Southern New Hampshire University

CS 499 Module One Assignment

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

I. **Self-Introduction:** Address all of the following questions to introduce yourself.

A. How long have you been in the Computer Science program?

I started the Computer Science program at SNHU in January 2019.

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

I began as a freshman with no previous college credit so the concepts and skills I have learned aren't limited to computer science.

The first set of skills I learned that helped throughout my academic career was how to process information in an organized way. Most of the general education and liberal arts classes I started with gave me a lot of practice with disseminating information, organizing my thoughts, and putting them down on paper. Without this I don't think I would have been successful in many classes, even those with little writing other than code.

The second set of skills learned that I feel were important were math skills. The logical and methodical approach needed for all of the math classes involved with the computer science program has directly informed the way I approach most programming tasks.

Finally, the third set of skills that I have learned, or in this case concepts, are all those related to programming. From the simplest coding loops and arrays that allowed me to understand how code worked, to more complex concepts like data structures and algorithms, and then eventually larger projects like computer visualization and full stack development, all of these are what allowed me to take the skills learned in math and liberal arts and apply them to the discipline of computer science.

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

I plan to demonstrate my skills in software design and complexity through random generation of 2D or 3D objects. I plan to demonstrate my skills in algorithms through task automation of a 2D or 3D object. I plan to demonstrate my skills in databases by tracking and updating tasks done by the autonomous object within a database.

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

My goal since the first day I started at SNHU was to work with autonomous systems, and I plan to both enroll in a graduate program for autonomous systems as well as work with autonomous systems in the future. My goal is for these skills to demonstrate an interest in and understanding of current and emerging trends in autonomous systems.

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

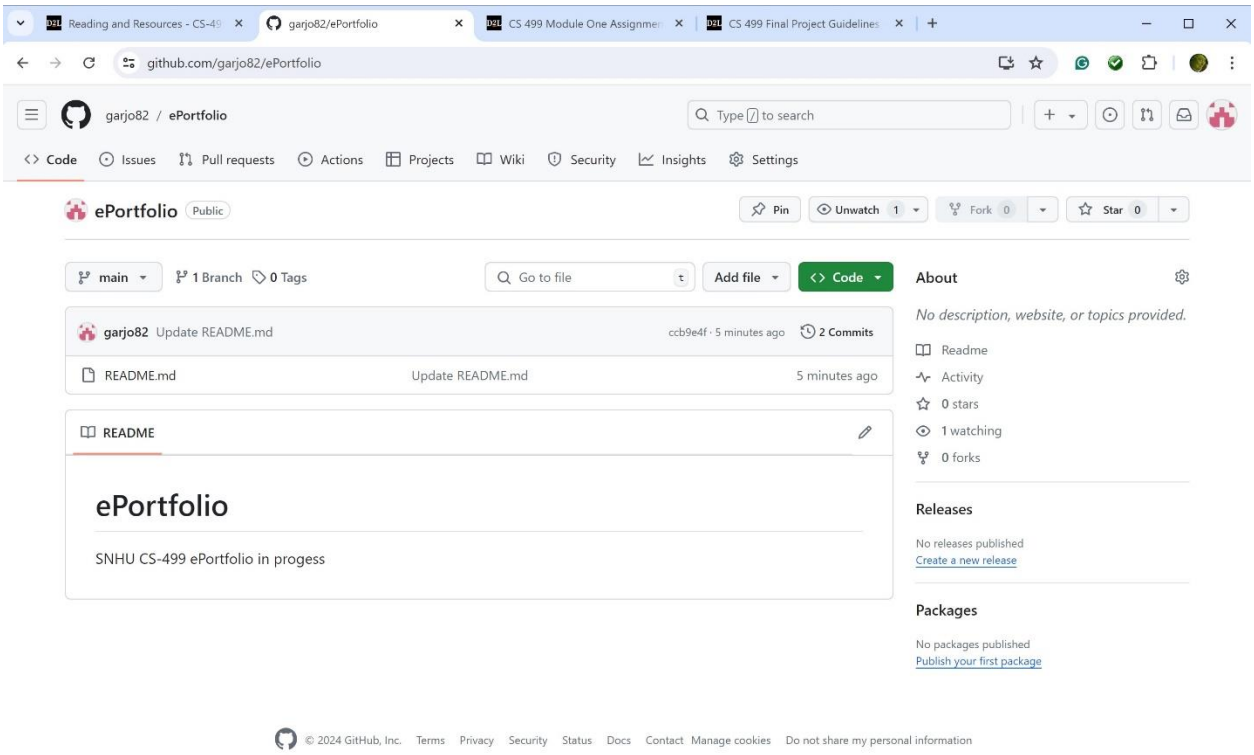
Object detection and autonomous reaction to random objects are key aspects of autonomous systems. All autonomous systems, from something as simple as a robotic vacuum to something as complex as a self-driving vehicle, must be able to detect and react to objects. Showing a capacity for understanding of these systems even at the most basic level will be critical for my career goals in autonomous systems.

