# CS/SE 2XC3 Lab 7 Report

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This report includes the main observations that we found in this week's lab, along with the analysis of our results.

# 1 Basic Graph Algorithms

In this section, we discuss basic graph operations and their implementations.

## 1.1 Generating Random Graphs

We defined a function `create_random_graph(n,c)` to randomly construct a graph when given some number of nodes $n$ and edges $c$. The argument $c$ is given the upper bound $\frac{n \times (n-1)}{2}$ because there can be at most $\frac{n \times (n-1)}{2}$ unique edges in a graph with $n$ nodes. The algorithm initializes a graph with $n$ nodes and then generates a candidate edge between two randomly selected nodes. The candidate edge is accepted only if it is between two unique nodes (does not accept self-loops) and only if it (or its reverse) does not already exist in the graph. If a candidate edge is invalid, it is discarded and the algorithm randomly generates another one. The algorithm adds $c$ valid edges to the graph and returns the populated graph.

## 1.2 Cycles and Connected Probability

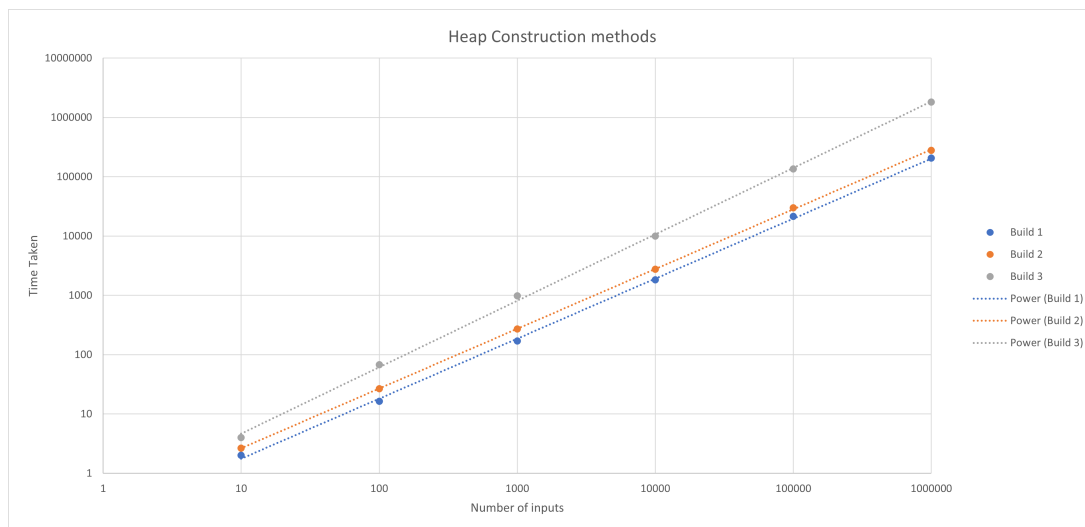The complexities of the various implementations can be seen in the graph below.



Figure 1: performance of three implementations