Bryan Burnett

SNHU CS-499 Computer Science Capstone

Prof. Brooke Goggin, M.S., M.S., M.S., Ed.D (ABD) Computer Science Adjunct Faculty

July 5, 2023

**Professional Self-Assessment**

During my time at SNHU, I have learned several important skills in the field of computer science that I will carry with me into my future career. Though I began with zero coding experience, I have learned SQL, C++, Python, Java, and some R. These languages were learned both through classes at SNHU and personal learning outside of SNHU. SNHU introduced me to new languages, concepts, and tactics that have helped me to understand computer science concepts. Some of the most important, and most enjoyable, topics I learned about were SQL (database queries), Python algorithms, code security, and data structures. These areas are key to a successful career in computer science or data science because they are critical to writing industry-standard code, and more importantly understanding it.

**Collaborating in Team Environments:**

Throughout my education in computer science, I have been fortunate to participate in solo and team collaboration projects. These introduced me to new learning and programming environments. I learned how to utilize GitHub to collaborate with a team to manage our code base while working on similar portions of the code. We as a team were able to work in an Agile environment, like how actual development teams work, and reported to the scrum master for issues and updates. Team building and collaboration was prevalent in every class with the discussion posts. Just having that interaction was beneficial to learn from peers.

**Communicating to Stakeholders:**

Aside from communication with the team members, I also learned about communication with stakeholders and/or customers. I had learned about the importance and role of a project manager and the use of a Unified Modeling Language or UML. A UML is essentially having a plan on paper. Typically, the project manager will be the contact person, and work as the go between for the developers and the stakeholders to ensure that the stakeholder’s scope for the project is met. The importance for all parties to be clear about the project and expectations is nearly immeasurable. From the developers stand-point this is where the UML usage begins. Before the project starts developers should form a UML of the system that covers the scope provided by the stakeholders. This is the stage where wants and needs are discussed, factoring in time and budget. When the plan is complete, and manageable, the stakeholders can get a glimpse into the system they want before any actual coding begins, as well as then could provide feedback. Doing this ensures all parties are involved in the process of developing a system to build the best possible final product.

**Data Structures and Algorithms:**

Through my coursework at SNHU, I have learned several different concepts and strategies for writing code. Using the knowledge gained from multiple courses, I’ve learned the importance of structuring applications properly, to use efficient storage methods, to use efficient algorithms, and to make the algorithms secure to reduce memory overhead, as well as undesired outcome of the applications. I have also learned about vectors, hash tables, binary search trees, and when it is most appropriate to utilize each one. Understanding the design and functionality of various data structures allows me to pick and choose which one(s) I feel are best suited to my applications scope and allows me to build my code to run more efficiently.

**Software Engineering and Databases:**

While at SNHU, I have been introduced to both SQL and Mongo DB database structures. This opportunity has allowed me to become familiar with both object-oriented and relational database designs and how to use them. I have learned how to create CRUD modules (create, read, update, delete) that allow me to interact with my databases, how to perform queries in each database, and more advanced concepts like aggregation pipelines, and advanced queries. These concepts are important because databases are a critical part of data science. The probability that I will encounter databases in the future is very high.

**Security:**

Working in healthcare for the past couple of decades, security has always been a priority in my work. Security is a critical piece in the development of any application. During my coursework at SNHU, I was introduced to security vulnerabilities related to multiple aspects of code, endless loops, and data overflows. I learned how deficits in security and security flaws can vary from crashing applications to executing arbitrary code. This knowledge has shown me that when designing an application that I should always consider ways to improve security and limit inputs from the user while still maintaining the full functionality of the program.

**Summary:**

I chose to enhance two projects. Both projects encompassed software design, data structures and algorithms, as well as databases. For my first project, I focused on the software design, structures and algorithms elements. The first project was an ATM Python project from IT 140: Intro to Scripting. This project was simple utilizing only three functions. I enhanced the project by adding new functionality, security, and improved upon the code to make it more efficient.

The second project focused on the databases element. This project was demonstrating a series of queries to manage a database from my DAD 220: Intro to SQL course. In this project I created a database with tables, updated and removed data from them. I enhanced the project by adding new functionality and utilized more advanced SQL methods to query the database. Comments were updated to describe what the code was to do as well.

I chose these artifacts to collectively demonstrate my abilities to create two clean, comprehensive, functional, and well commented artifacts. I was able to improve the readability, functionality, security, and real-world application of each artifact to demonstrate my skills. I accomplished this by modifying the Python application for greater functionality, efficiency, that also utilized an onboard data repository to save space, adding security through improved algorithms, secure logins with pass PINs and preventative measures against overflows, and endless loops. The advanced SQL queries and management of data demonstrate an ongoing learning of the functionality and techniques SQL offers. These enhancements demonstrate the knowledge I have gained throughout my time as a computer science student and showcase my ability to create functional programs from existing projects, as well as recreating projects in a different SQL environment.