ECE345 A3

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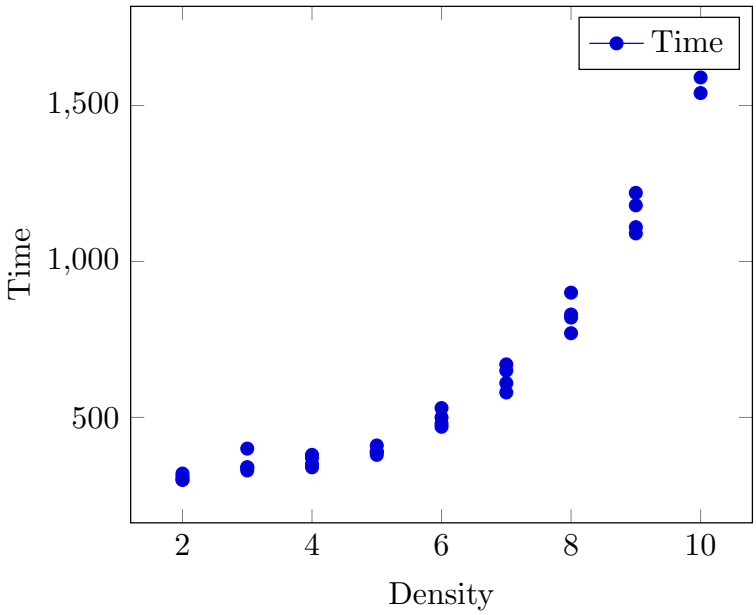
Question 8

0.1 Implementation Details

How are you representing the graph, using an adjacency matrix or an adjacency list, and why?
I am representing the graph using an adjacency list. The social network is a sparse graph and using a adjacency matrix will require memory complexity of m^2
Which shortest path algorithm did you use and why?
I used Johnson's algorithm to find all the shortest paths, but I modified it so that it only searches the paths up to the required time limit. Johnson's algorithm is basically iterating Djikstra's algorithm through all the nodes. It has a runtime complexity of $O(|V|^2 \log |V| + |V||E|)$

Graph of load factor vs Collision Count (Experiments)



Discuss the plot above. What do you observe and why?
From the data, the computation time increases quadratically with the density of the graph. This is because Djistra's algorithm runs in $O(|E|+|V| \log |V|)$ but the influence distance will also increase linearly number of edges as more nodes become influenced. This gives an amortized complexity of $O(|E|^2+|E|(|V| \log |V|))$ where the E term dominates and gives a quadratic.