Daniel George

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Hello,

I’m applying to Waymo as a Software Engineering Intern, Behavior Generalist hoping that I can bring my passion and experience to a cutting-edge, impactful project at Waymo. I am really motivated by projects that use new technologies and come together into a tangible product.

As an intern at UCSD’s Advanced Robotics and Controls Lab over the past year, I got to work on a project that fulfilled this desire to apply my programming skills to something tangible. My team’s project is developing a breathing robotic lung “phantom” (an artificial assembly to mimic a human) which would act in place of a human for lung biopsy. For the phantom to be accurate, it needs to look like a human on a CT scan and simulate a human when poked with a needle. I researched and selected materials that meet these criteria. I wrote the code for a simple 1-DOF robotic actuator to poke silicone samples with a needle attached to a force-torque sensor, to verify each sample’s mechanical properties. I read the analog voltages from the sensor, converted them to forces, and logged the data during the poking routine. The skills I learned while working on this silicone test setup translate to working with hardware components at Waymo.

Although this part of the project is important, the part of the project that I enjoyed the most and spent the most time on is developing an automated method to find the pose of a marker attached to the phantom using the CT scan. This will allow the robotic system to get the position and orientation of the phantom in real space, which is important for repeatable testing and surgery planning. To do this, I had to implement numerous computer vision techniques. The algorithms that I learned to translate image data into useful information are directly applicable to computer vision tasks at Waymo. Even while this technique was only in the development phase, I made sure to write reusable and readable code. My mentor was able to use my code to solve a completely different problem, generating 3D models using a CT scan. I know that practicing writing clean, simple, and understandable code is an important skill while working on a big project with many other engineers. While doing research, I felt that I was constantly learning, whether I was just reading the documentation for a software library or diving into papers to learn about new algorithms for marker tracking. I know that I have a lot left to learn to make a meaningful impact at Waymo, and I know that my willingness and ability to learn will come in handy.

Lab research is not the only experience that I have had in the field. I gained Machine Learning experience making a neural network to classify handwritten digits from the MNIST database. I implemented a feedforward neural network with backpropagation from scratch using only NumPy as a dependency, to classify digits with about 95% accuracy. This project stretched my math and programming abilities, and it gave me a solid foundation to learn more about deep learning, which can be incredibly useful in autonomous vehicles. I gained Software and Electrical Engineering experience at an internship at a medical robotics startup, where I created wiring diagrams for a working robot prototype and created a program to display the pose of a robot arm using an API in C++. I did the mechanical design for many robot assemblies while at my school’s robotics team. I think these experiences working directly with hardware help me write more informed software.

Working at Waymo has been a dream of mine for a long time – I am inspired by the mission towards safer, easier transportation. The mission towards Level 4 autonomy motivates me to keep learning more; hopefully I can contribute to this mission as a Waymo Software Engineering intern. Thank you for taking the time to review my application.

Sincerely,

Daniel George