Senior Design Capstone Project

For my senior project, I will be developing a compiler. Compilers are very interesting pieces of technology that take source code of one format and compile them into a binary that can actually be ran on a machine. During the transition from source code to the target code, the compiler may generate many intermediate forms. Compilers for languages such as C or Go can get pretty complex! Compiler design is an area of software engineering that I do not have much experience in. However, learning how to write things such as parsers can be helpful in other areas as well. I personally, thought this project was good to expand my horizons and work on something that I haven't seen before.

Thus far in my compute science degree, I have taken many classes with material relevant to compiler development. One course that comes to mind is EECE4029 or "Operating Systems and Systems Programming". Compilers rely heavily on OS features and knowing how they work is imperative to building a good compiler. Another noteworthy class that comes to mind is CS4071 or "Design and Analysis of Algorithms". This class' material will come in handy all throughout the the compiler and in areas such as building an abstract syntax tree. Some other helpful classes include EECE3093C - Software Engineering (For keeping organized and learning OOP concepts), CS4065 - Computer Networks and Networked Computing (For working with low-level networking libraries and how networking works), and CS3003 - Programming Languages (For understanding how programming languages function). These classes are fundamental to a lot of projects that you start and I feel a lot better knowing that I have all this knowledge in my toolbelt.

Complimenting what I have learned in the class room, I have five semesters of co-op experience. My first few co-op semesters I worked as an IT Technician for Metalex Manufacturing in Blue Ash, OH. Here I learned a lot about Windows Server, Authentication servers, Server hardware assembly, and writing scripts within PowerShell. I also picked up on a lot of soft skills within this such as teamwork, communication, time management, and others. I also worked (and still do) as a Data Engineering co-op for 84.51 (Kroger's Data Science wing). Here I learned how to build production data pipelines. I used technologies such as: Databricks, Snowflake, Python, SQL, MySQL, PostreSQL, GitHub, Bash, and others. This co-op in particular showed me what production code looks like and how to use technologies such as GitHub at a massive scale. I picked up and refined my soft skills here as well.

I am excited about this project because compiler design and development is an area that is new to me. I really enjoy just digging into something and think this project was a good idea to do just that. I am planning on researching what compilers are, how they work, the components that make up a compiler. After gathering information I will structure diagrams to map out exactly how

the implementation is going to look like. I believe that having a strong foundation will make the actual implementation easier later on. Being that I am working on this individually, time management will be the key to success.

The actual implementation of the compiler will all be done in C++. I am planning on having this compiler generate assembly code (either x86 or x64). I expect that this compiler will be able to take in the source code for my custom language and output an executable that can be loaded into system memory and executed on a machine. I am planning on making a roadmap with dates and stages of development that I will try my best to stick to. With this structured approach, I know that if I meet these goals and keep up with the pre-planned steps, I have done what is required and that the development is on track. I am super excited to begin this project and believe that I will come out of it a more well-rounded computer scientist.