

CS 499 Module One Assignment Template

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?
A little over a year.
- B. What have you learned while in the program? List three of the most important concepts or skills you have learned.
The most important things I have learned in the program are probably the process and ideas that go into the functions of working on a development team. Before I began my journey for this Degree, I was already quite familiar with programming languages and free-lance application development.
- C. Discuss the specific skills you aim to demonstrate through your enhancements to reach each of the course outcomes.
To demonstrate my ability to program in a full stack environment, and ability to work with API's.
- D. How do the specific skills you will demonstrate align with your career plans related to your degree?
I would like to work as a full stack developer with ArcBest, my current employer. Meetings I have had with friend who hold similar positions have lead me to a few specific ideas for portfolio artifacts.
- E. How does this contribute to the specialization you are targeting for your career?
Being able to work in multiple languages and multiple development stages would be the best way to show this.

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.

Hello World

I'm hosted with GitHub Pages.

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.

For this artifact I am going to use the App I built for CS360 “StockSense”.

The purpose of the course was to learn about mobile architecture. The goal of the app was to make a simple stock management application. There were other options I decided I liked this one the best.

Link below will take you to the Portfolio made for the class.

<https://github.com/Maiar0/DeprecatedPortfolio/tree/main/School%20Projects/CS360>

Link below is local GitHub project I will be working on.

<https://github.com/Maiar0/AndroidStudioProjects/tree/main/StockSense>

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 artifact I plan to increase its complexity, its current implementation is entirely local. I will implement a new view to allow for multiple database creation and selection. This view will connect to a database for storage rather than local storage. I plan to add an additional view to Import/export a CSV document. For this specific enhancement the scope is all within the app. This enhancement revolves around the creation of these views and their operations at a local level. At this stage the app will still function completely locally. The Database will still be stored within the device. The enhancements exact goals are:

To create Database view

- To create functionality for creation, deletion and view of databases.
 - This will entail the ability to fill out information pertaining to the creation of a database.
 - I feel it necessary to note that later in another enhancement this will be an API to create the database and the same to delete. Unique database identifier will be given back to a database from the API, upon creation. The same identifier will be needed upon deletion.

To create import/export view.

- To create functionality to import and export a csv file.
 - To parse csv within a specific format to import into database.
 - To parse database to export a specific format csv.

Pseudocode

// Application Initialization

START

 Login(I would like this application to be No Sign Up/No Login)//this is current implementation will likely change

 CHECK network connectivity

 IF connected

 AUTHENTICATE user(Sign in is still viable implementation will still need method of Database ownership possibly?)

 ELSE

 IF Permissions

 Error no Network connection

 ELSE Request Permissions

 IF Permissions

 Connect

 ELSE

 Error Permission not Granted

 DISPLAY Database Selection/Creation

//Database Selection/Creation

Choose:

 Implemented Database

 (options)

 view database

 view properties

 delete database

 confirm database token

 Delete

 create Database

 move to Database creation view.

 Add Database

 input token

 return database

 Import/Export View

 Choose Database

 Choose import or export

 IF Import

 Choose database name

 ELSE

 Choose CSV name

//Import

 Parse CSV file prepare for import

//Export

 Parse Database format into CSV

// View Database

These screens have already implemented Database view and Grid View

-The Database to be viewed will have to be passed into this view

END

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 offer 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.

- Database Management: Creating, managing, and interacting with local databases showcases an understanding of database design and operations. The ability to implement multiple database functionalities demonstrates a strong grasp of organizing and manipulating structured data.
- Data Interchange and Parsing: Importing and exporting CSV files requires proficiency in data parsing, validating input/output formats, and ensuring data integrity during transfer processes. This showcases practical skills in data management and interoperability.
- User Interface Design: Developing intuitive and functional views for database management and CSV operations demonstrates competency in designing user-centric interfaces that meet usability standards.
- Problem-Solving and Algorithmic Thinking: Designing solutions for handling database operations and CSV parsing reflects algorithmic principles and the ability to tackle complex problems using computer science best practices.

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

- Outcome 1: The transition from a fully local SQLite implementation to a more robust local database management solution with enhanced views (e.g., database selection and CSV import/export functionality) allows the app to be a more versatile tool for various user needs.
- Outcome 2: The enhancement requires designing intuitive and coherent user interfaces for database management and CSV import/export, ensuring the app is accessible to both technical and non-technical users.
- Outcome 3: The planned enhancement requires designing a solution that integrates database management and CSV import/export functionality. This involves evaluating various design choices, balancing complexity and usability, and adhering to established computer science standards.
- Outcome 4: implementing CSV functionality showcases the application of innovative tools and techniques in computing practices. These enhancements deliver value by improving the app's functionality, scalability, and user experience.

