

University of Cincinnati

Individual Capstone Assessment Essay

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The senior design project I am working on this semester is creating semantic spaces using document clustering. I have always been impressed by machine learning capabilities but have never taken a deep dive into how to construct one. Through general curiosity and a passion to learn more about the subject, my teammates and I have selected to make our own machine learning program. The way this program will work is that we will input data sets of whatever topics we decide to do. Our program will then use word clustering to give each word in the documents an array of ranked values based on different key words that help describe the overall influence of the word. These multi-dimensional vectors are then concentrated and plotted to a two-dimensional space, this space is called the semantic space and is a way for the computer to be able to compare words meaning and influence compared to other words. Next, the more relevant semantic spaces will be input into a summarizing program that will create a summary of the input topic. All in all, this program will demonstrate the powers of machine learning and some of its many abilities.

I am currently enrolled in the Electrical Engineering program at the University of Cincinnati. My college curriculum up until this year has been mainly focused on electrical theories. I have taken classes like network analysis, digital design, electronics 1 & 2, signals and systems 1 & 2, fundamental MEMS, and of course the multiple calculus courses. The fundamental MEMS course piqued my interest, so I am taking biomedical microsystems course this semester. This semester, I am also shifting my focus from electrical to more computer engineering or science. I have enrolled in an intelligent systems and probability and random processes course to help me better understand machine learning. Overall, these courses will help me be versatile and knowledgeable in multiple engineering fields.

During my coop experience I have worked for three different companies. The first company was the 1819 Innovation Hub at the University of Cincinnati. In this role, I was tasked with running the 3D printers and laser engravers in the makerspace. The second company I was employed at was Belcan Engineering Group. My role was electrical engineering assistant. In this position, I worked with a team

from Boeing to design wire diagrams and functional schematics for the next generation Air Force One. I gained valuable skills in Catia V5, Capital Logic, leadership, and communication. The third company I was and still am employed at is American Battery Solutions as an electrical engineering assistant. Here, I acquired skills in Grafana, SQL databases, problem solving, and critical thinking. These three companies have played a vital role in influencing how I want to use my engineering degree in future opportunities.

I am motivated to do this project based on my interest in the technology behind machine learning. I think this technology is the future and we are at a very early stage of fully understanding all its abilities. I am also excited to see the program that we develop and how well it completes the tasks we give it. We will start forming a solution by first forming a good understanding of all the different topics we will be using. Since the steps and topics of machine learning are similar for many projects and programs, knowing what to research should be simple. I am at a point where I understand how we will be doing the final task, but I need to learn about each individual step in the process to get there.

I expect to have a finished program by the end of the school year that will be able to complete the tasks we want it to complete. We have a plan in place that allows us to evaluate our progress later in the semester and base how in depth our project will go based on that progress status. We expect to at least have a semantic space be output from given data set inputs, how polished the output is along with the outputs delivery will be determined by how much time we have left. By working in a small team of three people it will be easier to hold each other accountable. This should keep our overall progress steady and constant. I plan to learn as much as I can this school year and use that knowledge for this project. I plan on constantly self-evaluating my work based on the work my teammates have done. In the end I will know whether we have done a good job based on how it compares to my original expectations and goals for the project.