarzschild metric and dynamically adjusting ray trajectories through a modified 4th order Runge Kutta integrator
- Designed and rendered artistic visualization of black hole's accretion disk, capturing phenomena like Black Body Radiation and astrophysical properties

Honors and Awards

Eva Stevenson Woods Endowed Presidential Scholarship, University of Texas at Austin (June 2025)
William F. Massey Scholarship Fund, University of Texas at Austin (June 2025)
University Honors, University of Texas at Austin (Fall 2022 - Fall 2024)

Technical Skills

Programming Languages:
- **Proficient:** Python, Julia, C++, Java, GLSL, HLSL, C#, JavaScript, Typescript, Dart
- **Basic:** MATLAB