CS499 Module 4 Milestone

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This artifact is a Java project completed early in my Computer Science degree around June 2023. It is a simple Java program for an Animal Shelter that allows a user to input new animals, either a dog or a monkey, into the database. The animals in the database can then be reserved through the shelter program. I selected the Rescue Animal Management System as the artifact to enhance for the algorithms and data structures category because it provided a clear opportunity to showcase my growth in designing efficient, modular data handling. Originally, the system relied on Java ArrayLists, which required linear searches and made data management cumbersome and inefficient. By refactoring the program into Python, I was able to replace those ArrayLists with Python dictionaries, enabling O(1) average-time lookups based on animal names and dramatically improving the system's performance and scalability.

Key components of this enhancement include the implementation of a dictionary-based structure to manage both dogs and monkeys, the addition of custom search functions by name, availability, breed, and country, as well as the creation of sorting functions to order animals by name or country. The improvements this week highlight my understanding of algorithmic tradeoffs, my ability to implement custom search logic, and my proficiency in modularizing code to ensure readability and maintainability. These structure improvements not only increase efficiency but also allow for a scalable program.

I successfully met the course outcomes I outlined in Module One for this enhancement by demonstrating the ability to design and evaluate computing solutions using algorithmic principles and to use innovative techniques, skills, and tools in best practices. These enhancements reflect my progress in thinking critically about data organization, selecting appropriate structures and evaluating tradeoffs in performance and complexity.

Reflecting on the enhancement process, I learned how important it is to think about data flow and access patterns early in the design process. Switching to dictionaries challenged me to rethink how animals are stored, searched, and updated. Implementing flexible search and sorting logic helped solidify my understanding of iteration, key-value access, and sorting mechanisms. One challenge I faced was ensuring that the logic worked seamlessly across two separate animal types (dogs and monkeys) without duplicating code. I overcame this by generalizing my functions and relying on shared base class attributes where possible. Overall, this phase of the project deepened my appreciation for clean, efficient, and scalable code design!