PERSONAL STATEMENT

Ryan Steed (ryansteed@gwu.edu)

I am keenly interested in research that advances the use of computation, especially AI, in sociotechnical systems. By May 2020, I will have earned my undergraduate degree in Computational Economics and already conducted research in social network analysis, online machine learning, and fairness and bias in machine learning. I aspire to earn a PhD in Machine Learning & Public Policy at Carnegie Mellon studying *interpretable machine learning for social good*. With my degree, I plan to begin a research career in industry.

I decided to pursue a PhD when I realized that research was the most meaningful and rewarding component of my undergraduate education. For my first two semesters, I focused on earning top grades towards a double major in Computer Science and Economics and a minor in Philosophy. My efforts earned me notes of praise in the margins of my papers and complimentary asides from professors after class. But over the course of my degree, I appreciated more and more the satisfaction of elegant research and increasingly prioritized the role of active scientific discovery in my education.

My first professional research experience occurred before I ever took a college course; I was the only rising first-year in a Duke security studies laboratory composed of post-docs, graduate students, and older undergraduates. By July, I was promoted to lead a team of three Duke and UNC undergraduates in research development for the social network analysis portion of the app. We designed a random graph model to estimate the political actors' propensity for certain interactions and I unsuccessfully submitted a first-author paper for publication. I even traveled to the Pentagon alongside the other team leads and my supervisor to present our findings to Department of Defense grant administrators. But though I learned the mechanics of academic research with a great supervisor and talented peers, I rarely set the research agenda. Lacking agency, I tended to view my early research as merely an application of the concepts I learned in class.

When I wrote my first independent research proposal for an undergraduate grant, research became much more difficult. After hours of reading, I proposed to study the propagation of knowledge through patents and their citations, finding that the current literature failed to adequately account for the evolution of knowledge transmission over time. I won a Data MASTER fellowship, granted to only a few undergraduate students at GWU, to complete my research with supervision from Dr. Rahul Simha. I developed a new algorithm for evaluating the contribution of a given patent to future knowledge, estimated the effect of legislation and other factors on knowledge transmission rates, and built an open-source software package. The culmination of this work was exciting: the project won first prize in the Economics category of GWU's 2019 undergraduate research poster competition.

The experience of directing my own research profoundly altered my view of education. Before, I considered my research an application of classroom knowledge; having attempted to make an original contribution on my own, I realized that classroom knowledge is an accessory to the socially valuable process of scientific discovery. I took what my peers would consider a great risk: I dismantled my standard plan of study and created my own interdisciplinary major, Computational Economics, based on my research experiences. I designed a curriculum to teach me the statistical, mathematical and theoretical foundations for excellent research in computational economics and artificial intelligence. My thesis project will explore the use of weakly supervised learning for

training moral algorithms, especially in economic settings.

In my second undergraduate year, I started to think more about the socially impactful contributions I could make with my research ability. I began to explore the use of AI for social good in complex sociotechnical systems and became an assistant to Dr. Aylin Caliskan, with whom I investigate sociocultural bias in state-of-the-art face recognition. Last semester, I designed and executed a novel experiment for evaluating the susceptibility of deep learning models to first-impression emotional bias and won two consecutive Sigelman Undergraduate Research Awards for my research. Outside of research, I am working with faculty across my university to design a Technology for Social Good minor to enable other students to improve society with their technical skills.

Thanks to my interdisciplinary undergraduate studies, I have learned a little about how to properly define social impact and the ways in which ML systems impact the public; as a PhD student, I hope to deepen my knowledge and make meaningful technical and philosophical contributions. The Heinz College epitomizes the kind of interdisciplinary, data-driven, impactful research environment I seek. There are numerous research areas in policy and machine learning that interest me. I am particularly inspired by Prof. Rayid Ghani's work in data science for social good. Like him, I am interested in the improving human-AI collaboration, notably with interpretable machine learning. Dr. Alessandro Acquisti's work in economic privacy and behavioral privacy and Professor Leman Akoglu's work in unsupervised learning are also relevant and compelling.

In closing, I find research at the intersection of computer science and social science both highly challenging and highly rewarding. Unlike many of my peers, who received straightforward, structured, guidance from faculty, I struggled to forge my own path and create my own interdisciplinary research experiences so that I could delve deeply into the topics I cared about. I balanced conflicting advice from different faculty and failed often. I learned that research is often lonely, usually frustrating, and incredibly rewarding in those hard-earned moments of success. Ultimately, having taken ownership of my education and my research, I am dedicated to earning a PhD in Machine Learning & Public Policy because of the passion I found for interdisciplinary research and my desire to solve difficult problems for social good.

For additional project information and various manuscripts, please visit `rbsteed.com`.