Enhancement Three: Databases

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CS-499-11109-M01

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08/03/2025

**Note on Artifact Selection**

In Module One, I originally selected a Trip Booking API project as my artifact for the Databases category. However, after further review, I chose to enhance a different project from CS-340: the Animal Shelter Dashboard. This project better demonstrates the same backend database principles I planned to showcase—such as NoSQL queries, schema planning, input validation, and access control—while also offering an interactive, visual frontend that helps illustrate the database logic. The enhancement plan remains the same and aligns with the same course outcomes.

**Artifact Description**

The artifact I selected for the Databases category is a Jupyter Notebook titled CS340.ipynb, which was developed in my CS-340 course. This project builds a full-stack dashboard using the Dash framework and MongoDB. It connects to a live animal shelter database through a custom CRUD class and visualizes the data using radio buttons, a dynamic data table, an interactive map, and a breed frequency bar chart.

The notebook walks through the project step by step, allowing for interactive demonstration and code review. It shows how the MongoDB database is queried and how those results dynamically drive the dashboard visuals. This format enabled me to demonstrate both backend logic and frontend responsiveness in a clear and organized way.

**Justification for Inclusion**

This artifact reflects my skills in building full-stack solutions that connect user interfaces to backend databases. It demonstrates my ability to:

* Interface with a NoSQL database using Python and pymongo
* Build an interactive dashboard with filters and real-time updates
* Handle CRUD operations with structured, object-oriented code
* Present backend data through frontend visual components

For the enhancement, I focused on areas of improvement identified in Module One:

* Added an input validation function to ensure queries are well-formed and limited to allowed values
* Added pseudocode for role-based access control, differentiating admin and user-level data access
* Replaced the original read() method in the AnimalShelter class to include validation
* Added a Markdown cell explaining a planned migration to a MySQL-based schema, including normalization and example SQL queries

These updates were embedded directly into the .ipynb file using both code and Markdown cells, making the artifact complete and more professional.

**Outcome Coverage**

This enhancement demonstrates substantial progress toward the following program outcomes:

* Apply innovative techniques and tools in developing database-integrated systems
* Design secure, scalable backend logic using validation and role-based access
* Deliver professional-quality communication, explaining design decisions clearly and concisely

The notebook format enabled me to present both the technical implementation and conceptual design in a cohesive and accessible manner, supporting both academic review and real-world applicability.

**Reflection on the Enhancement Process**

Enhancing this artifact helped me think critically about data integrity and access control. Adding input validation taught me how to prevent malformed data from reaching the database. Designing role-based access logic helped me consider different user roles and how to enforce secure data access at the system level.

Writing the SQL migration plan prompted me to reflect on database architecture, normalization principles, and the performance trade-offs involved. By combining these components in the notebook, I created a clear, informative artifact suitable for both technical and non-technical audiences.

This Jupyter Notebook artifact illustrates a strong grasp of backend database logic, full-stack development using Dash, and thoughtful planning for secure and scalable systems. The enhancements I added reflect professional-level thinking and elevate the artifact for inclusion in my ePortfolio. It demonstrates not only what I’ve learned but also how I’ve applied those lessons to produce a practical, industry-relevant solution.