Arya Maheshwari

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EDUCATION

Princeton University (Princeton, NJ) Aug. 2021 – May 2025

Major: **Computer Science**, Minor: **Mathematics.** GPA: **4.00** / 4.00.
Awards: **Goldwater Scholarship, Freshman First Honor Prize, Phi Beta Kappa, Shapiro Prize** for Academic Excellence
Adviser: **Matt Weinberg**

Coursework: 10 A+s received (*each A+ requires written faculty endorsement).* Relevant courses on Page 2.

Budapest Semesters in Math (Study Abroad, Spring 2024): A+s in all courses.

RESEARCH

Algorithmic Game Theory/Mechanism Design Research (Princeton University) October 2023 – present

- Junior paper under Matt Weinberg on lower bound constructions for matroid intersection prophet inequalities.
- Current senior thesis on improving sample complexity of reductions to truthful auction mechanisms for an additive buyer.

Algorithmic Graph Theory Research (Budapest Semesters in Math) January 2024 – May 2024

- Proved a new dichotomy theorem on the degree sequence graphicality problem for 3-uniform hypergraphs, mentored by István Miklós (Rényi Institute). Resolves complexity of this decision problem over all degree intervals.

Publication: Preparing submission to *Journal of Combinatorial Theory*. Presentation at Joint Mathematics Meeting 2025.

Quantum Research Intern (IBM Research) May 2023 – August 2023

- Worked on theoretical research and implementations for new quantum compilation algorithms at IBM Quantum.
- Proved new result for controlling the space-depth tradeoff in parity synthesis for Hamiltonian simulation circuits.

Publication: Paper on theoretical results currently being drafted. Code used for benchmarks in another recent paper (here).

ADDITIONAL PROJECTS

Combinatorial BMM via Graph Decomposition [paper]**:** Surveyed recent breakthrough in fine-grained complexity on combinatorial boolean matrix multiplication (Advanced Algorithm Design final project).

Incentive Compatible AMMs in Binary Prediction Markets [poster, paper]**:** Studied market scoring rules in automated market makers (DeFi final project). Outstanding Poster award at Princeton's 2023 DeCenter Conference on blockchains.

Spectral Graph Theory (Directed Reading Program): Studied Spielman's manuscript and worked on computational project on Graph Hot Spots Conjecture with PhD student mentor.

Variational Quantum Algorithms (VQAs): Developed VQA pipeline for creating thermal states with CS dept. researchers.

Applying GPT-3 and Dense Embeddings to NLProofS [poster, paper]**:** NLP final project on proof generation.

High School Astrophysics Research: Studied stellar stream formation, supernova modeling, and rare star classification. Paper published in Harvard JEI. Presentations at 233rd AAS Meeting and 2020 APS Meeting (first-author).

LEADERSHIP & EXPERIENCE

Princeton ACM Chapter: President, Adviser (Association for Computing Machinery) April 2022 – present

- Led organization of COSCON, Princeton's main CS contest, and guided competitive programming team as president.
- Mentoring current officers and members as an advising officer in 2024-25 year, alongside faculty adviser Pedro Paredes.

Software Engineering Intern: Jane Street May 2024 – August 2024

- Developed the first OCaml-native dataframe library, leveraging advanced functional programming and algebraic data types.
- Project selected for blog post highlight (3 out of 80+) by Jane Street's head of technology. Received return offer.

Software Engineering Intern: Two Sigma May 2022 – August 2022

- Developed new history tracking functionality for Two Sigma's distributed web service platform. Received return offer.

COURSEWORK & TEACHING

Relevant Coursework:
- **Graduate**: Advanced Algorithm Design, Algorithmic Mechanism Design, Theoretical Machine Learning
- Economics & Computing, Cryptography, Decentralized Finance, Quantum Computing, Algorithms/DS
- Probability, Combinatorics, Abstract Algebra, Discrete Math, Honors Linear Algebra, Single Variable Analysis
- Natural Language Processing, Regression, Functional Programming, Programming Systems
- **Budapest Semesters in Math (BSM)**: Graph Theory, Topology, Research course on algorithmic problems on hypergraphs (*BSM courses under professors from Rényi Institute of Mathematics*).

Teaching Experience (Princeton University, CS and Math Departments)
- **Combinatorics** [MAT377]: Teaching Assistant (*under Prof. Noga Alon*) (Fall 2024)
- **Discrete Math** [COS240]: Teaching Assistant (*under Dr. Iasonas Petras)* (Fall 2024)
- **Algorithms/DS** [COS226]: Precept Assistant (Spring + Fall 2022)

HONORS & AWARDS

Phi Beta Kappa, Early Induction (Princeton University) September 2024
- Inducted early into Princeton chapter of nation's oldest academic honor society. Top ~2% of senior class.

2023 Barry M. Goldwater Scholar (Princeton University) March 2023
- Awarded prestigious national STEM research scholarship for sophomores/juniors as one of four students nominated by Princeton, based on research and academic record. First sophomore to win the Goldwater from Princeton in seven years.

Freshman First Honor Prize (Princeton University) August 2022
- Awarded to two students with **highest academic standing** out of all second-year students at Princeton, for "exceptional achievement during the first year."

Princeton Qiskit Fall Fest 2022: 2nd Place (Princeton University) October 2022
- Placed 2nd in Princeton-wide quantum hackthon focusing on quantum search (Grover's algorithm).

Shapiro Prize for Academic Excellence (Princeton University) August 2022, August 2023
- Annual academic prize awarded to top ~3% of first- and second-year students. Won both years.

USA Computing Olympiad: Platinum Division Competitor (High School) March 2020
- Qualified to prestigious top division of the national computing olympiad (USACO) with a **perfect score** in Gold contest.

American Invitational Mathematics Exam (AIME) Qualifier (High School) February 2019 – 2021
- Three-time AIME qualifier from national AMC10 and AMC12 exams.

AP Computer Science A, AP Statistics Perfect Scores (High School) May 2021, May 2018
- One of **2** students worldwide (183,000 test-takers) to perfect score AP Statistics. One of 166 (66,000 test-takers) for APCS.

USA Astronomy & Astrophysics Olympiad (USAAAO): First Round Top 40 (High School) February 2020
- Qualified to National Astronomy Competition as one of the top 40 students nationally in the first round.