

I vividly remember the cancer patients I met during the summer of 2007 while researching at the Washington University Department of Radiation Oncology. Surprisingly enthusiastic despite their conditions, these patients were eager to undergo treatment to improve their conditions. By independently developing a paperless patient documentation system, which improved the efficiency of treatments on several radiation devices, as well as assisting in the development of treatment analysis software, I was able to employ my background in computer science to increase the quality of life for these patients. I had only begun to delve into the limitless field of research, but I already understood the profound societal impact I could have if I pursued a graduate degree in computer science. This firsthand research exposure has been a motivating factor in my pursuit of a PhD and ultimately a career as a university professor.

Intellectual Merit. To prepare myself for graduate school, I have actively participated in a research group since my sophomore year of college while completing bachelor's degrees in both computer science and mathematics. I have held leadership positions across campus, most notably within my research group and as a residential advisor (RA), which strengthened my communication skills. I have published articles at international conferences, several as a first author, and some of these publications I presented at these conferences. I have also been honored with prestigious national awards, such as the Barry Goldwater Fellowship. My undergraduate experiences allowed me to immediately begin research as a graduate student. I have already produced results for two distinct research groups in graduate school, and I have given several oral presentations in my courses and at paper reading sessions.

My motivation for a doctoral degree began to take shape when I joined the honors undergraduate research program in computer science. In my second semester, I met Prof. Ye Duan of the Department of Computer Science, who worked in the areas of computer graphics, computer vision, and human-computer interaction. After Prof. Duan gave a lecture on the undergraduate research program, I sought him out to learn more about the program and his own research. My conversation with Prof. Duan helped me realize the enormous scope and application of computer science research that existed. Prof. Duan was especially excited to discuss the research he was involved in, which included national security and autism research. Prof. Duan's fervor for these topics coupled with my own interest in computer graphics and computer vision compelled me to join his research group immediately.

I was extremely active in Prof. Duan's group throughout my undergraduate career, and last year I furthered my leadership skills by directing a team of graduate students within my research group. Our task was to develop a new brain structure segmentation algorithm to aid in our group's autism research. I was able to keep all members involved in our research planning by incorporating aspects of each team member's ideas in our project. By assigning timely deadlines and ensuring an efficient workflow, we were able to complete our application within only a few months.

My experiences as an undergraduate solidified my desire to attend graduate school. Working with cancer patients at Washington University, I recognized what I did not learn from my coursework: the ability of my research to have an immediate impact on society. I also found the research I completed with Prof. Duan to be the perfect combination of challenge and benefit. These profound realizations made me certain that I would strive for a career in academia.

As an undergraduate, I also decided to pursue a dual degree in mathematics because of the supplementary benefits it would afford me in computer science. The additional courses for this degree would prove to be some of the most formative in my development in the fields of computer graphics and computer vision. For example, I am much more capable of understanding the complex

math prevalent in most research papers, and my ability to prove rigorous mathematical concepts has progressed.

Broader Impact. My past research has positively impacted society, and I am confident that my future research will as well. I have also taken a sincere interest in teaching, which I began immediately after my freshman year. I taught and mentored students for two years as a residential advisor. The courses I taught as an RA motivated students to perform well in college and service their communities. I have also spent a semester as a teaching assistant for an upper level computer graphics class, and I will continue teaching in graduate school not only to prepare myself for becoming a professor but also to attract more students to the field of computer science.

In the courses I taught as an RA, the opportunity to prepare my students to succeed at the college level was immensely rewarding. My students seemed genuinely excited by my interactive lesson plans and reported that they were much more successful in their first year due to my class. I have kept in contact with nearly all of my students from these classes, and it is exciting to see them preparing for a successful life after graduation this year.

My role as an RA also allowed me to mentor students outside of the classroom by planning educational events for the residence hall. I hope to have a similar positive impact in computer science as both a teacher and a mentor when I become a professor. One event I planned was on the topic of genocide in Uganda. At the event, the documentary *Invisible Children* was shown and a speaker from the student anti-genocide coalition, STAND, discussed ways for residents to become involved in the fight against genocide. After the event's conclusion, many students in attendance voluntarily joined this organization or donated money to support STAND's cause. This is only one example of the wide variety of events that my colleagues and I planned. From these events, I realized the importance of my ability to motivate others to benefit society.

I gained valuable experience while I was a TA for a computer graphics course in my final undergraduate semester. My ability to convey material at a level suitable for beginners significantly improved in just one semester, and I have become much more comfortable with public speaking. I was excited to see the tremendous progress my students made over just a few months in this course. My students also seemed to enjoy the class, as I received excellent reviews at the end of the semester.

My research, teaching, and leadership experiences have shaped my desire to pursue a PhD and become a professor of computer science. While I am determined to satisfy these goals regardless of attaining the NSF GRF, acquiring such a tremendous fellowship will increase the quality and effectiveness of my research in graduate school. My research will not be constrained by the source of my funding, and I can more efficiently achieve my research proposal. With the NSF GRF, I will be able to focus strictly on research aimed at benefiting society through applications of computer science. I will continue to teach courses as a graduate student despite of the outcome of my application so that I can enhance my teaching aptitude for the future and inspire student interest in computer science. This fellowship will allow additional time for me to devote to my students, increasing the quality of their education. I will also use this time to participate in important extracurricular activities, such as mentoring and tutoring students, as I have done previously. Ultimately, the NSF GRF will substantially increase the quality of my graduate school experience, as well as my ability to positively impact the lives of others through research, teaching, and outreach.