**Personal, Background, and Future Goals Statement**

It was the spring of 2016, and I was indecisive about which undergraduate institution to attend. Then I learned about Oberlin’s STRONG program – a scholarship awarded to around ten students per annum that is dedicated to making research opportunities more accessible to students from disadvantaged backgrounds. One season later, I was attending workshops, learning research methods and applying them to a project in materials physics, a field teeming with real-world applications that fascinated and intimidated me at the same time.

As a member of the inaugural class of my chartered high school, my education in math and physics was limited by the shortage of STEM instructors in my high school. As a result, I lacked the necessary background in calculus and physics to pursue advanced research in this field. However, I did take advantage of this research opportunity to gather valuable research skills by working on data analysis for another project in the lab. Over the course of a year, I worked with my STRONG advisor Professor Yumi Ijiri to study the results of polarization analyzed small-angle neutron scattering experiments applied to manganese ferrite nanoparticles under 12 different conditions. We fitted this dataset to a computational model written in C++ to gain insights about the particles’ structural and magnetic properties and inter-particle interactions. Incidentally, a lab mate pointed out that I had a knack for optimizing the efficiency of Mathematica notebooks, which initiated my journey toward the realm of interface design.

After two projects, one publication, one symposium presentation, and multiple semesters of grinding, my explorations with magnetic nanoparticles came to a close. But the skills of writing concise abstracts, communicating ideas effectively and presenting informative posters have remained and became indispensable for my other endeavors in research. More importantly, the cohort of intelligent and motivated women from STRONG has formed an invaluable support network that lasted throughout my undergraduate career as we encourage and assist one other in our various pursuits in academia and beyond. Among this community was one senior researcher who recommended an online course for novice programmers. Completing the challenges of this course helped me build the necessary confidence and motivation to attempt, ace and eventually TA for an introductory computer science course in Python. Fortunately, my interest for computing did not terminate here: it further blossomed when exploring courses in the subdisciplines of algorithms and human computer interaction.

Attraction toward the former can be attributed to my interest and background in mathematics while curiosity for the latter arose from teaching opportunities and an introductory course in cognitive science. It was fascinating to explore the wealth of interdisciplinary approaches available in this flourishing field, as well as the insights about human cognition and behavior that these techniques can help us achieve. Thereafter, I declared a cognitive science concentration and started applying to research opportunities in related fields.

These efforts brought me to the 2018 REU program for software engineering (REUSE) at Carnegie Mellon University, where I worked with Professors Brad Myers, Aniket Kittur and graduate student mentor Michael Xieyang Liu. Over the summer we evaluated programming tasks and implemented design improvements to the *comparison table* - a visual model developed for representing information gathered in foraging sessions. After reviewing literature to understand past findings and current objectives, I analyzed the model’s usability by assessing its adaptability to more than 200 Stack Overflow questions. After this initial analysis I learned ReactJS to improve the interface of UNAKITE -- a Chrome extension that leverages the visual model to support and document a programmer’s information collection process. Finally, I designed and ran user tests on a small sample population to gather user feedback and gauge the potential usability of our system.

As a sophomore, I was extremely intimidated to work directly with both renowned professors (after Michael suffered a severe sports injury). On the bright side, this incident also gave me the chance to individually present research findings and practice methods common in HCI research: these included scenario-based interface design and implementation, sampling techniques, and user testing. Some of these experiments continued during the next academic semester when my Oberlin research advisor and I began remote collaboration with the UNAKITE group. Over the course of a year we designed, conducted and improved user studies, qualitatively coded raw results from 16 participants and evaluated our inter-rater reliability using intraclass correlation as the standard of measurement, and wrote about our observed improvements in a programmers’ ability to understand technical problems and solutions with the aid of a comparison table in several conference submissions.

