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CS-499 Computer Science Capstone

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Milestone Four: Enhancement Three – Narrative

My artifact was the CS-340 Client/Server Development project one from last year. It is essentially a simple Python-based CRUD application that connects to a MongoDB database and helps manage the data for an animal shelter. The original had a pre-populated MongoDB database (AAC) that was in the Apporto virtual environment so I could not get all the values exact, but I simulated it and added it to my assignment as proof. The project showed integration of a database with application logic through OOP and the PyMongo driver. The enhancement showcased here has refactored code to improve validation, error handling, and performance while introducing advanced database functionality such as indexing and data aggregation.

This was a great choice of an artifact for an enhancement because it shows how much I’ve grown in database design, and now I utilize this skill at work much more. My enhanced version includes environment-based configuration using a .env file, structured input validation to prevent invalid data entry, and robust error handling for each CRUD operation. Additionally, I implemented MongoDB indexes on commonly queried fields to improve search efficiency and added an aggregation pipeline method that calculate average stay duration by breed. These improvements showcased my ability to apply professional database practices to real-world applications as well as improved the artifact’s performance and reliability.

From what I can tell, the enhancement directly aligns with course outcomes in which I panned in Module One, like developing software that integrates secure database interactions, optimized data retrieval, and scalable design. With implementing validation logic, indexing, and analytics, I feel that I have successfully achieved those outcomes. Additionally, no changes were necessary for my outcome-coverage plans because the completed enhancements completely hit the mark.

Through these enhancements I grasped a deeper understanding of MongoDB optimization techniques, the importance of schema validation even in NoSQL databases, and the use of environment variables for security and flexibility. A challenge I encountered was maintaining backwards compatibility with the original code structure while adding new functionality, which in turn helped with practicing modular design and clean refactoring principles which apply to a professional environment. Finally, this enhancement showcases my technical proficiency and growth in building secure, efficient, and maintainable database applications for a wide spectrum of use-cases.

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