II. ePortfolio Set Up:

A. Submit a **screen capture** of your ePortfolio GitHub Pages home page that clearly shows your URL.
   i. 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.

B. Use the GitHub Pages link in the Resource section for directions on:
   i. How to create your GitHub website and publish code to GitHub Pages
   ii. Issues, such as adding links to other sites

C. Paste a screenshot of your GitHub Pages home page with your URL clearly showing in the space below.



III. Enhancement Plan:

A. **Category One:** Software Engineering and Design

i. **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.

I plan to use the project from CS 330: Computational Graphics and Visualization for all categories.

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

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

For this category I plan to modify my 3D set piece to generate a set of random objects arranged in a grid pattern. The color of the objects will be randomized, and possibly the number of objects. This will serve as a map or environment for my autonomous agent to navigate and flag objects based on color.

Pseudocode:

```
// function for generating objects with random color
RandomObject()
        Generate randomColor object

// logic for generating a random number of objects in a grid pattern
For randomArraySizeXaxis
        For randomArraySizeYaxis
                RandomObject()
```

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.

iii. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.

a. Identify and describe the specific skills you will demonstrate that align with the course outcome.

I will demonstrate skills in setting up complex environments for testing autonomous systems.

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

4 - 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.

Course Outcomes:

1. Employ strategies for building collaborative environments that enable diverse audiences to support organizational decision-making in the field of computer science.
2. Design, develop, and deliver professional-quality oral, written, and visual communications that are coherent, technically sound, and appropriately adapted to specific audiences and contexts.
3. 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.
4. 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.
5. 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.

B. **Category Two:** Algorithms and Data Structures

i. **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.

I plan to use the project from CS 330: Computational Graphics and Visualization for all categories.

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

For this category I plan to create an autonomous agent in the form of a 3D object. This object will roam over the environment attempting to detect objects based on color. Once certain objects are detected it will flag it and then continue roaming until all objects have been detected.

Pseduocode:

```
// function for detecting object color
Detection()
        Bool flagged = null
        If (object found)
                if (pixelColor == flaggedColor)
                        flagged = true
                else
                        flagged = false
                UpdateSQL(id, x, y, flagged) // part of category 3
        Else
                return

// logic for traversing environment and detecting objects
// starts at bottom left corner then increments right until array width reached
// then moves up one position and starts over until top right is reached
// detection function checks each position for flagged colors
Int agentPosX = 0
Int agentPosY = 0
While (agentPosX != randomArrayWidth && agentPosY != randomArrayHeight)
        If agentPosition < randomArrayWidth
                agentPosX++
                Detection()
        Else
                agentPosX = 0
                agentPosY++
                Detection()
```

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.

iii. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.

a. Identify and describe the specific skills you will demonstrate to align with the course outcome.

I will demonstrate skills in designing a simple algorithm for an autonomous agent to traverse and environment and detect objects.

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

3 - 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.

4 - 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.

C. **Category Three: Databases**

i. **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.

I plan to use the project from CS 330: Computational Graphics and Visualization for all categories.

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

For this category I plan to set up a SQL database that updates automatically when objects are found, and place flagged objects in a separate table with a timestamp.

Pseudocode:

```
// table to hold all objects found
CREATE TABLE Objects (
        ObjectID int,
        ObjectX int,
        ObjectY int,
        Flagged bool)

// table to hold flagged objects
CREATE TABLE FlaggedObjects (
        ObjectID int,
        ObjectX int,
        ObjectY int,
        DateTime date)

// trigger to check for flagged objects
// inserts into separate table with timestamp
CREATE TRIGGER flagged_object
AFTER INSERT ON Objects
FOR EACH ROW
IF (Flagged == True)
        BEGIN
                INSERT INTO FlaggedObjects(ObjectID,  ObjectX, ObjectY, NOW())
        END

// function called by autonomous agent to update database when object found
UpdateSQL()
        INSERT INTO Objects (objectId++,  agentPosX, agentPosY, flagged)
```

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.

iii. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.

a. Identify and describe the specific skills you will demonstrate that align with the course outcome.

The skills demonstrated here will be database automation and advanced SQL concepts using triggers.

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

3 - 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.

4 - 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.

IV. ePortfolio Overall Skill Set

A. Accurately describe the **skill set** to be illustrated by the **ePortfolio overall**.

i. Skills and outcomes planned to be illustrated in the code review

In the code review I plan to illustrate functionality, code, and enhancements necessary for modification.

ii. Skills and outcomes planned to be illustrated in the narratives

In the narritives I plan to explain the artifact, justify its use here, and reflect on why it works well for my ePortfolio.

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

In the self-assessment I plan to reflect on the capstone and why I chose these code enhancements and summarize their purpose and how they might achieve stakeholder goals.