My past research experiences influenced my goals of obtaining a Ph.D. and conducting research for a national lab. As an undergraduate, I participated in several research experiences. Most notably, I worked at the University of Michigan to implement a target tracking system for unmanned aerial vehicle (UAV) control. This project was funded and motivated by the Navy's autonomous aircraft, the Fire Scout. I particularly enjoyed this project because I was able to address detection and UAV control problems with meaningful applications to the Navy and national security.

My project at Michigan laid the foundation for my interests in computer vision and robotics. I saw the potential to make large strides with robotics through the improvement of computer vision technologies. During my internship at MIT Lincoln Laboratory, I began to harness this potential. I worked on motion detection from a camera on an aerial vehicle and demonstrated how modeling camera motion can be used to identify moving people and vehicles. By improving UAV technologies, my work enables identification of potential defense risks. I submitted this work as the first author to ICASSP 2014, and further solidified my interests in contributing to national welfare through my research.

My future goal is to create an autonomous UAV system for construction site monitoring. I plan to investigate two main challenges: aerial vehicle localization and material recognition. To address the localization challenge, I created colored fiducial markers that leverage the L*a*b color space for improved detection. I hope to continue refining my design to include payload information and then place them strategically around construction sites for improved localization. For the material recognition problem, I have implemented a system that is capable of achieving comparable recognition results with state-of-the-art methods. These methods only apply to close view material swatches. My goal is to extend current systems by leveraging depth and perspective information for recognition in real world scenes. I hope to then deploy this algorithm on a UAV monitoring system in order to keep track of material usage on the construction site.

An improved autonomous defense system is an area of emphasis for the DoD. It is mentioned that next generation autonomous systems must comprehend their environment and relevant aspects of the battlespace. My research extends to this emphasis when considering an autonomous agent localizing in the environment and recognizing materials that may be crucial to defense. Due to the multidisciplinary nature of my research, I work with professors specializing in computer vision (Derek Hoiem), robotics (Tim Bretl), and civil engineering (Mani Golparvar-Fard). Working under their guidance, I have made significant strides with my quadrotor localization and material recognition projects. Having the NDSEG fellowship would allow me freedom to continue working with each professor without funding limitations.