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CS 499 Capstone Artifact Narrative

Module 3

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For my CS 499 Capstone, I chose to Use my Animal Shelter project from CS 340 Client-Server Development course That I originally created in February 2025. The artifact was a web dashboard built in Jupyter Notebook using Python and a dash that connected to a mongo database which pulled data from an uploaded csv file. It displayed a table of animal shelter outcomes through a searchable record list that included filters and charts. The project used CRUD operations to query the database for different analysis. Some searchable patterns included filtering by shelter type such as transfer or adoption.

I chose this project because it brings together everything I have learned by working with data, building the interface, and connecting it all through Python. It brings together backend work using MongoDB, data handling with pandas, and a user-friendly interface built with Dash. The original version worked, but it lacked structure and security, which made it a great candidate for enhancement. I reorganized the project into a more modular MVC format, replaced hardcoded credentials with environment variables using python-dotenv, and added logging to help with debugging. I also moved the callback functions into a separate controller to keep things organized. On top of that, I included new filters for breed and color and improved the dashboard visuals to make them more clear, polished, and responsive. I also improved the dashboard visuals to make them clearer, more polished, and easier to use.  
 In Module One, I originally planned to meet two outcomes, which were:

1. Outcome 3 (Software Design and Engineering): I met this by applying modularity and using environment variables for safer and cleaner design.
2. Outcome 4 (Algorithms and Data Structures): I improved the filtering logic and added input validation to strengthen how the app handles different rescue types and attributes like breed and color.

As I continued working on the project, I realized I had missed an important outcome related to the database enhancements I made. Because those changes were important, I later added Outcome 5 (Databases) to my plan. I moved away from using Mongo shell and instead used MongoDB Compass, added error handling, and ensured the database connection was properly closed and securely managed. I also updated my Module One template after receiving feedback from my instructor.

Working on the enhancements helped me look at my code differently and focus more on structure and reusability. I split the code into separate files, kept the logic organized, and followed best practices like using a .env file for sensitive info. One issue I ran into was reorganizing the file structure. I had to fix my import paths and test each callback to make sure everything was still working. I also had some trouble setting up the virtual environment. I installed a venv to keep my project’s dependencies separate from other projects and to make setup easier. I had to install some packages like pandas, dash, plotly, and python-dotenv, and then activate the environment in VS Code. Using venv helped avoid version conflicts and made it easier to manage a clean setup for testing and future deployment.