# CS 499 Module One Assignment Template

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

# CS 499 Module One Assignment

## I. Self-Introduction

**A. How long have you been in the Computer Science program?**  
I have been enrolled in the Computer Science program for roughly three years. Sept 2021!

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

* Full stack development, including backend APIs with Node.js/Express and frontend interfaces with Angular.
* Database design, management, and querying with MongoDB, including data modeling and CRUD operations.
* Cybersecurity fundamentals, focusing on secure coding practices, threat mitigation, and data protection.

**C. Discuss the specific skills you aim to demonstrate through your enhancements to reach each of the course outcomes.**  
The enhancements will demonstrate the ability to design modular, maintainable software reflecting best practices in software engineering; optimize and implement efficient data filtering and searching algorithms; and develop robust database schemas with query optimization and secure data handling. These skills align with course outcomes emphasizing professional communication, computing solution design, and security-minded software development.

**D. How do the specific skills you will demonstrate align with your career plans related to your degree?**  
These skills support my career goal of becoming a cybersecurity specialist with strong software development expertise. The focus on secure backend design, data integrity, and scalable user interfaces positions me to develop and audit secure applications effectively.

**E. How does this contribute to the specialization you are targeting for your career?**  
By integrating software engineering, algorithmic problem solving, and database security in one project, this work directly contributes to my specialization in cybersecurity and software development, preparing me for roles involving secure application design and intrusion mitigation.

## II. ePortfolio Set Up

**A. Submit a screen capture of your ePortfolio GitHub Pages home page that clearly shows your URL.**  
[Insert your screenshot here.]

**B. Use the GitHub Pages link in the Resource section for directions on:**

* Creating and publishing your GitHub Pages site.
* Handling issues such as linking to other code repositories or external sites.

**C. Paste a screenshot of your GitHub Pages home page with your URL clearly showing below.**  
[Insert screenshot here.]

## III. Enhancement Plan

## A. Category One: Software Engineering and Design

**i. Artifact selection and origin:**  
The CRUD Python module, originally developed in CS 340 (Advanced Programming Concepts), manages MongoDB interactions for the animal shelter project.

**ii. Enhancement plan with pseudocode:**

* Refactor the module to improve connection handling, substitute hard-coded values with configuration variables, and add exception handling.
* Standardize method names (e.g., create\_record, get\_record\_id) and implement logging for critical operations.
* Add docstrings and comments to increase maintainability and clarity.

**Pseudocode snippet:**

text

Initialize database connection safely

For each CRUD operation:

Try to execute the operation

If operation fails:

Log the error and return failure response

Else:

Return success status or data

**iii. Skills demonstrated and course outcome alignment:**

* Skills: Modular software design, exception handling, professional documentation, logging.
* Outcomes: 2, 3, 4, and 5 (design and evaluate solutions, implement computing practices, develop a security mindset).

## B. Category Two: Algorithms and Data Structures

**i. Artifact selection and origin:**  
Data filtering logic implemented in the Dash dashboard application (CS 340).

**ii. Enhancement plan with flowchart description:**

* Replace static breed filters with dynamic queries using regular expressions for efficient pattern matching.
* Add pagination and sorting features implemented at the database query level to reduce frontend processing load.
* Optimize data transformation before rendering visuals using pandas DataFrames.

**Flowchart overview:**  
User selects filter → Build dynamic MongoDB query → Retrieve filtered paginated data → Transform data → Update dashboard visuals.

**iii. Skills demonstrated and course outcome alignment:**

* Skills: Algorithm optimization, efficient data retrieval, application of regex, and data preprocessing.
* Outcomes: 3 and 4 (design computing solutions and implement innovative computing techniques).

## C. Category Three: Databases

**i. Artifact selection and origin:**  
MongoDB database schema and queries for the animal shelter project, originally developed in CS 340.

**ii. Enhancement plan with pseudocode:**

* Implement MongoDB schema validation to enforce field types and mandatory fields.
* Create indexes on frequently filtered fields like breed and age\_upon\_outcome\_in\_weeks to improve query speed.
* Enhance update and delete methods to include verification of operation success and rollback if necessary.

**Pseudocode snippet:**

text

Define schema rules for collection documents

Apply validation rules in MongoDB

Create indexes on key fields

For update/delete:

Execute operation

Verify result

If failed:

Log error and rollback

**iii. Skills demonstrated and course outcome alignment:**

* Skills: Database schema design, indexing, data integrity enforcement, query optimization.
* Outcomes: 3, 4, 5 (design solutions, use innovative techniques, develop security mindset).

## IV. ePortfolio Overall Skill Set

**A. Skills and outcomes planned to be illustrated in the code review:**  
Clear understanding of software design principles, algorithm efficiency, and secure, optimized database interactions.

**B. Skills and outcomes planned to be illustrated in the narratives:**  
Reflection on design decisions, problem-solving approaches, and iteration based on debugging and testing.

**C. Skills and outcomes planned to be illustrated in the professional self-assessment:**  
Self-awareness of strengths and weaknesses, professional growth outlook, and readiness for career alignment.