# CS 499 Module One Assignment Template

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

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

**I have been enrolled in the computer science program for three years now. I am in my final term at the moment.**

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

**During my 3-year computer science program, I developed a comprehensive understanding of various programming languages including Python, Java, C, C++, MongoDB, MySQL, and Assembly. The program provided insights into how different languages are utilized based on application compatibility. I also gained significant experience in learning software development methodologies, such as Agile and Scrum, as well as version control systems like Git, and software testing practices. Consequently, I learned about data structures, including arrays, linked lists, trees, graphs, and algorithms for efficiently organizing and manipulating data. Additionally, I learned about various types of databases, database management systems, and effective data querying. The program gave students a deeper understanding into working across different platforms such as Windows, Linux, Ubuntu, and cloud environments. This program allowed students to acquire experience across various fields, such as web development, mobile application development, cybersecurity, machine learning, and artificial intelligence. Throughout my studies, I recognized the importance of debugging code and cultivating analytical and critical thinking skills to identify and address issues. The program has helped me improve my critical thinking skills, problem-solving skills, and logic reasoning skills. Due to the skills I've acquired, I am able to incorporate attention to detail into my academic coding practices.**

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

**For my computer science capstone, I aim to showcase considerable enhancements in functionality, user experience, compliance with standards, and the overall design of my projects.**

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

**My current career aspirations are quite diverse, reflecting the numerous opportunities present in this field. Throughout my computer science studies, I was fortunate to work with various technologies and projects that offered me valuable insights about how technology works in this domain . Nonetheless, I have particularly enjoyed courses centered on UI/UX design, and I want to focus my career in that area. In the CS 360 course, we developed an application for tracking weight, which gave me an excellent experience working with Android Studio on this assignment. I appreciate the interface of this IDE, especially since it allows for extensive customization. I intend to create everything from designing the layout, user interface, and overall aesthetic appeal of web pages as a web designer. It will enable me to put to good use my attention to detail, extensive data management knowledge, and user research skills.**

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

**This enhances my focus on UI/UX design and enables me to utilize both creative thinking and technical skills. My program equipped me with abilities like critical thinking, problem-solving, and logical reasoning, which improved my capacity to create interfaces and experiences that are intuitive and easy for users. Through my knowledge of website goals and requirements, design principles, and an understanding of industry trends, I will be able to translate these requirements into crafting interactive and aesthetically pleasing interfaces. I can provide comprehensive services that meet diverse client needs, from website design to game development promotion, making me a versatile and valuable asset in the industry.**

1. **ePortfolio Set Up:**
   1. Submit a **screen capture** of your ePortfolio GitHub Pages home page that clearly shows your URL.
      1. 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.
   2. Use the GitHub Pages link in the Resource section for directions on:
      1. How to create your GitHub website and publish code to GitHub Pages
      2. Issues, such as adding links to other sites
   3. Paste a screenshot of your GitHub Pages home page with your URL clearly showing in the space below.

**A screenshot of a computer

AI-generated content may be incorrect.**

1. **Enhancement Plan:** 
   1. **Category One:** Software Engineering and Design
      1. **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.

**SOFTWARE ENGINEERING AND DESIGN**

**Artifact Selection and Origin:**

**Name: Weight Tracking App**

**Origin: Provided by the CS 360 course ( Mobile Architecture and Programming)**

**In this project, I aim to create a basic weight-tracking application consisting of at least three screens: one for logging in, another for displaying daily weight, and a third for recording daily weight. With this app, users will have the ability to monitor their weight, determine their ideal weight, and evaluate their progress.**

**To enhance this artifact, I will concentrate on the following improvements, which are in line with advanced software engineering standards**

**I struggled to provide clear and user-friendly charts and graphs for monitoring weight changes, progress, and additional data on the second screen during the completion of my project.. With the application, I aim to enhance account management and login functions, as well as improve the software engineering by incorporating features to view charts allowing users to track habits that can help users pinpoint areas where they might need to adjust their dietary or exercise habits. Additionally, I will create an account page for the user to enter his or her personal details. Users should also be able to input their daily weights, store them in the database, modify or remove records, clear all information, and view the charts.To improve the Login process, I recommend implementing a feature to recover user passwords in case they are forgotten. Finally, the code does not include thorough input validation since it fails to check if users have entered the username and password in an acceptable format.**

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
  + 1. **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

**I will illustrate how to optimize a mobile app by enhancing its functionality in their software design and development. With Android Studio IDE, we can create, read, update, and delete records in a database using the Java programming language and SQLite database. Also, Exhibit expertise and knowledge of the relation and integration between components in source codes, transcribe information between activities, and activate the features of mobile devices. With this improvement, I will showcase my creativity along with my ability to utilize industry-standard tools and methods in developing a mobile application.**

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.

