Jarem Thimoty M. Arias   2020-00782   CMSC 142 – EF7L
James Alfred R. Arellano 2020-07542   June 1, 2023

CMSC 142 Project Analysis/Essay

(1) Explain what you did / your modifications to the backtracking algorithm to make it work for the Partition problem.

To accommodate the Partition Problem with the backtracking algorithm. We took all the outputted unique combinations from the backtracking algorithm, compared it with the original array to check for the elements that it did not contain to create the other set, and checked if their sums were the same. If they were, they were added to the solution set. Not much was touched in the actual backtracking algorithm, except for the capability to save the set of combinations.

(2) Compare and contrast the Partition problem with the Subset Sum problem.

It is similar to the Subset Sum problem in concept. Both problems tackle the issue of summations of a set but in different ways. The subset sum looks for a subset that equals a specified sum, while the partition problem, finds a way to split a set into two sets with an equal sum. The way we implemented the partition problem, it can also be used for the subset sum, but the same cannot be said for the dynamic programming implementation used for the subset sum towards the partition problem.

(3) Analyze the running time of your solution. Graph the actual running times of your solver while N gets larger.

N	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	TRIAL 5	AVERAGE
2	0.000003	0.000004	0.000002	0.000002	0.000004	0.000003
3	0.000003	0.000003	0.000004	0.000003	0.000003	0.000003
4	0.000006	0.000006	0.000006	0.000007	0.000008	0.000007
5	0.000005	0.000005	0.000007	0.000007	0.000008	0.000006
6	0.000015	0.000013	0.000013	0.000014	0.000016	0.000014
7	0.000030	0.000032	0.000035	0.000033	0.000041	0.000034
8	0.000068	0.000066	0.000066	0.000071	0.000081	0.000070
9	0.000140	0.000146	0.000138	0.000157	0.000162	0.000149
10	0.000321	0.000370	0.000338	0.000404	0.000373	0.000361
11	0.000854	0.000912	0.000804	0.000956	0.000878	0.000881
12	0.001721	0.002027	0.001667	0.001866	0.001703	0.001797

Figure 1: Table of trial runs of the partition problem code
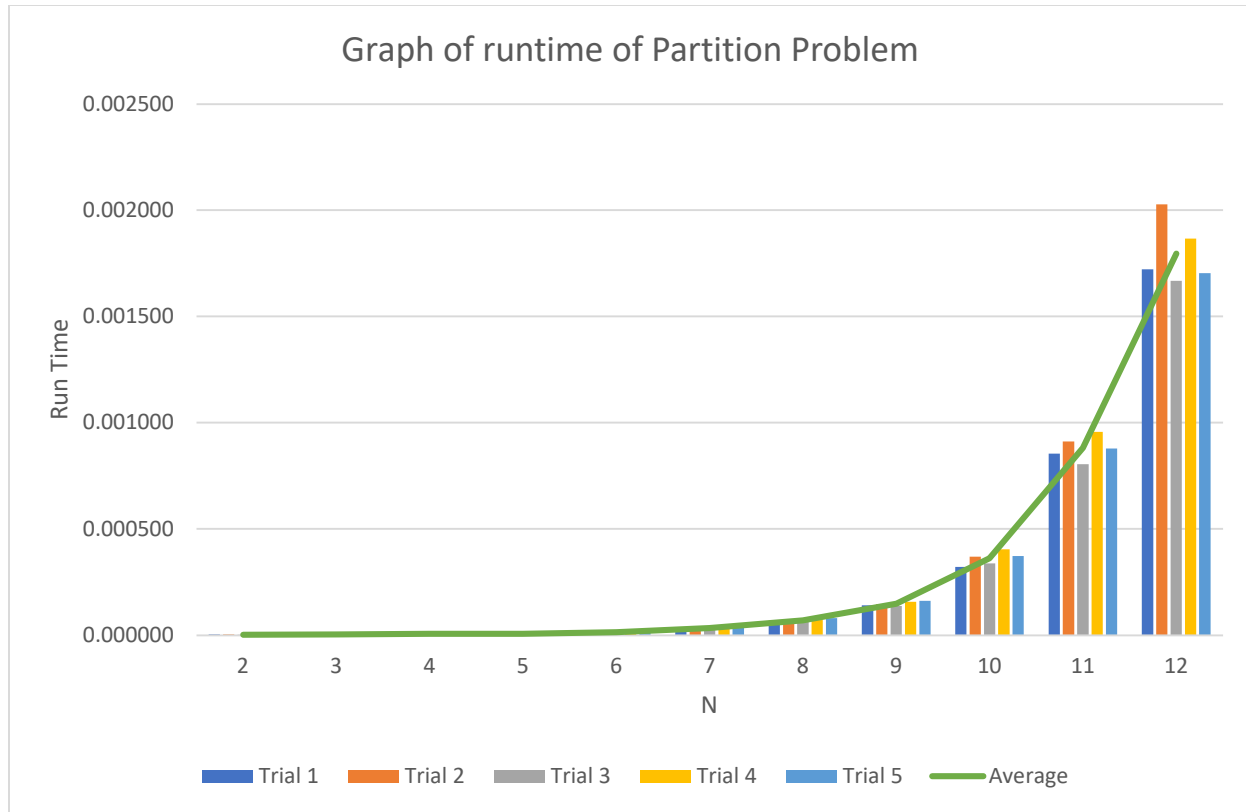
Figure 2: Graph of the test runs for the partition problem code

As can be seen from the graph and table, the run time of the code increases at an approximately quadratic rate. Starting from N=7, there is a consistent increase of run time by a factor of two.