# 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’ve been in the program for about four years, balancing it with work experience in the data field.**

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

**I’ve learned how to work with data structures and algorithms, design scalable software, and manage databases using SQL and cloud tools.**

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

**I’ll be showing skills like Python-based data pipeline design, feature engineering using algorithms, and Snowflake SQL view creation for analytics.**

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

**These are exactly the skills I use in my career as a data analyst—turning raw data into clear, actionable insights.**

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

**This project supports my focus in data analytics and cloud data engineering, helping me build a strong portfolio for roles in that space.**

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.

**For this category, I’m creating a Python-based ETL pipeline script from scratch as part of my capstone project. The script connects to AWS S3, pulls customer churn data, performs cleaning and transformations using pandas, and then loads the data into Snowflake. This artifact showcases clean code structure, modular design, and logging—all aligned with software engineering principles.**

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.

**To enhance this project, I’ll make the Python ETL pipeline modular and production-ready. I’ll include robust error handling, a logging mechanism, and support for environment-based configurations (like dev, test, and prod). I also plan to containerize the pipeline using Docker so it can run on any system or cloud VM. These enhancements increase the code’s portability, reliability, and maintainability.**

**Start**

**Load config based on environment (dev/test/prod)**

**Connect to AWS S3 using boto3**

**Read customer churn CSV files**

**Clean and transform data using pandas**

**Log each major step and catch errors**

**Upload cleaned data to Snowflake**

**Close all connections**

**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 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.

**Modular software design**

**Exception handling and logging**

**Containerization using Docker**

**Working with external APIs (AWS S3, Snowflake)**

**Data pipeline orchestration with real-world tools**

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

**Design and evaluate computing solutions that solve a given problem using algorithmic principles and computer science practices.**

**Demonstrate the ability to communicate effectively with a range of audiences in a variety of professional contexts.**

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.

**For this category, I’m using a Python script from my capstone project where I create new features from customer churn data—like tenure buckets, average charges, and churn risk scores. I wrote this code from scratch based on real-world logic.**

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

**To enhance it, I’ll optimize the feature generation using NumPy for faster calculations and use dictionaries for efficient lookups. This will improve performance on large datasets and make the script more scalable.**

**Start**

**Load cleaned customer data**

**Use NumPy to calculate average monthly charges**

**Bucket customers based on tenure (e.g., New, Loyal, At-Risk)**

**Use dictionaries to map customer behaviors to churn risk flags**

**Create binary features (e.g., uses tech support = 1/0)**

**Return enhanced DataFrame for downstream use**

**End**

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.  
      **I’ll demonstrate skills like efficient feature engineering, using NumPy for vectorized operations, and applying dictionaries for fast data mapping. These show my ability to design practical algorithms and apply data structures for real-world tasks.**
   2. 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.**
   3. **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.

**For the database category, I’m using a Snowflake SQL script from my capstone project. It creates a view that joins cleaned customer churn data with key metrics to support Power BI dashboards. This artifact is new and part of my current work.**

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

**To enhance it, I’ll normalize the data model by creating dimension and fact tables, add indexes for faster queries, and improve the SQL view for better performance and clarity. This will support more complex analytics and scale better.  
  
 Start   
 Create dimension tables (customer, services, churn status)**

**Create fact table (usage, billing)**

**Write SQL view joining all key tables**

**Apply filters and aggregations for dashboard use  
 Stop**

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.

**I’ll demonstrate skills in relational database design, writing optimized SQL, creating views, and preparing data for BI tools—all key to modern data roles.**

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

**Utilize databases, programming languages, and other computer science tools to design and develop software solutions.**

1. **ePortfolio Overall Skill Set**
   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

**The code review will show my ability to write clean, modular, and scalable Python code, use efficient algorithms, and implement SQL queries that support real-world analytics. It reflects my understanding of software engineering, data pipelines, and performance optimization.**

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

**The narratives will highlight my thought process, problem-solving approach, and how I applied key concepts like design patterns, algorithmic logic, and data modeling to build a complete solution. They will connect each enhancement to course outcomes and real job scenarios.**

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

**The self-assessment will show my growth throughout the program, my readiness for industry roles in data analytics and engineering, and how I’ve applied classroom knowledge in real-world settings. It will also reflect on my strengths, areas of improvement, and career goals.**