* + 1. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.
       1. Identify and describe the specific skills you will demonstrate that align with the course outcome.

**Improving the weight tracking application by incorporating charts can significantly enhance user experience by providing more personalized, detailed insights into their progress. These enhancements can foster greater self-awareness and accountability, demonstrating my grasp of data visualization and management principles and focusing on user-centric principles. A well-designed user interface incorporates account creation and input validation for easy system navigation and understanding of its security measures. I will illustrate how principles such as data security, which protects account information, and accessibility, which ensures that the interface is usable for everyone, are also significant**

* + - 1. Select one or more of the course outcomes below that your enhancement will align with.

**[Course Outcomes: 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.

The design of the artifact will be improved and its efficiency fine-tuned through modular components, showcasing my capability to boost software performance and effectively tackle limitations.

**[Course Outcomes: 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.

This application shows my ability to bring value to the application, especially through the implementation of modular coding and improved user experience, which can be significantly enhanced through the provision of more tailored options.

**[Course Outcome 5]: "**Develop a security mindset that anticipates adversarial exploits in software architecture and designs to expose potential vulnerabilities."

 By implementing input validation, I aim to reduce possible security threats, such as incorrect data entry, while ensuring the system's integrityand safety.

**Pseudocode:**

* **Improve the CRUD capabilities of the database.**
* **Retrieve user passwords directly from the login interface.**
* **Implement input validation for both username and password fields.**
* **Incorporate charts or graphs to illustrate progress over time.**
* **Develop a user account registration page.**

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.
   1. **Category Two:** Algorithms and Data Structures
6. **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. Artifact Selection and Origin:**

**Name:animal\_main.py, animal\_module.py**

**Client/Server Development**

**Origin: This artifact comes from the CS 340(Client/Server Development ) course, where I developed a fully functional and interactive web-based dashboard for an animal rescue training company. A rescue animal training company, Grazioso Salvare, aims to identify dogs that make good candidates for their search-and-rescue training programs. After these dogs are trained, they can rescue both humans and dogs from life-threatening conditions. The Grazioso Salvare dog training program does have a specific profile they are looking for in dogs to train. With the help of this program, GS will be able to identify and categorize available dogs based on existing data from Austin animal shelters.**

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

**While working on the project, I discovered that it was a monolithic application, consisting of all components bundled together in a single large codebase. Modifying or adding features can be challenging due to the interconnected dependencies, leading to decreased scalability, increased complexity, and difficulties adapting to new technologies. Restructuring the code into smaller, individual services is the most effective approach to ensure that each service is independent and can be deployed separately by dividing it into smaller, reusable, and maintainable units, such as modules, functions, and classes, that perform specific tasks.**

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.

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

**Additionally, I plan to utilize advanced operations, as the list will facilitate sorting algorithms like quicksort and binary search, which are beneficial for dynamic data in this complex application.By this enhancement, I aim to illustrate my understanding of data structures and my capability to enhance algorithms. This modification will highlight my proficiency in choosing the proper data structure for a particular application, thereby boosting performance.**

**Given that the animal class consists of heterogeneous data types, using a List will enable us to execute operations more effectively and optimize the code. Indexing, sorting, and CRUD operations can be performed more efficiently, thus demonstrating my capacity to improve the system's efficiency.**

**Transitioning to an N-tier architecture will allow me to partition an application into various logical and physical layers. This distinction aids in managing complexity, enhancing scalability, and improving maintainability. I will show my algorithm optimization skill by minimizing unnecessary processes, making the program more efficient.**

**The enhancement reduces redundant actions, resulting in better system performance. My algorithm demonstrates my ability to develop efficient algorithms according to industry standards.**

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

**Course Outcome 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."

By applying algorithmic principles, I will refine the data structure and algorithms of the Animal Shelter class to illustrate my capacity for creating efficient solutions. Furthermore, this improvement will highlight my skill in making design trade-offs, such as utilizing advanced operations with a List, which are beneficial for dynamic data in this complex application and also enhance data access speed and facilitate operations like adding, deleting, and modifying records.