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 will be enhancing the StockSense mobile application from CS360. The focus of this enhancement will be implementing a search function into the database view, we will focus on efficiency and optimizing the search process so that we can find entries quickly. My goal is to do this in the UI thread, which means that it must be very responsive with large data sets to not crash the application. I will implement a search function into the database view, leveraging hash maps for fast lookups. The enhancement will replace the current list-based data structure with a dual hash map approach for searching by unique ID or stock name. This ensures that the app remains responsive when handling large datasets, even on the UI thread.

Link below will take you to the Portfolio made for the class.

<https://github.com/Maiar0/DeprecatedPortfolio/tree/main/School%20Projects/CS360>

Link below is local GitHub project I will be working on.

<https://github.com/Maiar0/AndroidStudioProjects/tree/main/StockSense>

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

Implement two separate hash maps:

ID-based Hash Map: Maps unique IDs to stock records for $O(1)$ retrieval by ID.

Name-based Hash Map: Maps stock names to records for $O(1)$ retrieval by name.

Workflow Changes:

On database load, populate the hash maps with all stock data.

For each search query:

Check if the query is an ID or a name.

Retrieve the corresponding result from the appropriate hash map.

Search Optimization:

Use hash map lookups to minimize search time.

Handle cases where the user provides partial matches by scanning the hash map keys if exact matches are not found.

User Interface Updates:

Add a search bar to the database view for user input.

Displaying the search results in a paginated view for improved UI responsiveness.

Analysis:

Calculate time complexity of operation

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 offer 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.

Efficient Data Management:

Implementing hash maps for fast lookups by unique ID and stock name demonstrates proficiency in selecting and applying appropriate data structures for optimizing performance.

Managing dual hash maps to ensure seamless integration with the existing database showcases advanced data management skills.

Algorithm Optimization:

Designing and implementing algorithms for $O(1)$ average-case lookups improves search efficiency, especially with large datasets.

Adding a partial match feature and calculating time complexity ensures responsiveness and scalability, highlighting algorithmic thinking and performance analysis.

User Interface Design:

Enhancing the UI with a search bar and paginated results ensures the app is user-friendly and responsive, even when handling large datasets.

Synchronizing search operations with the UI thread without blocking it demonstrates proficiency in balancing user experience with technical constraints.

Problem-Solving and Debugging:

Replacing a list-based structure with hash maps involves refactoring existing code while ensuring compatibility and reliability.

Handling potential edge cases, such as invalid queries or partial matches, showcases problem-solving and debugging skills.

Performance Analysis:

Measuring and analyzing the time complexity of operations, including hash map population and search functionality, demonstrates the ability to optimize code and justify design decisions.

- b. Select one or more of the course outcomes listed under Category One that your enhancement will align with.
- Outcome 3: This enhancement involves designing a solution to improve search efficiency, adhering to algorithmic principles and computer science standards. Managing trade-offs, such as using additional memory for hash maps to achieve faster lookup times, demonstrates thoughtful design evaluation.
 - Outcome 4: By leveraging hash maps for optimized search, this enhancement demonstrates the use of innovative techniques to improve performance. The result is a more efficient and scalable StockSense application that adds value to the user experience.
 - Outcome 2: Documenting the design choices, pseudocode, flowchart, and performance analysis ensures clear communication of the enhancement plan. Creating a well-structured user interface for search functionality demonstrates the ability to deliver a coherent and user-friendly application.

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 will be enhancing the StockSense mobile application from CS360. The focus of this enhancement will be deploying a relational database application. This will likely be a SQLite application. The current implementation within this application is fully local. The implementation will focus on the local application being able to create a database, with a simple schema.

Link below will take you to the Portfolio made for the class.

<https://github.com/Maiar0/DeprecatedPortfolio/tree/main/School%20Projects/CS360>

Link below is local GitHub project I will be working on.

