COMPSCI 2XC3 Lab Report 2

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Part 1

Experiment 1

In our experiment finding probabilties of cycles existing in graph, we used the following parameters:

- 200 Nodes
- ranging from 0 to 100 edges
- running 10000 tests per edge amount

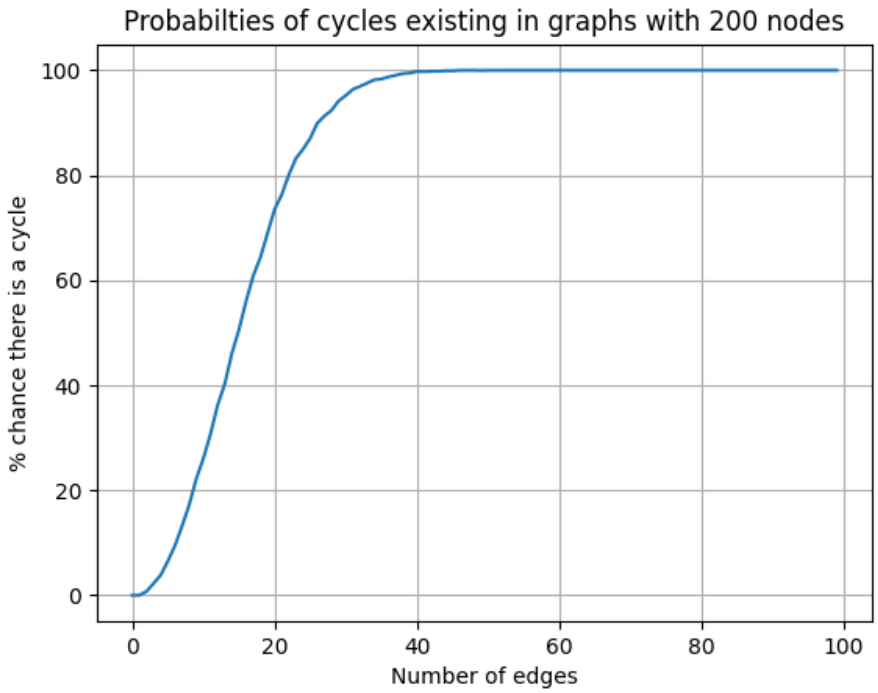

Figure 1: Probabilties of cycles existing in graphs with 200 nodes

In Figure 1 at around 40 edges, the graph tops out meaning that it's very likely that a graph with 200 nodes and over 40 random edges will have a cycle. This is because each time a random edge is added, the chances of the edge creating a cycle increases, resulting in the S shaped curve in Figure 1.

Experiment 2

In our experiment finding probabilties of graphs being connected, we used the following parameters:

- 200 Nodes
- ranging from 0 to 1500
- doing 1000 tests every 10 edge amounts (0 edges, 10 edges, 20 edges, ..., 1000 edges)

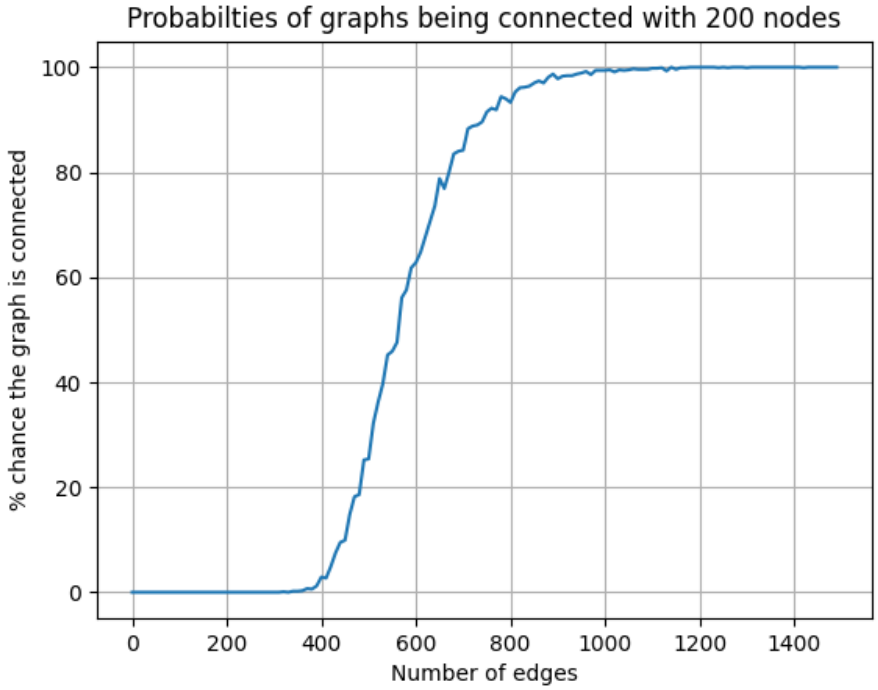

Figure 2: Probabilties of cycles existing in graphs with 100 nodes

In Figure 2 at around 1000 edges, the graph tops out meaning that it's very likely that a graph with 200 nodes and over 1000 random edges will be connected. The graph with the max amount of edges possible without making it connected would look like a graph where every node is connected to every other node except for one specific node. To get this max number of edges, you set N = number of nodes and plug it into $\frac{(N-1)(N-2)}{2}$, which gives us 19701 for our experiment. Our experiment tops out much before this max though as the chances of fully connecting the entire graph with a single unique edge increase as the graph has more and more existing edges. This makes it very unlikley for more denser graphs($\geq$ 1000 edges) to be unconnected.

In Figure 2 the graph bottoms out until about 300 edges. This is because a graph cannot be connected if: number of edges $<$ number of nodes $-$ 1 and even if you have more edges then that if they are picked at random it's very unlikely for it to be connected.

Part 2