**Course Outcome 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."

This improvement demonstrates my ability to creatively select data structures and develop algorithms, enhancing the system's overall performance and value. The software is in line with industry objectives of providing efficient and scalable.

By applying these principles and enhancements, code apps can become more efficient, performant, and scalable, leading to a better user experience.

**Pseudocode:**

**1. refine the data structure and algorithms of the Animal Shelter class**

**2. Using advanced operations with a List**

**3. Transitioning to an N-tier architecture**

* 1. **Category Three: Databases**
     1. **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.

**Artifact Selection and Origin:**

**Name: AnimalShelter.py (Database using MongoDB)**

**Origin: This artifact comes from CS 340 Project (Client/Server Development). the Grazioso Salvare Animal Rescue Dashboard, as the aligned artifact.**

**, I have selected my CS 340 project, the Grazioso Salvare Animal Rescue Dashboard, as the aligned artifact. This project encompasses creating a web application dashboard that connects with a MongoDB database to showcase and manage animal rescue information. The MongoDB database was used due to its flexibility in managing dynamic schemas, which was critical for handling the varying structure of animal rescue data. I utilized the pymongo library to implement CRUD operations, allowing seamless management of the data within the dashboard. This artifact showcases my ability to work with databases, manage large datasets, and integrate them into a user-facing application to provide real-time data visualization and insights.**

**The goal of this project is to develop a web application dashboard that connects with a MongoDB database to display and filter information pertaining to animal rescues.. We utilized MongoDB to manage data for an animal shelter by building CRUD (Create, Read, Update, Delete) applications. The system will offer user functionalities such as adding new animals, accessing animal records, updating animal information, and deleting animal entries. The implementation of CRUD operations within the dashboard was achieved using a Python library, enabling smooth data management. By incorporating a CSV file into MongoDB, the application will facilitate the creation and retrieval of animals in the database. This project showcases my capability to work with databases in a web application environment, using MongoDB as a data storage mechanism and Dash as a UI builder.**

* + 1. **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

**Although the original system functions well, it but can be enhanced with additional database features and a more efficient data access strategy. For this enhancement, I will incorporate advanced MongoDB features such as:**

**Implementing indexing to frequently queried fields like age, animal ID, type, and color offers efficient methods that allow the database to swiftly find data without needing to search through the entire table, facilitating significant horizontal scalability without making adjustments to application logic.**

**Utilizing aggregation pipelines to handle the data flowing through the pipeline for the animals, focusing on specific characteristics such as age, breed, and more, and producing reports on the animal population in the shelter.**

**pseudocode:**

* **Use the animal ID field as an index to improve filtering**
* **A multi-filter search for animals**
* **Counting animals with the same breed**
* **Optimize query for search**

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.

* + 1. Explain how the planned enhancement will **demonstrate** specific **skills** and align with course outcomes.
       1. Identify and describe the specific skills you will demonstrate that align with the course outcome.

**In the suggested improvement, essential skills correspond with the outcomes of the CS 340 course, especially regarding database optimization, data retrieval, and system scalability. Implementing MongoDB indexes and aggregation pipelines will illustrate my ability to enhance database performance. It is advantageous to create an index on the animal ID field to boost query efficiency. As a widely accepted method for increasing database effectiveness, indexing perfectly aligns with the course outcome of using well-founded and innovative techniques in computing practices.**

**My application of MongoDB's aggregation framework to produce statistics, such as the overall count of animals by breed type, showcases my capability in executing complex data manipulations. Computing solutions that leverage algorithmic principles are crafted and assessed utilizing this skill. The capacity to aggregate data facilitates intricate data transformations, including filtering, grouping, sorting, and projecting, which provides versatility for analysis or reporting.**

**Furthermore, various filters like rescue type, breed, and age range can be employed to dynamically query the dataset. Creating adaptable and efficient data retrieval methods reflects my comprehension of performance optimization and user-centric queries. This supports the course outcome of designing computing solutions that navigate the trade-offs involved in design decisions.**

* + - 1. Select one or more of the course outcomes listed under Category One that your enhancement will align with.

**The planned enhancement for the CS 340 project aligns with the following course outcomes**

**[Course Outcomes: 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:

This improvement includes indexing and aggregation, leveraging algorithmic principles to boost performance. My decision to implement indexes and utilize pipelines for aggregation guarantees that scalability is maintained.

**[Course Outcomes: 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:

My enhancement makes use of MongoDB's advanced capabilities, including indexing and aggregation, to boost the functionality and performance of the database. With these improvements, the web application provides real-time data processing, providing useful and valuable solutions for animal rescue.

