Dalton Rutledge - Westminster Computer Science Portfolio

Waste Project:

I included this project in my portfolio because completing this project taught me more as a student than any other assignment I completed in my time at Westminster. This project was my submission, along with 3 teammates, for the CMPT 307 Databases final project. The assignment was to create an application that utilizes a relational database that you design and manage. Our team took the project to the next level by creating our application for the Westminster Environmental Center. Instead of making our own application, we were building this project for a client, with the goal of making something that would help make people's lives easier. The application is a GUI for a relational database that is designed to make it easier to keep track of Westminster's waste production data. We made a desktop application using Java's Swing libr ary, connected to SQLite.

This was my first application. The code is not perfect, and knowing what I know now I would change almost everything about it. But working with an actual client, making mistakes, designing around a real problem, and doing it with a team of smart talented students, was an amazing experience. I learned about software design from the perspective of a complete newbie, and I did it working with someone who was actually invested in what I was making. We only had a month to make the final product, but during that time I learned so much about working with a group in software design.

I think this project helped me to accomplish the following computer science program learning goals:

- To understand the concepts and techniques of software design.
    - This was my first real attempt at creating a fully fledged piece of software.
- To acquire significant project experience working both individually and in a group setting.
    - I had a major part in coding this project, but I also had to workly quickly and efficiently with three teammates who were updating files at the same time that I was.

This project also helped me accomplish all 5 Westminster College learning goals:

- Critical thinking
    - We needed to determine the best possible solution to the problem that we could feasibly create in the span of a month.
- Creativity

    - We had full creative freedom over the design and layout of the project, as long as it met the client's needs.
- Collaboration
    - I was working with 3 students very closely (usually for 6 hours at a time, several times a week).
- Communication
    - The project required constant communication with the client, the professor, and my three teammates.
- Global Responsibility
    - The project was to support Westminster's environmental center in maintaining a proper waste management system for the school.

Ray Tracing Lab:

I have included this lab assignment from computer graphics because I think it demonstrates strong work, because it was incredibly fun to complete, and because it helps show the diversity of programming languages and computer science subjects that I have become familiar with . This lab asked me and a partner to render spheres using ray tracing, a technique which we had not previously covered in the class.

I think this assignment helped me to accomplish the following computer science program learning goals:

- To develop effective problem solving skills.
    - This lab required me to adapt my thinking in new ways in order to implement a new rendering technique.
- To attain a system-level understanding of the computer.
    - This lab, as well as the others that I completed in computer graphics, helped me understand the entire computer graphics rendering pipeline.

This project also helped me accomplish the following Westminster College learning goals:

- Critical thinking
    - This lab required me to adapt my thinking in new ways in order to implement a new rendering technique.
- Collaboration
    - I was working with another student very closely on this assignment.

Math Games Website:

I included this project in my portfolio for very similar reasons as the waste project. While the waste project was my first experience building a desktop application, this project was my first building a web application. We had one semester to complete the project for CMPT 322 Software Engineering. The assignment was to build an application that would allow first graders to learn and practice basic math skills through games. Together with two partners, I used Amazon Web Services to host a serverless website built with HTML, JavaScript, and CSS, with an embedded game we built in Unity. Overall, I think the project turned out extraordinarily, and I am proud of what we accomplished.

Once again with this project, no one on the team knew anything about the tools we needed to use in order to accomplish our goals. This project shows my ability to learn new tools quickly in a group setting, and use those skills to design and build software. This was the project I finished the semester after the waste project, and I think the design of the software overall is a lot cleaner, and the two projects together show my growth as a software developer.

I think this project specifically helped me to accomplish the following computer science program learning goals:

- To understand the concepts and techniques of software design.
    - Creating an end to end application taught me about both front and back end software development.
- To acquire significant project experience working both individually and in a group setting.
    - This was a semester long project that I worked on with two partners. We did everything together as an AGILE development team. We set our own deadlines, and project goals. In other words, this project required a significant amount of both individual and collaborative work.

This project also helped me accomplish the following Westminster College learning goals:

- Critical thinking
    - This project involved creating software with a required functionality in a given time frame. As a team we had to think critically in order to accomplish everything efficiently.
- Creativity
    - We had full creative freedom over the design and layout of the project, as long as it met the client's (professor's) needs.

- Collaboration
    - I was working with 2 students very closely for an entire semester.
- Communication
    - The project required constant communication with my team, and very clear reports to our professor about our development decisions and processes.

Chat Shack

This was my computer networks final project, which I completed with a partner. The code only tells half of the story of this project. My computer networks class was tasked with coming up with our own chat room transfer protocol to be used by a chat room application. The idea was for each team to create a different application that followed the same data transfer protocol, the end result being that we could all join a chat room server from clients written in different programming languages and designed with different user interfaces. I took a lead on designing this protocol, and facilitated all of the class meetings that we had to discuss the specifics of its implementation. We ended up creating a protocol that resembled a simplified version of HTTP.

My partner and I created a server / client application that implements the protocol using Java. It functions well, and overall I am proud that we could create something of this quality in only a few weeks.

I think this project helped me to accomplish the following computer science program learning goals:

- To understand the concepts and techniques of software design.
    - This project taught me about the importance and nuance of multithreading, and the flexibility that a reliable protocol can provide.
- To attain a system-level understanding of the computer.
    - This project (and class as a whole) helped me develop skills as a network programmer and taught me to understand the internet through the lens of the client and server model.

This project also helped me accomplish the following Westminster College learning goals:

- Critical thinking
    - This project required me to think very critically. Especially taking a lead in designing the protocol, I had to come up with a solution that would give our chat room reliability, but still leave creative freedom for everyone to create their own unique client and server implementations.
- Creativity

    - We had full creative freedom over the design and layout of the project, as long as it followed the protocol. This helped us design a well working application.
- Collaboration
    - This project required good collaboration between my partner and I, as we split up the coding between the client and the server sides of the application. We needed to collaborate effectively to make sure they would work together.
- Communication
    - This project honed my communication skills more than any other. As the facilitator I had to properly address all of my classmates' concerns and help everyone come to fair compromises when designing the protocol.

K Means ++ Implementation:

I have included this small assignment from my machine learning class in the fall of 2019 because this assignment represents one of my proudest moments as a computer science student. It has helped me to gauge my own progress as a coder and a problem solver. The assignment was to code the K Means ++ algorithm from scratch and show the results in a plot. I had missed the previous class covering the K Means algorithm and its uses due to illness and was behind in my learning. After quickly reading the wikipedia article about the algorithm, and receiving a brief explanation from a few of my classmates, I felt that I fully understood the concept. I then coded the entire thing in about 20 minutes and it worked immediately. While this is not the most difficult assignment I have completed in my academic career, I am proud of the swiftness that I was able to understand and implement through code new mathematical concepts.

I think this project helped me to accomplish the following computer science program learning goals:

- To develop effective problem solving skills
    - This assignment was a classic computer science problem: "Here is an algorithm that you haven't heard of, go code it." These are the kinds of skills that I want to develop for coding interviews, and I think this assignment was helpful for that.

This project also helped me accomplish the following Westminster College learning goals:

- Critical thinking
    - This project gave me a mathematical task and asked me to implement it through code. This requires systematic logical thinking to get right with no bugs.