

Essay 1: Tell us about your experiences as a New American. Whether as an immigrant yourself or as a child of immigrants, how have your experiences as a New American informed and shaped who you are and your accomplishments? (1000 words)

My childhood was full of stories. I recall tales at the dining table of my grandfather swimming in the lake near his village, of one great-grandfather running one of the only typewriting institutes in Kerala, and of another great-grandfather helping run a small restaurant. Oral stories such as these were complemented with written stories through the Amar Chitra Katha collection, a series of children's illustrated stories. These works illustrated figures across Indian culture and history, from real-world independence fighters such as Bhagat Singh, to pseudo-mythological figures such as Birbal, to fully mythological figures such as Arjuna.

Stories, both oral and written, have allowed me to understand and connect with my Indian heritage. Like many other Indian immigrants, written and photographic evidence from my family's past is scant beyond a few decades past. Instead, much of my ancestral knowledge is through the "dining room" stories. Frequently, these stories originate from simple questions I would ask while eating: "Where did we come from", "What did my ancestors eat", and "What did my ancestors do beyond work". Family gatherings not only featured ancestral stories but also fables and mythologies that blurred the lines between reality and imagination; there was never a situation that couldn't be summarized by a line from Thirukkural (a Tamil book of proverbs). Beyond just understanding my heritage, my worldview was shaped by the stories around me. Walks in the park would turn into questions about "Why the clouds were shaped like that", which quickly turned into explanations and stories.

My parents had a big emphasis on the phrase "Indian at home, American outside." Instilling Indian values was a big part of my childhood, and one way in which this occurred was through stories. For example, many of the stories I heard at home contained a message of charity: do good for others, not because of any reward, but because it is the right thing to do. This theme was repeated through my ancestral stories, such as my great-grandfather running a typewriting service that was free of pay for those who could not afford it, and was also present in fables, such as the poor man who offered his guests all his food, despite having nothing to eat for themselves. In a sense, stories allowed me to practice decision-making, as they presented scenarios without clear right and wrong, making me think about the values I hold implicitly.

The preponderance of stories influenced many hobbies as a child, as I became infatuated with history books and stories. History appealed to me because of the dynamism of the characters; I wanted to understand the actions of individuals ("Why did Gandhi choose non-violence"), and the

development of events ("Why did India become independent in 1947"). In high school, I found a natural outlet for this fascination through trivia-style competitions, such as Quizbowl. Participating in these competitions gave me starting points for my Wikipedia deep dives, which not only expanded my knowledge, but gave context to the monuments, parks, and statues around me. Such a world became more dynamic, as I understood the stories behind the names and the history that took place where I lived.

While my interest in storytelling emerged at a young age, my interest in computer science (CS) came later and was rooted in my fascination with how algorithms model complex tasks. Although interesting, work in CS felt removed from reality, as computer programs seemed distant from humans. My perception changed after reading stories about the impacts of artificial intelligence (AI) on real-world issues, both positive and negative. On one hand, there are applications like the kidney exchange program at Facebook, which uses big data to deliver life-changing results, and on the other are racial bias issues surrounding the Correctional Offender Management Profiling for Alternative Sanctions (COMPAS) recidivism algorithm. These stories convinced me of the momentous impacts AI has on real people and real social problems and drove me to focus on researching approaches to AI that account for social good.

Because my passion for research arose from my interest in stories, my taste in research problems revolved around understanding the real-world impact of algorithms. I'm interested in engaging with real-world stakeholders to understand their problems and see if AI should be leveraged. An example of research with real-world stories is exemplified by a book I recently read: "Poverty by America" by Matthew Desmond. Rather than analyze income inequality solely through a theoretical lens, Desmond engages with a litany of characters ranging from Amazon warehouse workers to amputees, and arguments are contextualized through real-life figures. Such a combination of real-world applicability with technically rigorous methodology is reflective of the type of research I aim to pursue; I'm interested in ensuring that the societal context shapes algorithm development and deployment.

Through my past experiences, I've encountered elements of real-world algorithm development. During my time at the World Resources Institute, I engaged with school districts for school bus electrification, resulting in a dataset with school bus depot locations. At the University of Maryland, I used natural language processing to develop applications that assist trivia players with knowledge retention, grounding the app in the needs of the trivia community. With John Dickerson, I improved the fairness of rideshare matching algorithms; while this project did not end up being implemented into practice, I learned about some of the difficulties of translating multi-definitional words, such as "fairness", into algorithmic objectives.

Going forward, I'm interested in working across the methodology-implementation spectrum. To do this, I've started talking with local food donation organizations to see how AI can help, specifically for volunteer notifications, and to gain perspective, I plan to volunteer for these organizations. My interest in projects such as these arises from my interest in stories, and in general, stories have profoundly shaped my life: they've allowed me to create a bridge from my American experience to my Indian heritage, influenced my taste in research, and better understand those around me.

