

1 Question 1

1. the Erdos-Renyi model takes
 - (a) n , the number of nodes in the graph
 - (b) p , the probability that two nodes in the graph have an edge between them
2. the Watts and Strogatz model takes
 - (a) n , the number of nodes in the graph
 - (b) c , an even number. Each node is connected by edges to the c nodes nearest to it
 - (c) p , the probability that we remove an edge and replace it with one that joins two nodes chosen uniformly at random from the network
3. the configuration model takes
 - (a) k , the degree sequence such that for each node i , k_i is the degree of that node
4. the Barabasi-Albert preferential attachment model takes
 - (a) n , the number of nodes in the graph
 - (b) c , the number of connections made by each node added in each step

2 Question 2

1. the Erdos-Renyi model

(a) Karate Club Dataset

- $n = 34$
- $p = 0.14$

(b) Prison Dataset

- $n = 67$
- $p = 0.08$

(c) Dolphins Dataset

- $n = 62$
- $p = 0.08$

2. the Watts and Strogatz model

(a) Karate Club Dataset

- $n = 34$
- $c = 7$
- $p = 0.25$

(b) Prison Dataset

- $n = 67$
- $c = 20$
- $p = 0.25$

(c) Dolphins Dataset

- $n = 62$
- $c = 12$
- $p = 0.25$

3. the configuration model

(a) Karate Club Dataset

- $k = [17, 16, 12, 10, 9, 6, 6, 5, 5, 5, 4, 4, 4, 4, 4, 4, 3, 3, 3, 3, 3, 3, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1]$

(b) Prison Dataset

- $k = [13, 12, 11, 11, 11, 10, 10, 9, 8, 8, 8, 8, 8, 8, 7, 7, 7, 7, 7, 7, 6, 6, 6, 6, 6, 6, 6, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 3, 3, 3, 3, 3, 3, 3, 3, 3, 2, 2, 2, 2, 2, 2, 1, 1]$

(c) Dolphins Dataset

- $k = [12, 11, 11, 10, 10, 9, 9, 9, 9, 8, 8, 8, 8, 7, 7, 7, 7, 7, 7, 7, 6, 6, 6, 6, 6, 6, 6, 5, 5, 5, 5, 5, 5, 5, 5, 4, 4, 4, 4, 4, 3, 3, 3, 3, 3, 3, 2, 2, 2, 2, 2, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1]$

4. the Barabasi-Albert preferential attachment model

(a) Karate Club Dataset

- $n = 34$
- $c = 3$

(b) Prison Dataset

- $n = 67$
- $c = 5$

(c) Dolphins Dataset

- $n = 62$
- $c = 4$

3 Question 3

See appendix.

4 Question 4

1. The configuration model works best for Karate Club dataset. It's because the karate club dataset is a small one with only 34 nodes, therefore, once we have the degree sequence the outcome tends to be similar to the real world dataset.
2. The arabasi-Albert preferential attachment model works best for prison dataset. It's because the new prisoner is often added to prison one by one. And this way of adding prisoner is like the way arabasi-Albert preferential attachment model uses to construct a graph.
3. The Watts–Strogatz model works best for dolphins dataset. It's because the dolphins dataset is a social network in which two dolphins that are communicated with a dolphin are more likely to communicate with each other. Such pattern is best described by the Watts–Strogatz small-world model.