I have learned a lot over my last 4 and change years of college education, but there is still something I have not had the opportunity to do. In my classes I have primarily learned the theory and techniques necessary for coding excellence and on co-op I put those skills to use by maintaining and upgrading a web application. I have even gotten to create new and exciting components for massive systems that I know will be in use for years to come. However, I have not had the chance to truly build something from the ground up. Through this project, I plan on seizing that chance. My making this drill creator, I will truly complete my education.

The courses I have taken in college will primarily be useful for designing the systems for image interpretation and drill transitions. The drill transitions themselves are a nearly purely mathematical issue; it is all about finding an optimal solution to a complex problem. For this task classes like CS 4033 AI Principles and Applications and CS 4071 Design and Analysis of Algorithms will be useful for finding efficient solutions. Ever since taking CS 2028C Data Structures, I have learned about how algorithms scale and deal with large inputs. It is clear to me that an implementation of drill transitions that simply tries every old dot with every new dot would be extremely inefficient, so I understand that I must come up with useful heuristics and strategies for solving this problem. All the courses I have taken have also taught me how to find and use a variety of different tools to solve problems, which is why I feel comfortable tackling image processing as a group even though I do not have specific experience with it.

During my five semesters with Siemens Digital Industries Software in Milford, Ohio, I worked nearly exclusively as a web developer working on the front end of a large web application. These semesters have given me ample experience with UI design and the process by which the interface is constantly made better. I was regularly part of the decision-making process which determined the best course of action when improving the UI, and I also spent many hours implementing small tweaks that were nearly imperceptible on their own but greatly added to the consistency of the application. Many of these UI challenges did require extensive and efficient problem solving in JavaScript, but substantially

less than what will be required for this project. However, through my co-ops I also gained experience in teamwork, especially working distantly and asynchronously. As part of my team was international for the duration of my time at Siemens, I was able to develop this skill both before and during the pandemic. The skills I learned on co-op will greatly improve our UI and I will be a valuable and hardworking team member.

I must admit that my primary inspiration for the project is a longtime personal grievance. I've been playing the trombone since the 4th grade and have been marching since the 9th, and a consistent problem has been lack of space. When directors write drill, they seem to forget that the trombone slide sticks out substantially further than any other instrument, and often spacing is more compact than any of us really feel comfortable with. Additionally, drill writing is a dense technical process with very few current solutions, and I would like anyone to be able to make a marching band show easily and then have the program find issues before they manifest on the field. Manual drill writing leaves a lot of room for human error, and I have seen my fair share of it. Lastly, since the use case is so specific and the industry has dealt with adequate but not exceptional drill writing software for so long, I doubt many others would attempt such an undertaking.

The plan is to create an application with two major parts, tied together by an intuitive UI. One part will allow for image interpretation; a user can enter an image they want to translate into drill and the program will automatically space the given number of players out evenly to fit that image. The other component will be a way to efficiently move between drill sets, considering the distance each marcher will need to go, any potential collisions, and the preservation of musical sectionality. The program will also allow drill moves to be manually edited including changing the direction players face and incorporating follow the leader drill moves in addition to floats. For these more manual drill moves, the editor will be informed of any potential issues with routing. I will know we have succeeded if the non-marching members of the group are able to replicate one of our shows with the finished product.