

## CS333 Homework 4 Report

1.

- a. See code.
- b. 6 iterations to converge.

Top 5 members (in pagerank):

- 1. Kevin McCarthy: 0.005984807685924967
- 2. Steve Scalise: 0.004435625118816459
- 3. Nancy Pelosi: 0.00437734836216711
- 4. John Cornyn: 0.0039872889171330165
- 5. Chuck Grassley: 0.0038714829239431888

- c. Top 5 members (in pagerank) after one iteration:

- 1. Kevin McCarthy: 0.006847308900622564
- 2. Steve Scalise: 0.00503872542181036
- 3. Nancy Pelosi: 0.004593239283159675
- 4. Steny H. Hoyer: 0.003892653211978782
- 5. James E. Clyburn: 0.0037413721012512133

The pageranks after convergence is found are the probabilities that a “surfer” will end up at that spot after a long time of surfing. In this case, we have only done one iteration, and so the probabilities are heavily influenced by the number of incoming edges to a node. For example, the respective incoming edges for the top 5 members after one iteration are: 275, 228, 303, 271, 232. Meanwhile, the respective incoming edges for the top 5 members after convergence are: 275, 228, 303, 197, 196. This is due to the fact that in the beginning, every node has uniform probability, and so nodes with high indegrees have a more likely chance of being visited on the next iteration.

2.

- a. To make it more efficient, at each node, we could try to add up all probabilities from incoming edges first. We will have hashmaps that hold incoming edges and outgoing edges. In this way, we can get edges in  $O(1)$  time. Since the number of edges is  $O(n)$ , and we need to loop through all edges, it should make it possible to compute a single iteration in  $O(n)$  time.
- b. The titles with the 5 highest indegrees:
  - i. “the large  $n$  limit of superconformal field theories and supergravity.”: indegree = 2414
  - ii. “anti de sitter space and holography.”: indegree = 1775
  - iii. “gauge theory correlators from non-critical string theory.”: indegree = 1641
  - iv. “monopole condensation, and confinement in  $n=2$  supersymmetric yang-mills. theory.”: indegree = 1299
  - v. “m theory as a matrix model: a conjecture.”: indegree = 1199