CS-499 Milestone Four: Database Enhancement Narrative

Joseph Klenk
Computer Science Capstone
Enhancement Three: CS340 - Animal Shelter Database Dashboard

Artifact Description

My enhanced artifact is the Global Rain Animal Shelter Dashboard from CS-340, developed during Winter 2024. The Python/Dash web program interfaces with MongoDB to build an interactive dashboard to analyze animal shelter data, which assists rescue shelters to determine dogs apt to participate in specialized training programs using data filtering and visualization.

Justification for Inclusion

I have chosen this artifact as it reflects my database integration and full-stack development capabilities. The improved version reflects MongoDB aggregation pipelines to perform in-depth data analysis, query optimization using indexing and field projection, robust error handling, as well as data validation, real-time dashboard capabilities with automatic updating, modular database structure with specialized query methods, etc. All these enhancements pushed basic find() queries to advanced database mechanisms with industry-standard performance as well as maintainability.

Course Outcomes Achievement

This outcome is addressed with the enhanced course outcome in Module One. Application of algorithmic principles to designing and assessing computing solutions is exemplified using MongoDB aggregation pipelines to conduct complex database-level data analysis, such as age demographics and breed statistics. Show soundly founded and novel approaches to computer solution implementation is exemplified using advanced MongoDB capabilities, intelligent indexing, and live dashboard refreshes which provide enhanced value to the user. Adopt a security mindset is covered with end-to-end data validation, effective error checking, and secure database management of the database connection.

Reflection on Enhancement Process

Enhancing this artifact taught me MongoDB's aggregation framework, which required understanding data flow and performance implications rather than simple query replacement. The greatest challenge was incorporating robust error handling with clean separation of concerns and balancing real-time features with system performance. The value of database-level analysis over application-side processing improved dramatically in terms of efficiency. The exercise reinforced the role database design has in the overall application structure as well as the importance of keeping scalability and maintenance in mind from the outset as opposed to as add-ons after completion.