1. **ePortfolio Overall Skill Set**

**My ePortfolio showcases a comprehensive understanding of essential elements of computer science, such as programming languages, algorithms, data structures, and software development techniques. Moreover, the document will emphasize the practical experience and problem-solving skills gained from projects, and coursework. In my portfolio, I showcase projects that demonstrate designing, developing, and enhancing software solutions by employing best practices, coding methodologies, and the latest tools across multiple areas, including backend services, web applications, and system-driven frameworks.**

Key Skills Illustrated:

**Database Management and Query Optimization:**

In CS 340, I will showcase my skills in managing databases with MongoDB, performing CRUD operations, enhancing query performance through indexing, and creating aggregation pipelines for efficient complex data manipulation.

**The Development of Web Applications:**

In the CS 360 project,  Incorporating a password recovery option into a login interface emphasizes user ease while still upholding security. Moreover, input validation will focus on verifying and sanitizing user inputs to ensure data integrity, security, and reliability. Understanding and implementing the concepts of object-oriented design is crucial for developing software that is reliable, expandable, and simple to maintain. Ultimately, this results in superior-quality software because I am committed to delivering construct systems that can be easily extended, modified, and troubleshooted.

**Algorithm Design and Optimization:**

In the CS 340 web application dashboard projects, I will showcase my skills in refining code, optimizing logic, utilizing parallel processing, creating scalable systems, and performing ongoing testing. Code that has been refined by eliminating redundancy and simplifying logic can be faster and more efficient, establishing a strong basis for processing data quickly and effectively. Performance and scalability can be improved by using sorting, filtering, and indexing techniques.

**Scalability of the system and performance**:

Enhancements made in my projects, CS 340 project emphasizes database indexing and overall system efficiency, demonstrate my understanding in designing efficient data structures, and focusing on query performance. I possess the ability to navigate tradeoffs among various design options to maintain system efficiency as they become more intricate.

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

**In the code review, I will focus on demonstrating:**

**-Enhancing code efficiency: Showcasing my capability to create performance-focused code by emphasizing enhancements like database indexing, aggregation pipelines, and algorithm optimizations.**

**Clarity and Future Maintenance: Improving code organization, adding comments, and adhering to best practices for easier future maintenance.**

**Utilizing Algorithms for Problem Solving: Evaluating and showcasing the application of algorithms to tackle specific challenges aligned with real-world needs and course objectives.**

* + 1. Skills and outcomes planned to be illustrated in the narratives

**Through narratives from the fields of software engineering and design, algorithms and data structures, and databases, I aim to highlight the skills and knowledge gained from applying the appropriate data structures to effectively arrange data according to the requirements and limitations of various challenges. The use of fundamental algorithms and shared data structures, along with the implementation of technically sound algorithms, play a crucial role in crafting efficient computer programs. In the CS 340 project, I utilized algorithmic techniques to address complex challenges, including enhancing performance via indexing and aggregation in MongoDB. Additionally, I will showcase my dedication to simplicity, user-friendly interfaces, maintaining a consistent user experience, and emphasizing performance in my CS 360 project. My narratives will also demonstrate my ability to decompose software into smaller methods to fulfill the requirements of each code block and to apply security techniques by correcting method behaviors. Lastly, I will illustrate how to implement and apply quality assurance methods that effectively identify and resolve vulnerabilities.**

* + 1. Skills and outcomes planned to be illustrated in the professional self-assessment

**In this self-assessment, I will outline my knowledge and inspiration for pursuing a Computer Science program aimed at enhancing the knowledge and skills I have gained over the years of my education. I aim to showcase my distinct abilities and strengths through my portfolio, emphasizing my strong motivation, problem-solving skills, and solid mastery of the various components and tools essential for planning and programming during my studies. Furthermore, I will emphasize the skills and knowledge I have gained in various programming languages including JAVA, Python, and SQL, as well as development tools and IDEs, which have improved my capabilities.. The technical skills I have developed encompass coding problem-solving, debugging, creating robust applications, securing data, and troubleshooting, with particular attention to applying industry best practices and standards I will also demonstrate my ability to make informed design decisions, manage performance and scalability tradeoffs, and communicate technical solutions effectively through the self-assessment. My enthusiasm for learning new concepts and swiftly acquiring necessary skills motivates me to excel and challenges me to reach new levels of achievement.**

**References**

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