

Algorithm Report

CSC 705

For this assignment, you are to research the Knapsack problem; one of the more popular problems in computer science. The goal of this exercise is to measure your ability to deconstruct and analyze a known algorithm in order to determine its real world uses.

You are free to use online resources to aid and guide you in your report but be prepared to answer questions about anything in it with confidence.

Please follow the given outline:

- **Abstract:** In a paragraph, give a summary of what the problem is trying to solve, what kinds of approaches there are to solving the problem (naive divide-and-conquer, dynamic programming, backtracking, etc.), and what kind of Big O time complexities it may have for those given approaches.
- **Problem Statement:** Describe what the knapsack problem is in detail. Describe its history and why it's such an important problem in computer science. If there are any variants to the primary knapsack problem, shortly list and describe what the variant is and why it's included.
- **Algorithms:** You must present pseudocode for at least two different algorithms in your report that solve the knapsack problem. The algorithms must be from different paradigms (dynamic programming, backtracking, naive Divide and Conquer, etc.). New and obscure implementations are welcomed, but not necessary.
- **Time Complexity:** For each algorithm presented above, cite your sources and you may use their justification for the time-complexity.
Feel free to utilize online resources to help in this, but be comfortable enough that if you were asked questions about the work, you could answer them. Huge leaps in logic or math will likely be met with questions.
YOU DO NOT NEED TO PROVE ALGORITHM CORRECTNESS OR TIME COMPLEXITY. We will assume correctness for now.
- **Code:** Write up the algorithms you presented above in the coding language of your choice. Using similar input, note the difference in their respective observed runtimes in your report and why there might be deviations from our expectations of the time complexity given above. Provide screenshots and instructions on how to run your programs in your report. Also, submit these code files along with your report.
- **Citations:** Cite all sources used in your report. (Yes, everything).

I am requiring you to use the IEEE report format. Word or PDF files are preferred. Look into LaTeX if you plan on pursuing research in the future. A single column is fine, but two is acceptable:

https://owl.purdue.edu/owl/research_and_citation/ieee_style/ieee_general_format.html