**CS 499 Module One Assignment Template**

Complete this template by replacing the bracketed text with the relevant information.

* **Self-Introduction:** Address all of the following questions to introduce yourself.
* How long have you been in the Computer Science program?

**This is my second year in the Computer Science program at SNHU. During this time, I have learned quite a lot about computers, coding and software design.**

* What have you learned while in the program? List three of the most important concepts or skills you have learned.

**The three most important skills I have learned are probably the three that will be applicable in this capstone project. That would be Software Engineering Principles, such as writing modular, scalable and maintainable code. Algorithms and Data Structures, consisting of efficient searches, sorting and storage mechanisms. Database Management, through designing relational databases and ensuring data integrity.**

* Discuss the specific skills you aim to demonstrate through your enhancements to reach each of the course outcomes.

**The aims I am seeking to demonstrate in this course is my proficiency in software design, data structures and databases by converting a Java-based rescue animal management system into Python, while implementing optimized data handling and persistent storage.**

* How do the specific skills you will demonstrate align with your career plans related to your degree?

**These specific skills align with my goal of becoming a software engineer with a strong foundation in full-stack development and secure software design.**

* How does this contribute to the specialization you are targeting for your career?

**The ability to design efficient, scalable and secure systems is crucial for my career in software engineering, database management and/or backend development.**

* **ePortfolio Set Up:**
* Submit a **screen capture** of your ePortfolio GitHub Pages home page that clearly shows your URL.
* You already have a repository in GitHub where you uploaded projects in previous courses. Your ePortfolio will reside in GitHub but can link to work at other sites, such as Bitbucket.
* Use the GitHub Pages link in the Resource section for directions on:
* How to create your GitHub website and publish code to GitHub Pages
* Issues, such as adding links to other sites
* Paste a screenshot of your GitHub Pages home page with your URL clearly showing in the space below.



* **Enhancement Plan:**
* **Category One:** Software Engineering and Design
* **Select an** **artifact** that is **aligned with** **the** software engineering and design **category** and explain its origin. Submit a file containing the code for the artifact you choose with your enhancement plan.

**IT145 Animal Rescue - This final project was a simple Java program that stored rescue animals. The original program allowed for two types of animals, monkeys and dogs. A user was able to enter new animals into the system with information such as name, species, gender, training status, service country, etc. This project will be used for the entire CS499 project.**

Note: Your artifact may be work from the following courses:

* IT 145: Foundation in Application Development
* CS 250: Software Development Lifecycle
* CS 260: Data Structures and Algorithms
* IT 315: Object Oriented Analysis and Design
* CS 320: Software Testing, Automation, and Quality Assurance
* CS 330: Computational Graphics and Visualization
* CS 340: Advanced Programming Concepts
* CS 350: Emerging Systems Architectures and Technologies
* CS 360: Mobile Architecture and Programming
* IT 365: Operating Environments
* IT 380: Cybersecurity and Information Assurance
* CS 405: Secure Coding
* CS 410: Reverse Software engineering
* IT 340: Network and Telecommunication Management
* IT 380: Cybersecurity and Information Assurance
* **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

The original Java program is structured with tight coupling between its classes, lacks robust error handling, and does not use logging for tracking program events. The enhancement will convert the program to Python, improving modularity, validation, and debugging capabilities.

1. **Convert Java to Python, making the system more modular and maintainable.**
2. **Improve input validation to prevent crashes from invalid user input and SQL injection attacks.**
3. **Implement logging to track system operations and errors for debugging.**

Start Program

Function display\_menu():

Print options: [1] Add Dog, [2] Add Monkey, [3] Reserve Animal, [4] List Animals, [Q] Quit

Function main():

While True:

display\_menu()

Get user input

If input is valid:

Call corresponding function

Else:

Print error message and log issue

Function add\_dog():

Collect user input

Validate input

Add dog to system

Function add\_monkey():

Collect user input

Validate input

Ensure species is valid

Add monkey to system

Function reserve\_animal():

Find available animal

Mark as reserved if conditions are met

Function list\_available\_animals():

Print all unreserved animals

For this category of enhancement, consider improving a piece of software, transferring a project into a different language, reverse engineering a piece of software for a different operating system, or expanding a project’s complexity. These are just recommendations. Consider being creative and proposing an alternative enhancement to your instructor.