From these experiences I reaped foundational knowledge that has supported my understanding and appreciation for these techniques when they were formally introduced in my junior year HCI seminar. While theoretical, the perspectives gained from this course proved to be a considerable asset during my internship at IBM, where we applied these methods of user-centered thinking toward a real-world problem: my team of four interns worked together to conduct extensive user research with the aim of identifying target personas (multicloud application managers using Kubernetes for orchestration) and some of their painpoints. These investigations consisted of in-depth interviews and walkthroughs, which equipped us with critical insights that motivated our design, testing, and enhancements of a navigational interface for the terminal. This exposure to industry helped me recognize the importance of collaboration between users, designers, and engineers. It was also enlightening to experience first-hand how some of the approaches from HCI research (such as principles from design thinking) can be successfully applied to industry projects while other methods may be limited by proprietary restrictions.

My various roles thus far have taught me the importance of observation, empathy and intentionality in analysis, design and execution. Moving forward, I aspire to further strengthen my communicative and technical abilities. In future experiences and endeavors, I am excited to continue making new discoveries about human behavior in computing, on both individual and collective scales. Equipped with these findings, I strive to move closer toward the greater objective of strengthening and empowering our society.

**Intellectual Merit**

During my time at REUSE, I analyzed user needs and the compatibility of our model of representation to the information available on the question-answer forum Stack Overflow. The initial results of this investigation culminated in a first-author publication for the Visual Learning and Human-Centric Computing conference, where I presented these findings in person during the next semester. As the project grew we conducted more usability studies for the system, honing our technique in conducting the tests and enhancing features of UNAKITE. These efforts resulted in a second-author publication that recently received honorable mention at the 2019 ACM Symposium on User Interface Software and Technology. Currently, I continue the explorations with Stack Overflow in my senior honors project, where I use data mining and qualitative analysis to construct a formalized and verifiable rubric for successfully formulated question posts, since previous research has primarily focused on answer post qualities.

**Broader Impacts**

My passion for teaching first spawned during my second semester at college: I learned about teaching methods in a language pedagogy course and practiced them as a teaching assistant for advanced Chinese course as well as in my weekly lab-helping duties for computer science. While transitioning to the heavy teaching load was initially exhausting, the process of reviewing and scaffolding the content from an instructing perspective is always extremely enlightening. Thus far, I have worked as a lab helper, a co-leader for Oberlin Workshops and Learning Sessions (a program designed to provide students with collaborative and alternative styles of teaching to supplement the traditional lectures) as well as an office hour holder, tutor, and grader for algorithms and data structures. As an algorithms OWL, I collaborated with the professor and my co-leader weekly to plan and ensure that session materials complement course content without being redundant. Continuing the TA-ship as an office hour holder, grader and tutor, I continue find ways of sharing my knowledge of problem solving techniques, mathematical concepts and proof-writing skills in ways that are not only correct and rigorous, but also intuitive and approachable.

During my graduate studies I plan to refine my craft in teaching to further accelerate knowledge sharing in the realms of research and computing. In particular, I strive to support and guide future generations of scientists, mathematicians and researchers from minority and low-income backgrounds the same way that the STRONG and Luce programs helped pave my way toward valuable research opportunities. As a recipient of the 2019 Clare Boothe Luce scholarship (a private fund to support women in STEM that is awarded to one student per year) at Oberlin and the 2018 CRA-W GHC Research scholarship, I documented the voices of other women in the sciences through recorded interviews to reveal the various motivations and challenges they have encountered. After a summer of experience in an industry setting, I have become more conscious of situations when I need to speak up for my own ideas and perspectives in male-dominated environments. This heightened sense of awareness has caused me to seriously consider root causes for these differences in attitudes as well as ways of bridging the gender gap.

As a first-generation immigrant and the first woman in my family to pursue a doctoral degree, I aim to contribute to the scholarly community in a way that will achieve positive impacts for different communities, especially those from disadvantaged socioeconomic backgrounds. As an avid enthusiast for knowledge transferring, I intend to give back to the educational community by teaching, advising, and sharing my experiences in engaging, welcoming and intuitive ways. As a liberal arts student, I recognize that there might be gaps in my technical understandings, but I am enthralled to build my toolset to enable uses of a greater assortment of interdisciplinary techniques. The NSF fellowship will serve to strengthen my drive for conducting innovative research in the burgeoning fields of cognition and computing and sustain my commitment for building and supporting a more diverse research community through leadership and outreach.