Now is a fantastic time to be a computer scientist. Due to the rapid pace at which computational methods continue to transform every aspect of the modern world, we have tremendous opportunity for broad impact across a wide variety of domains. I believe that this opportunity also comes with a social responsibility to utilize this power to improve the greater good and that we have many opportunities to do exactly that. In this essay, I briefly describe my own personal journey as a computer scientist, why I am excited about the potential for machine learning to have a big impact on critical problems in the field of sustainable energy and finally my future career aspirations and goals.

Personally, I have always taken a hands-on approach to computer science. During my career as an undergraduate at UCSD, I held a variety of part-time programming jobs, including working with a meteorologist modeling climate change at the Scripps Institute of Oceanograpy and working at Neurome, a small neuroscience startup founded by Floyd Bloom, former editor-in-chief of Science magazine. My experience at Scripps underscored the importance and ubiquity of computational methods in the sciences; as a first-year student, I built an automated pipeline for processing large NASA satellite datasets which was critical to research efforts. At Neurome, we developed new technologies for visualizing and analyzing large (>50 GB) volumetric datasets with the goal of better automating the way neuroscience research is done. Although both were great learning experiences, it was clear in both environments that the emphasis was on scientific goals, not in pushing the state-of-the-art in computation.

For this reason, I was excited to take a position at Google upon graduation in 2005. Here, I had the opportunity to work on many challenging problems at web-scale and learn firsthand various state-of-the-art technologies such as Bigtable and MapReduce. I also gained invaluable teamwork and leadership experience; as my career progressed, I went from an individual contributor to the technical lead of a team with more than 10 people. Along the way, we also launched many successful projects [1, 2, 3, 4], one of which I will go into more detail in my previous research essay. Google was a tremendous learning experience and I believe it was the best route for me immediately after college. Beyond the technical knowledge acquired, I also came to realize that what I enjoyed most was working on early-stage, research-oriented projects with the strongest team available. Perhaps most importantly, at Google I was also exposed to the impact of large-scale machine learning, which deeply influenced my desire to pursue research more broadly.

A mentor at Google once framed this desire with the following audacious question: "We will achieve human-level A.I. in the next N years, what role do you want to play?" I don't recall the precise value of N and besides, it is well-known that similar statements have proven false in the past. Nonetheless, the broad impact of machine learning on large datasets is already undeniable. There are many such well-known efforts at Google including spelling correction, speech recognition and autonomous vehicle navigation. However, I feel strongly that I will be able to make the largest possible contribution by developing the state-of-the-art through a career in academia.

Upon leaving Google and entering the Ph.D. program at CMU in 2010, I was excited to have the opportunity to work on research full-time. Through my coursework, I began to learn

about the current state-of-the-art and what quickly became clear was that in many different domains, the best computational results are achieved by applying a common set of principles and methods that form the basis of machine learning. However, I had not yet formulated a clear direction and, in particular, was undecided about whether to focus on the theoretical or more applied aspects of machine learning. On one hand, machine learning is compelling due to a core set of theoretically sound methods that can be applied across many domains; yet, I fundamentally had the desire to solve tangible real world problems.

I believe that my current research proposal represents the best of both approaches; by developing new machine learning methods to meet the needs of the smart grid, I will have truly global impact. Typically, these challenges are not treated as computational problems, and thus exploiting the massive amount of data now being collected with machine learning has the potential to be transformative. Through these methods, I can improve the efficiency of energy production and consumption as well as dramatically improve the integration of renewables in the smart grid. This will not only conserve precious resources, but also reduce our carbon footprint which is critically important to safeguarding the future of our environment from the effects of climate change. The growth of renewables will also reduce our dependence on foreign oil, significantly improving our energy security. As computer scientists, we have the tools to tackle these challenges and the time to do so is now.

Ultimately, making progress will require advancing the state-of-the-art across many disciplines including Computer Science, Electrical Engineering, Mechanical Engineering as well as working together with partners in industry. I believe that I am well-positioned to do this at CMU and upon graduation, I plan to continue pursuing this research in a faculty position.

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[3] M. Mayer. *Yes, we are still all about search.* Google blog, 2006. `http://googleblog.blogspot.com/2006/05/yes-we-are-still-all-about-search.html`.

[4] S. Seth and R. V. Guha. *Eureka! Your own search engine has landed!* Google blog, 2006. `http://googleblog.blogspot.com/2006/10/eureka-your-own-search-engine-has.html`.