<https://github.com/Maiar0/AndroidStudioProjects/tree/main/StockSense>

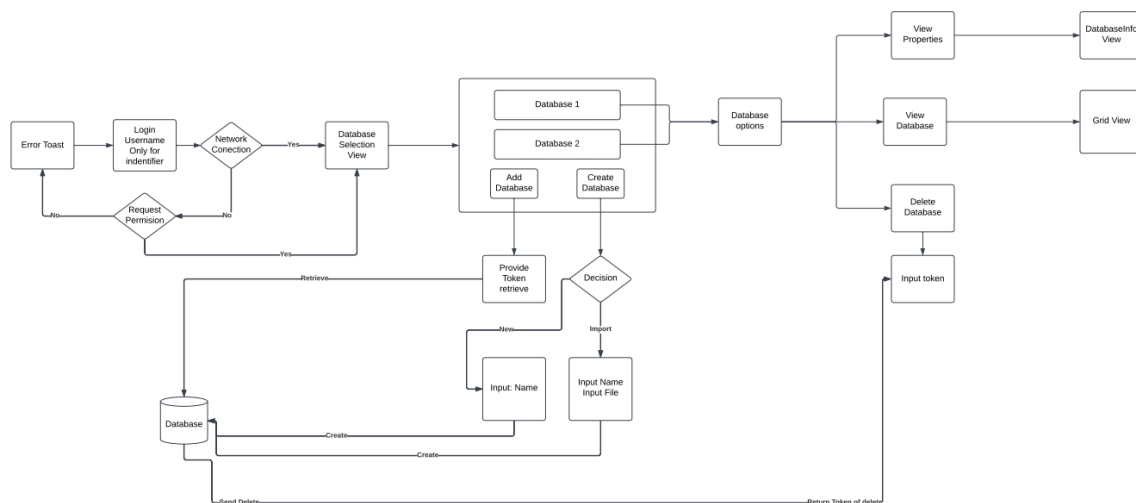
- ii. **Describe** a practical, well-illustrated **plan** for enhancement in alignment with the category, including a pseudocode or flowchart that illustrates the planned enhancement.

Enhance the StockSense application by transitioning from a fully local SQLite database to a hosted SQLite database. This implementation will involve connecting the application to a remote database hosted on a cloud service or server, enabling centralized data management, improved scalability, and access from multiple devices.



CS499 Database interaction.pdf

Flowchart:



Pseudocode: implementation of CRUD

Insert Database// This could be done locally and then synced
 send Data for insert
 return token

Delete Database
 send token to delete hosted Database
 return token
 (locally Delete on this token)

Add Database
 send token
 return database

Add/Subtract record
 send Quantity to change item by ID
 Return Record

Delete record
 Send Record ID
 return confirmation

Insert record
 Send data
 Return Record

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 offer 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.

Database Management and Integration:

- Transitioning from a local SQLite database to a hosted SQLite database demonstrates advanced database management skills.
- Designing schemas and handling database operations, such as CRUD and synchronization, showcases a strong understanding of relational database principles.

API Development and Integration:

- Developing a RESTful API for database interaction demonstrates backend development skills, including creating secure endpoints and managing network communication.

System Design and User-Centric Development:

- Creating intuitive interfaces for database management and data import/export emphasizes skills in designing user-friendly systems tailored to specific audiences.

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

- 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. This enhancement involves designing a solution for centralized database access while managing trade-offs like network dependency versus offline functionality.
- 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. Transitioning to a hosted SQLite database and integrating it with a RESTful API exemplifies innovative techniques and tools that enhance the app's scalability and usability.
- Outcome 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. By implementing secure token for database identification, the enhancement aligns with best practices in ensuring data privacy and application security.

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

The code review for the StockSense application will illustrate a range of technical and problem-solving skills that align with the course outcomes. It will showcase my ability to work within mobile architecture, demonstrating a strong understanding of Java and local database management using SQLite. My aptitude for UI development and creating user-friendly designs will also be evident, highlighting the focus on providing an intuitive experience for end-users.

The review will emphasize my understanding of full-stack development by detailing the integration of front-end and back-end functionality, particularly in the planned enhancements that expand the app's capabilities. My ability to analyze the existing project, identify areas for improvement, and outline appropriate next steps demonstrates my capacity for strategic planning and technical growth.

In the code analysis portion, I will highlight my commitment to clean, reusable code that adheres to industry standards. The existing code's structure, documentation, and lack of bugs will reflect my attention to detail, rigorous testing, and focus on maintainability. This segment will also showcase my ability to evaluate the efficiency, logic, and security of the current implementation, setting the stage for the planned enhancements.

The enhancement walkthrough will demonstrate specific skills such as optimizing search functionality using hash maps, transitioning from local to hosted database management, and ensuring scalable and secure API integration. By addressing the alignment with course outcomes, I will show proficiency in designing innovative solutions, applying algorithmic principles, and balancing trade-offs in design decisions. The planned improvements, including enhanced database functionality, optimized search operations, and improved UI responsiveness, will further validate my ability to execute meaningful enhancements that add value to the application.

