I would like to enter the Worcester Polytechnic Institute Computer Science PhD program so that I may continue my education and research in robotics. In the robotics lab where I currently work as an undergraduate at Arizona State University, I have particularly enjoyed the programming aspects of my projects, which drove me to find an internship as a software engineer. However, I found that my work was not challenging enough, and I missed the open-ended problem-solving and investigative aspects of research. This reaffirmed my interests in pursuing an advanced degree so that I may later find a job in industry where I am able to continue working in a research setting. I have learned about the applications of artificial intelligence and machine learning towards robotics in my coursework, and some of my favorite projects and labs have been in these areas. Consequently, I would like to join one of the robotics labs conducting research in autonomous systems at WPI so that I may learn more about and make contributions to this rapidly evolving field.

For the first project that I worked on when I joined Dr. Aukes' IDEA lab, we developed a methodology to leverage the deficiencies of soft, low-cost, informal robots to our advantage to sense contacts in a way that rigid systems cannot. My contribution was to design a force sensing device that could easily be incorporated into a robot's design as an example of our integrated-sensing methodology for nonrigid systems. After building a prototype of my design and verifying its operation, I demonstrated an application of this system by utilizing the data in a force-feedback control loop. Many aspects of this project were centered around electrical and mechanical engineering. Yet, my favorite part was demonstrating my device's application through programming a force-control demonstration, and I enjoyed drawing on my knowledge of embedded systems and control loops to do this.

Following my completion of this force sensing device, I was awarded another fellowship by the Fulton Undergraduate Research Initiative to work on a larger project to construct a bio-inspired laminate robot based on terrestrial birds. While other members of the team have been tackling separate challenges the robot will face, such as gliding and balancing, my role in this project has been to develop simulations to optimize the design of the robot's legs for jumping. I have enjoyed the opportunities this project has provided to make software contributions to our lab by developing a virtual test environment using a purpose-built dynamics simulator written in Python and the Unity game engine.

Since my favorite parts of my research projects have revolved around programming, I decided to pursue a software engineering internship where I have been working for Benchmark Electronics developing an IoT device for asset tracking. At my internship, I have gained experience designing software systems, using high-level messaging protocols and libraries in Python, and performing low-level wireless UWB messaging operations on an embedded platform in C.

While my internship has been a great learning opportunity, I do not find the work that we are doing to be challenging enough since our IoT work is mostly taking systems that have already been developed and making them work together. I much prefer the open-ended investigation that I have experienced in academic research, which is why I would eventually like to work in research and development in industry where I will continuously be challenged by the cutting-edge problems no one has yet solved. I am intrigued by research in autonomous systems which is of interest to groups in both the commercial world, like Amazon Robotics and Google's Waymo, as well as the DoD and its contractors, such as NAVSEA and Lockheed Martin.

My interest in the field of autonomy comes from my coursework in which I have learned about computer vision and artificial intelligence and how they are applied to robotics. I have completed labs where I learned to write and simulate basic problem solving and searching algorithms. Two of my favorite projects have been training an artificial neural network to perform object sorting and programming a pick and place manipulator to locate and move to an object in its workspace. I am eager to learn more about this field in graduate school, and I look forward to making my own contributions to the capabilities and intelligence of autonomous systems. I am excited to join one of the labs at WPI researching autonomous systems decision-making, perception, navigation, and collaboration such as the groups led by Professors Pinciroli, Gennert, or Calli.