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CS 499 – Milestone 3

1. Briefly describe the artifact. What is it? When was it created?
   * Artifact No. 2 is a course advising application written in C++. It aimed to load csv data regarding courses and their prerequisites into a binary search tree and provided a console menu that would assist in loading the data, displaying the full list of courses and their perquisites or looking up a specific course.
   * I made the original application during my time in CS300 – Data Structures and Algorithms
2. Justify the inclusion of the artifact in your ePortfolio. Why did you select this item? What specific components of the artifact showcase your skills and abilities in software development? How was the artifact improved?
   * This artifact was a good fit for the enhancement category of “Algorithms and Data Structure” because of its utilization of a BST as its data structure of choice. I was able to visit how a hashtable (C# dictionary) could potentially be used instead and showcase my ability to understand and choose data structures.
   * The BST was replaced with a dictionary. A BST has O(log n) time complexity for search, insert and deletion. Using a dictionary makes these operations have a complexity of O(1).
   * The enhanced application will attempt to automatically load the course data at startup rather than requiring the user to input the file path. The user must only do this if the automatic load fails. This improved the user experience of the application.
   * I transitioned from C++ to C# to utilize its automatic memory allocation with the tradeoff of control and speed. This eliminates some vulnerabilities like memory leaks and overflows.
   * The enhanced artifact handles I/O much more gracefully in managing errors and validating input.
3. Did you meet the course outcomes you planned to meet with this enhancement in Module One? Do you have any updates to your outcome-coverage plans?
   * Yes, I met “Design and evaluate computing solutions using algorithmic principles” by replacing the BST with a hash table, where I demonstrated my ability to evaluate and compare various data structures for a job. Choosing a hash table for its O(1) time complexity for search and retrieval operations shows my understanding of algorithmic principles
   * I met “Use innovative techniques, skills, and tools in computing practices” by writing the application in C#, where I showed my ability to learn and apply a new programming language and its modern features.
   * I met “Develop with a security mindset” by moving to a managed language and using more error handling and input validation.
4. Reflect on the process of enhancing and modifying the artifact. What did you learn as you were creating it and improving it? What challenges did you face?
   * During the process of enhancing this artifact I had an encounter with algorithmic tradeoffs. I wanted to use a dictionary for its O(1) complexity of over the BST’s O(log n) complexity. While implementing this, I realized that I had lost the inherent ordered nature of the BST. If I wanted to print the list of courses the exact same way every time, I would need to sort the dictionary and incur a time penalty. I learned that it is very important to consider all tradeoffs when deciding between data structures, algorithms, or design patterns and not to become tunnel visioned on a single improvement.