Joseph Sullivan

DAAD Final Report

Joseph Sullivan

Leuphana University, Lüneburg, Germany

07 August 2019

"I agree that my report and accompanying pictures may be used by the DAAD in printed materials, presentations, and on websites in order to inform funding organizations, sponsors, and students about the RISE program."

Research in Germany has been nothing but professional and it fosters the purest forms of scientific endeavors. The culture shaping the academic environments is one of diligence, excellence, and passion. You can tell that those who work in research are dedicated and genuinely enjoy that which they work on. If they are not happy, their focus may shift to a different aspect of the same project, always ensuring satisfaction and efficacy. Of universities as a whole, the academic environment equally fosters the diligence and proficiency of its students. Given Germany's prominence on the world stage, even smaller universities boast large international populations, as was the case at Leuphana University. Half of my coworkers were not from Germany and were instead from countries like Ghana, Lebanon, India, and China. This created an interesting workplace dynamic and these diverse cultures were often celebrated through the university itself with specific events for international students, events meant to enlighten about certain cultures, and the general acceptance of those from abroad.

The research project given to me was compelling and thought-provoking in its entirety. As a computer scientist accustomed to working with industrial and management engineers, the environment was familiar and I could bring a similar set of skills to Leuphana as those I put forth at my home university. My supervisor assigned me an initial task: use artificial intelligence to train computers to play video games. As a student who wishes to pursue an academic career in AI and similar fields, this was an immense boon. I spent my days learning the intricate details of artificial intelligence and the training that exists behind such systems. I eventually succeeded at this first task, training a computer to play the Atari games "Breakout" and "Pong".

The bulk of my time during the first half of my internship was spent reading about reinforcement learning and implementing algorithms in the programming language Python. The second half of my internship involved the production of a similar framework of algorithms and programs in the Java programming language for use in a simulation environment called

AnyLogic. I would build, test, and repair the program in an effort to create an AI agent that could reduce the tardiness of a factory process. Occasionally, I would debrief personnel to the project on my progress and the program that I created. I became the office "expert" on this particular kind of artificial intelligence implementation so infrequently I would be asked for my input on certain questions that arose from those around the office. I also gave two separate presentations to my superior, his superior, and my office mate regarding the project. My process of conducting research was dynamically based on the goals of my supervisor. Most often, I would run a training program to completion, see the output, and implement the results into our test program before seeing the final performance of the system based on the AI agent that I had trained. I was seeking to find a decrease in the tardiness of a factory procedure and how to bring about the largest decrease using AI. I would document the results and related data points before tweaking my training program to test different parameters. The process then repeated and that is how my active involvement would proceed. As of writing this paper, the program I wrote decreased tardiness by about 6.5% without influence by random chance (since we used a reproducible set of random values to test the program with for each set of training parameters).

Moving forward, my supervisor at Leuphana University, in addition with my supervisor in the United States, wishes to write a conference paper on the work that I have accomplished and hope to present at Northwestern University in Boston, Massachusetts, USA. I would be a credited author on this publication and, as a young bachelor researcher, the opportunity is incredible. I am grateful for the opportunities afforded to me by both my research mentor Dr. Wuest at West Virginia as well as by my supervisor in Germany in Mr. Voss. I am also grateful for the opportunities given to me by the DAAD and the German higher education system as a whole. The experience I gained here will be invaluable to my future career in academia and I will remember the friends and skills gained here for the rest of my life.