**Introduction:**

My name is Tuyet and I’ve been immersed in the computer science program for over three years, starting with an associate degree before transferring last year to pursue my bachelor’s. Along the way, I’ve developed a few key skills that have shaped how I approach learning and problem-solving. One is paying attention to detail, something I continue to refine. Another is taking the time to understand the fundamentals of a subject, which has taught me the value of patience. Finally, perseverance has been crucial, as I’ve committed to consistently improving my skills through practice and learning.

In this course, I’m focused on demonstrating my ability to write clean and efficient code, deepen my understanding of algorithms and data structures in machine learning, expand my knowledge of database design, and develop the skills to create functional, purposeful software. These goals align closely with my career aspiration to work in the AI field. Mastering coding, algorithms, and data structures is essential for building and improving AI systems. Efficient data management and a solid grasp of databases are equally important, as AI relies on well-organized and accessible data to function effectively. By developing these skills, I’m preparing myself to build reliable AI solutions and keep progressing in a field that I’m deeply passionate about.

**Enhancement Plan for the Artifacts:**

Software Engineering and Design:

I’ve chosen to enhance a handwriting recognition project from my CS 370 course. Originally focused on the MNIST dataset, my goal is to adapt it to the IAM dataset, include a database, and create a simple, user-friendly product. To improve the project, I’ll use a larger dataset, try different algorithms, and add real-time testing features. I’ll also include detailed comments, documentation, and keep a journal to track bugs and solutions.

This project will highlight skills like using algorithms to build a reliable system for various handwriting inputs. I’ll present my work through clear visuals and presentations, supported by research. Secure coding practices will be a priority throughout development. By meeting course outcomes and managing trade-offs in design, I’m excited to show my growth and create a practical, impactful solution.

Functional requirements:

Dataset Adaptability: The system must work with the IAM dataset, a more complex and diverse dataset than MNIST, which includes images of handwritten words rather than single digits.

Database Integration: The project must integrate at least one database to store, retrieve, and manage relevant data efficiently. This could involve storing training data, user inputs, or processed results.

Usability: The final product should be simple and user-friendly, allowing individuals without technical expertise to interact with it. This includes providing a clear and intuitive interface for uploading handwriting samples and viewing recognition results.

Real-Time Testing: The system should offer real-time or near-real-time feedback during testing, enabling users to interactively validate the recognition of handwritten inputs.

Algorithms and Data Structures

In this project, I’m working primarily with Convolutional Neural Networks (CNNs) and exploring new neural network models I encountered during my research for this artifact. Alongside CNNs, the source code integrates several key algorithms, including data augmentation, loss functions, optimization functions, training, and evaluation algorithms. The data structures utilized are diverse, encompassing Numpy arrays, lists, dictionaries, the Keras model structure, and the ImageDataGenerator object.

To enhance the algorithm, my plan is to adjust the components of the CNN to improve system efficiency. I also intend to incorporate Connectionist Temporal Classification (CTC) and Recurrent Neural Networks (RNNs) to further advance the model’s performance. This process involves leveraging my curiosity and technical understanding of algorithms and neural networks. I’ll analyze and optimize the algorithms using Big O complexity to ensure they are both efficient and effective. At the same time, I’ll work on explaining how these algorithms function in a way that’s accessible to people with varying levels of technical expertise.

My goals for this project extend beyond technical improvements. I aim to demonstrate my ability to apply algorithmic principles and computer science practices to tackle challenges while thoughtfully managing design trade-offs. Furthermore, I’m committed to delivering professional-quality written, visual, and oral communications that are clear, technically sound, and tailored to specific audiences. These goals are vital not only for the success of this project but also for my growth as a well-rounded computer science professional.

Database:

This project involves working with two different datasets. The first is the IAM database, a public dataset used for training. The second is a custom dataset designed for quick processing. If time allows, I’d also like to create a MongoDB database to record users and their input images for testing purposes. Managing the datasets is key to the program’s functionality, so my plan is to split them into two portions: one for training and the other for validation. For faster processing, I’m using the Lightning Mapping Database, where images are serialized and encoded to ensure efficient handling. Through this project, I aim to achieve the course outcome of developing a system that fosters collaboration, enabling diverse audiences to contribute to advancing handwriting recognition technology in the field of computer science.

**ePortfolio Overall Skill Set:**

I plan to demonstrate my technical skills in programming by providing a strong understanding of algorithms and data structures through a practical project. I’ll emphasize my ability to develop agile, maintainable code that aligns with industry best practices in software engineering, with a focus on security and performance optimization. My work with MongoDB integration will further demonstrate my knowledge of database management and connectivity. The code will reflect thoughtful design choices and my ability to evaluate trade-offs in algorithmic decisions, aligning closely with course outcomes related to designing and evaluating effective solutions.

Through the narratives, I’ll share my journey and growth in applying algorithmic principles, database management, and software engineering skills to real-world challenges. I’ll detail how I used these skills to create a functional, user-interactive handwriting recognition system, highlighting my approach to problem-solving, iterative improvements, and adapting new concepts. This section will illustrate my dedication to continuous learning and my ability to apply knowledge to the ever-evolving demands of technology. Additionally, I’ll discuss my strategies for clear, technical communication with diverse audiences, reflecting my commitment to effective professional communication.

In my professional self-assessment, I’ll reflect on my progress in understanding neural networks and machine learning, including the skills I’ve developed in algorithm design, data structure optimization, and database handling. I’ll evaluate my strengths, identify areas for growth, and explore how these experiences have fueled my passion and curiosity for machine learning. This section will emphasize my commitment to advancing my skills in machine learning while highlighting how my current expertise and capacity for growth align with industry needs, demonstrating my readiness for a career in this exciting field.