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

The narrative accompanying the StockSense mobile application will illustrate my ability to transform a simple project into a user-friendly, scalable solution designed to address real-world challenges. StockSense, initially developed in early 2024 as a lightweight inventory management system, has been enhanced to support multi-device use and improved scalability. This artifact was selected because it allowed me to strengthen specific technical skills, including cloud database integration and the application of hash maps for efficient data retrieval. The narrative will reflect on the learning experiences and challenges encountered throughout the process and how the enhancements align with the five course outcomes.

The enhancements to StockSense demonstrate how software can support collaborative environments by enabling inventory data to be managed across multiple devices using a hosted database. This feature is particularly beneficial for small teams, as it fosters shared access to up-to-date inventory information, improving decision-making and coordination. The narrative will emphasize the

design of user-friendly interfaces that ensure accessibility for diverse audiences, from technical staff to non-technical users, supporting teamwork and organizational goals.

The narrative will showcase my ability to articulate the purpose and functionality of StockSense clearly and professionally. This includes explaining the rationale behind design choices, such as the implementation of hash maps for fast searches and hosted databases for scalability. Additionally, the enhanced documentation, including pseudocode, flowcharts, and time complexity analysis, illustrates my capacity to communicate technical concepts effectively to both technical and non-technical stakeholders.

The use of hash maps to replace list-based data structures highlights a solution designed to optimize search efficiency, particularly for large datasets. The narrative will reflect on the trade-offs considered during this enhancement, such as increased memory usage versus faster search times. By applying algorithmic principles, I was able to design a computing solution that balances scalability and performance while adhering to computer science standards.

Transitioning from a local SQLite implementation to a hosted database required innovative use of modern tools and techniques such as RESTful APIs. These enhancements add significant value by making StockSense scalable and capable of supporting organizational needs across multiple devices. The narrative will discuss how these enhancements align with industry-specific goals, such as improving inventory management for small businesses.

The inclusion of unique ID for accessing the hosted database demonstrates a proactive approach to securing sensitive inventory data. The narrative will address how this enhancement mitigates vulnerabilities, ensures data privacy, and aligns with best practices in secure software design. Reflecting on potential security risks and implementing measures to address them underscores my commitment to developing secure and reliable software.

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

The professional self-assessment will emphasize my growth throughout the Computer Science program and the capstone project, showcasing how I have developed both technically and professionally. It will highlight my ability to identify real-world problems, analyze them critically, and deliver effective software solutions, using the StockSense project as a key example of my capabilities. Through this reflection, I aim to demonstrate my strengths in problem-solving, algorithmic thinking, and secure software development, while also illustrating my commitment to designing scalable, user-friendly, and maintainable solutions. The self-assessment will not only focus on my technical competencies but also underscore my adaptability, collaboration skills, and ability to balance user needs with technical requirements, setting me apart in the competitive field of computer science.

One of the centerpiece projects in my portfolio is the StockSense mobile application, initially developed as part of my coursework in mobile architecture. Through enhancements, I transformed this project into a scalable, user-friendly solution designed for inventory management. This evolution demonstrates my ability to analyze existing systems critically, identify areas for improvement, and implement innovative solutions. Key enhancements include the integration of a hosted SQLite database for centralized data management, the optimization of search functionality using hash maps, and the

implementation of secure communication protocols. These improvements highlight my technical proficiency in database management, algorithmic optimization, and secure software design.

In addition to technical skills, my ability to communicate complex ideas clearly and professionally sets me apart. Whether documenting technical processes, collaborating with peers, or presenting solutions to stakeholders, I ensure that my communication is tailored to diverse audiences and contexts. My projects reflect this strength, with well-documented code, structured narratives, and intuitive user interfaces that prioritize usability and clarity.

Concerns & Questions

My main concern is my ability to finish this somewhat daunting task in the time allotted, I don't have the best experience in a lot of the areas I am going to cover. Any advice on how to narrow down these enhancements or change them to better fit the scope of the class. I will likely do all of these enhancements regardless of this class, so I have it on my portfolio.

I do have another application that could be used for algorithms but I didn't know if it actually applied (<https://github.com/Maiar0/AndroidStudioProjects/tree/main/dennisward>) its an app I made in my free time it was initially supposed to be a resume application. The idea was alright implementation not so much. I built 2 games into it that could benefit from optimization. My goal for this on my portfolio is to refactor the entire project into an application with just games. If this somehow fits into a category, I am open to the idea.

I did have an idea of creating a full stack MEVN website to showcase skills with Vue as my goal employer uses Vue.

Any advice on this would be more than helpful, I am a little worried about the workload within the class.