Think about what additions to include to complete the enhancement criteria in this category. Since one example option is to port to a new language, that is the kind of scale that is expected. This does not mean you need to port to a new language but instead have an equivalent scale of enhancement. Underlying expectations of any enhancement include fixing errors, debugging, and cleaning up comments, but these are not enhancements themselves.

* Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.
* Identify and describe the specific skills you will demonstrate that align with the course outcome.

**The program will be converted from Java to Python for better modularity and readability.**

**There will be improved error handling and input validation to prevent crashes and SQL injections.**

**Logging will be implemented for better debugging and program tracking.**

* Select one or more of the course outcomes below that your enhancement will align with.

**Employ strategies for building collaborative environments that enable diverse audiences to support organizational decision-making in the field of computer science.**

**Demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.**

**Develop a security mindset that anticipates adversarial exploits in software architecture and designs to expose potential vulnerabilities, mitigate design flaws, and ensure privacy and enhanced security of data and resources.**

**Design, develop, and deliver professional-quality oral, written, and visual communications that are coherent, technically sound, and appropriately adapted to specific audiences and contexts.**

Course Outcomes:

* Employ strategies for building collaborative environments that enable diverse audiences to support organizational decision-making in the field of computer science.
* Design, develop, and deliver professional-quality oral, written, and visual communications that are coherent, technically sound, and appropriately adapted to specific audiences and contexts.
* Design and evaluate computing solutions that solve a given problem using algorithmic principles and computer science practices and standards appropriate to its solution while managing the trade-offs involved in design choices.
* Demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.
* Develop a security mindset that anticipates adversarial exploits in software architecture and designs to expose potential vulnerabilities, mitigate design flaws, and ensure privacy and enhanced security of data and resources.
* **Category Two:** Algorithms and Data Structures
* **Select an artifact** that is **aligned with the** algorithms and data structures **category** and explain its origin. Submit a file containing the code for the artifact you choose with your enhancement plan. You may choose work from the courses listed under Category One.

**IT145 Animal Rescue - This final project was a simple Java program that stored rescue animals. The original program allowed for two types of animals, monkeys and dogs. A user was able to enter new animals into the system with information such as name, species, gender, training status, service country, etc. This project will be used for the entire CS499 project.**

* **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

The current Java implementation relies on an ArrayList for storing rescue animals, which is not efficient for searching and retrieving specific records. The enhancement will replace this structure with Python dictionaries (dict), allowing for faster lookups using key-value pairs.

1. **The ArrayList in the Java program will be replaced with Python dictionaries (dict) for faster lookups.**
2. **Implement the ability to search for animals by name, availability, breed and country.**
3. **Add options for sorting the animals alphabetically by name or country.**

Define Dictionary: animals = { "Dog1": {...}, "Monkey1": {...} }

Function search\_animal(name):

If name in animals:

Return animal details

Else:

Return "Not Found"

Function sort\_animals(by\_attribute):

Return sorted list of animals based on attribute

Function list\_available\_animals():

Filter animals where reserved = False

Print results

For this category of enhancement, consider improving the efficiency of a project or expanding the complexity of the use of data structures and algorithms for your artifact. These are just recommendations. Consider being creative and proposing an alternative enhancement to your instructor. Note: You only need to choose one type of enhancement per category.

Think about what additions to include to complete the enhancement criteria in this category. Since one example option is to port to a new language, that is the kind of scale that is expected. Perhaps you might increase the efficiency and time complexity of an algorithm in an application and detail the logic of the increased time complexity. Remember, you do not need to port to a new language but instead have an equivalent scale of enhancement. Underlying expectations of any enhancement include fixing errors, debugging, and cleaning up comments, but these are not enhancements themselves.

* Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.
* Identify and describe the specific skills you will demonstrate to align with the course outcome.

**Efficient data structures will be implemented using the dictionaries instead of lists for faster searches**

**Algorithm implementation will be implemented with search and sorting functions**

**Performance optimization through improving time complexity for lookup operations.**

* Select one or more of the course outcomes listed under Category One that your enhancement will align with.

**Design and evaluate computing solutions that solve a given problem using algorithmic principles and computer science practices and standards appropriate to its solution while managing the trade-offs involved in design choices.**

**Demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.**

* **Category Three: Databases**
* **Select an artifact** that is **aligned with the** databases **category** and explain its origin. Submit a file containing the code for the artifact you choose with your enhancement plan. You may choose work from the courses listed under Category One.

**IT145 Animal Rescue - This final project was a simple Java program that stored rescue animals. The original program allowed for two types of animals, monkeys and dogs. A user was able to enter new animals into the system with information such as name, species, gender, training status, service country, etc. This project will be used for the entire CS499 project.**

* **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

The original Java program does not use a database, meaning all animal records are lost when the program exits. The enhancement will introduce an SQLite database to provide persistent storage for the rescue animals.

1. **The new implementations will include an SQLite database for persistent storage.**
2. **Will develop CRUD operations (Create, Read, Update, Delete).**
3. **The database will be secured using parameterized queries to prevent SQL injection.**

Function connect\_db():

Connect to SQLite database

Function add\_animal():

Collect user input

Execute SQL INSERT INTO animals (...)

Function get\_available\_animals():

Execute SQL SELECT \* FROM animals WHERE reserved = FALSE

Return results

Function update\_animal\_status():

Execute SQL UPDATE animals SET reserved = TRUE WHERE name = ...

For this category of enhancement, consider adding more advanced concepts of MySQL, incorporating data mining, creating a MongoDB interface with HTML/JavaScript, or building a full stack with a different programming language for your artifact. These are just recommendations; consider being creative and proposing an alternative enhancement to your instructor. Note: You only need to choose one type of enhancement per category.

Think about what additions to include to complete the enhancement criteria in this category. Since one example option is to port to a new language, that is the kind of scale that is expected. Perhaps you might increase the efficiency and time complexity of an algorithm in an application and detail the logic of the increased time complexity. Remember, you do not need to port to a new language but instead have an equivalent scale of enhancement. Underlying expectations of any enhancement include fixing errors, debugging, and cleaning up comments, but these are not enhancements themselves.

* Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.
* Identify and describe the specific skills you will demonstrate that align with the course outcome.

**Database design will be used to store animal data in SQLite instead of memory.**

**Secure query handling by using parameterized SQL statements.**

**Persistant storage, which will ensure that data isnt lost when the program exits.**

* Select one or more of the course outcomes listed under Category One that your enhancement will align with.

**Design, develop, and deliver professional-quality oral, written, and visual communications that are coherent, technically sound, and appropriately adapted to specific audiences and contexts.**

**Demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.**

**Develop a security mindset that anticipates adversarial exploits in software architecture and designs to expose potential vulnerabilities, mitigate design flaws, and ensure privacy and enhanced security of data and resources.**

* **ePortfolio Overall Skill Set**
* Accurately describe the **skill set** to be illustrated by the **ePortfolio** **overall**.
* Skills and outcomes planned to be illustrated in the code review

**The code review will demonstrate an understanding of the original Java project and its limitations.**

**It will explain planned enhancements and how they align with course outcomes.**

**Critical thinking will be shown through the planning of improvements.**

* Skills and outcomes planned to be illustrated in the narratives

**How software design, algorithms and databases were improved through this project.**

**Provide a solid comparison between the original and the enhancement implementations.**

**Reflect upon the challenges, solutions and the lessons learned throughout the process.**

* Skills and outcomes planned to be illustrated in the professional self-assessment

**Reflect upon my growth as a developer and how that translates to career goals and overall improvement and confidence in life.**

**Provide an opportunity for further evaluation, through examining this final project and how it could be improved even further in the future.**