Essay 2: Tell us about your current and near-term career-related activities and goals, as well as why you decided to pursue the specific graduate program(s) and school(s) that you have. (1000 words)

Artificial Intelligence (AI) and machine learning (ML) algorithms have seen large improvements recently, with super-human performance in games including chess, poker, and go. However, going beyond well-defined games to real-world scenarios is difficult due to the complexity of real-world interactions. One example is AI for decision-making, where objectives like “win the game” are no longer well-defined, instead needing to balance fairness, risk, and regret. These algorithms have the potential to govern important decisions in policy, business, and healthcare, and so require methods tailored to these applications. In my research, I strive to bridge this gap through ML research that is built on the needs of practitioners, specifically in social good applications such as food scarcity.

My journey has been two-fold. Through technical projects and coursework, I built a strong understanding of leading ML technologies, and through on-the-ground research, I developed the skills necessary to effectively collaborate with practitioners.

On the technical side, I got exposed to ideas from AI decision-making through my project on rideshare systems, where I studied the fairness in matching policies between riders and drivers used by companies such as Uber and Lyft. Existing matching systems can inequitably distribute drivers and riders; two drivers who drive for similar amounts of time could have different wages, while certain neighborhoods are serviced significantly more than others. To tackle this issue, I modified the objective function, which determines which rider-driver pairs are prioritized, so that more fair matches were prioritized. One of my favorite parts of the project was being able to incorporate ideas from other fields, as I used Shapley values from microeconomics to equitably redistribute wages. While the project was never deployed, it exposed me to the difficulties that arise when tackling real-world problems. For example, defining “fair” was difficult, and I spent time debating between different metrics and definitions of fairness before settling on two variants for the rider and driver sides.

My experience working on the electric school bus project at the World Resources Institute (WRI) taught me how to engage with real-world stakeholders. My goal was to retrieve information on bus depots so we could target school districts for school bus electrification. To do this, I emailed school districts across the country to request data on school bus depots. We received datasets with various formats, so communication with each school district was a conversation on how to understand the data. I then combined and cleaned all the datasets to produce a comprehensive table with data from each school district. From the project, I learned about the complications when working on real-world problems, as real-world data is always messy and harder to work with than synthetic or benchmark datasets.

My goal during my PhD is to combine my technical experience with on-the-ground collaboration with stakeholders. My previous experiences showed me different perspectives on this, ranging from methodology to implementation-focused. I intend to unite these threads during my PhD to study and implement technically interesting decision-making algorithms, leveraging my background in ML and AI.

My first ongoing PhD project combines methodology and implementation by improving volunteer notifications for food rescue organizations. Food rescue organizations transport excess food from sources such as restaurants and grocery stores to locations such as food banks. Doing so relies on volunteers, who receive request notifications on different trips, which they can accept or reject. Determining which volunteers to notify is challenging, as frequent notifications lead to burnout while scarce notifications lead to food wastage. Another challenge is modeling volunteer behavior, which requires understanding volunteer-task preferences, and volunteer burnout rates. This project excites me both because of its methodological complexity and the importance of tackling food scarcity. To tackle this problem, I'm using bandit-style algorithms to predict volunteer responses and notify volunteers based on their likelihood to accept the trip.

To prepare for this project and increase the chances of implementation, I plan to engage with individuals across ML and food rescue. In particular, I plan to attend meetings between my advisor and food rescue organizations so I can better understand the organization's needs. I've also started talking with experts on AI for social good, such as Rayid Ghani, who provides a good perspective on what is needed to get algorithms implemented in practice. Finally, I plan to become a volunteer with the food rescue organization to better understand the challenges faced by volunteers, which can assist in algorithm development.

Beyond research, I'm interested in teaching and mentoring the next generation of AI developers. I previously worked with grade school children on topics ranging from literacy to cybersecurity, and was a teaching assistant at the University of Maryland. Currently, I'm participating in the AI mentorship program to introduce undergraduates to AI research and working with local middle school students through the TechNights program. Through these teaching and mentorship opportunities, I've been able to engage with exciting material, learn and present the material in different ways, craft a different story, or develop a diverse perspective each time. These storytelling skills I learn from teaching are symbiotic with my research, and teaching itself is rewarding.

Attending Carnegie Mellon University (CMU) allows me to work on a variety of applications to better understand how decision-making algorithms perform across scenarios. My advisor, Fei Fang, specializes in decision-making and game theory, and has deployed algorithms to domains including food rescue and wildlife conservation. Working with her allows me to both study new methodologies for decision-making and work with real-world partners so algorithms can be deployed. Beyond my advisor, CMU features many professors who work on AI decision-making. For example, I intend to collaborate with Tuomas Sandholm, who works on decision-making in the context of kidney exchange algorithms, to improve their fairness and efficiency. His work is both methodologically interesting and has impacted the deployment of the UNOS kidney exchange program. Receiving a PD Soros Fellowship would not only assist me in developing decision-making algorithms for social good applications but also allow me to meet a community of New Americans, whose stories and perspectives I would love to hear.