Ahan Mishra

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Education

🔖 **B.S.** Computer Science (Honors), **Cornell University**. **GPA: 4.16**.   *Expected May 2026*

Work Experience

🔖 **MathWorks,** *Software Engineering Intern*   *May 2024 - Aug 2024*
- Developed a reference client for multiple production APIs using Django templates and server-side rendering.
- Created a prompt template rendering API in Go now in production, estimated 1,000 API calls/week.
- Identified and resolved 3 critical bugs in production code, wrote 4000+ net lines of code overall.

🔖 **Cornell Bowers CIS,** *Teaching Assistant*
CS 3780 (Machine Learning) - Will hold office hours, grade assignments/exams, 400+ students   *Jan 2025 – …*
CS 4820 (Algorithms) - Held office hours, grading assignments/exams, 300+ students   *Aug 2024 – Dec 2024*
CS 2110 (Data Structures) - Held office hours, grading assignments/exams, 600+ students   *Jan 2024 – May 2024*

Research Experience

🔖 **Cornell University Artificial Intelligence (CUAI),** Cornell University, *Student Researcher*   *Sep 2024 – …*
- Working on theory for diffusion models in the area of flow matching, part of NVIDIA Student Network.
- Improving adjoint matching algorithms, using Hugging Face to train models for experimental evaluation.

🔖 **Kleinberg Research Group,** Cornell University, *Undergraduate Researcher*   *Aug 2024 – …*
- Working with Prof. Bobby Kleinberg on algorithms for pinwheel scheduling and bandit learning.
- Implementing a polynomial time approximation scheme for pinwheel covering, exploring additive relaxation.
- Using linear programming relaxation and Markov chain Monte Carlo methods for stochastic monotone bandits.

🔖 **Ranka Research Group,** University of Florida, *Research Intern*   *May 2022 – Nov 2022*
- Collaborated with Florida Department of Transportation to make roads safer in and around Gainesville.
- Collected a wide variety of traffic data and performed data analysis that has led to two publications.
- Permanent changes in traffic signaling systems in the intersections resulting in 80% reduction in accidents.

Research Publications

[1] **A. Mishra**, K. Chen, S. Poddar, E. Posadas, A. Rangarajan, and S. Ranka, "Using video analytics to improve traffic intersection safety and performance," *Vehicles*, vol. 4, no. 4, pp. 1288–1313, Nov. 2022, Featured in Forbes. 🔗 DOI: 10.3390/vehicles4040068.

[2] J. Fleischer, R. Pallack, **A. Mishra**, R. de Andrade, P. Subhadipto, and et al., "Video-based pedestrian traffic analysis during football games," *IEEE Intelligent Transportation Systems Conference*, 2024.

Skills

Languages	🔖 Java, C++, Python, LaTeX, MATLAB, HTML, CSS, Javascript, Go, SQL, Bash
Technologies	🔖 VS Code, IntelliJ, Linux, Windows, Git, GitHub, Django, MongoDB, AWS EC2, SLURM
Frameworks	🔖 Docker, Kubernetes, YOLO, PyTorch, NumPy, Pandas, Matplotlib, JUnit, Bootstrap, Scikit-learn

Honors and Awards

🔖 **Putnam Top 700**. Score of 23/120, *William Lowell Putnam Mathematical Competition*, 2023.

🔖 **National Merit Scholar**, *National Merit Scholarship Corporation*. Top 1% of students taking the PSAT, 2023.

🔖 **USCF rating: 1862**, *US Chess Federation*. Multiple state and national awards, 2023.

🔖 **Top 50 in USA Physics Olympiad**, 2022. Top 50 out of 4556.

🔖 **National Math Champion**, *Mu Alpha Theta*, Alpha Ciphering, Alpha Equations and Inequalities, 2022.

🔖 **Four-time AIME Qualifier**, *Mathematical Association of America*, 2019-2022. Top 2.5%. AIME: 7, AMC 12: 120

Education Details

College Coursework

Graduate ML Theory (A)	Machine Learning (A+)	Discrete Structures (A+)
Graduate Algorithms (A)	Algorithms (A+), Probability	Linear Algebra (A+)
Functional Programming (A)	Data Structures (A)	Honors Analysis (A+)
Independent Research (A)	Computer System Organization	Stochastic Processes

Test Scores: GRE - **337**/340 (Verbal: 167, Quantitative: 170), **SAT** - **1590**/1600, **PSAT** - **1510**/1520

Research Details

Using video analytics to improve traffic intersection safety and performance
- Road safety has always been a crucial priority for municipalities, as vehicle accidents claim lives every day. Recent rapid improvements in video collection and processing technologies enable traffic researchers to identify and alleviate potentially dangerous situations. This paper illustrates cutting-edge methods by which conflict hotspots can be detected in various situations and conditions. Conflict hotspot detection, volume hotspot detection, and intersection-service evaluation allow us to understand the safety and performance issues and test countermeasures comprehensively. We demonstrate the selection and efficacy of countermeasues. This paper advocates for selection from a menu of countermeasures at the municipal level, with safety as the top priority. We also present a novel concept of a performance–safety trade-off at intersections.

Video-based pedestrian traffic analysis during football games
- This study uses video analytics to examine pedestrian and vehicle behavior during University of Florida football gamedays. It shows how traffic patterns change, with increased pedestrian activity and higher pedestrian volumes, correlated with the home team's win probability. This correlation suggests that fans prefer to watch and attend challenging games. Predicting pedestrian volumes using win probabilities could aid traffic management. Pedestrian-to-vehicle (P2V) conflicts rise on gamedays, especially before games, suggesting a need for a "Barnes Dance" phase at intersections. Law enforcement presence can enhance pedestrian safety. Remarkably, vehicle-to-vehicle (V2V) conflicts do not significantly increase on gamedays and may decrease due to increased driver caution.

Projects

h-index visualizer | *Elsevier API* | *Python* | *Pybliometrics*   GitHub Link
- Implemented a visualizer for the h-index of researchers over time supporting two analysis modes
- Exposed a full configuration interface including automated author finding and a CLI tool for using the visualizer
- Woking on developing better metrics for research output and predictions for h-indices.

Static Instrumentation Tool | *Python* | *Abstract Syntax Trees* | *NumPy* | *PyTorch*   GitHub Link
- Implemented an extensible tool to detect flaky tests and enabled automated seed setting for Python ML libraries.
- Logged/categorized assertions for TensorFlow, PyTorch, and Qiskit, finding 14, 53, and 392 randomized assertions in an extensible pattern that can reduce flakiness by over 50% using seeding across files and directories.

Extracurricular Activities

Vice President, Cornell Cybersecurity Club | *Communication* | *Teaching*   *Dec 2023 – Dec 2024*
- Leading organization logistics and education efforts, including weekly cybersecurity lessons and guest speakers

Head of Quantum Algorithms, Cornell Quantum Computing Association
- Leading the Algorithms subteam of the Cornell Quantum Computing Association   *Dec 2023 – …*
- Participated in hackathons including IBM Qiskit Fall Fest, MIT iQuHack, Xanadu QHack, QRISE
- Working on improving quantum max cut approximation ratios and implementing a Cirq circuit visualizer

Other Activities
- **Cornell SPICMACAY** - Vocalist performing Indian classical music, 2000+ attendees collectively.   *Aug 2023 – …*
- **Cornell Math Club** - Participate in math competitions and weekly math talks   *Aug 2023 – …*
- **Cornell ACM/IEEE** - Regular professor luncheons and company information sessions   *Sep 2023 - …*
- **Cornell Nexus** - Implemented better turning and object detection for a beach cleaning robot *Oct 2023 – May 2024*