605.744: Information Retrieval
Problem Set (Module 9)

Sabbir Ahmed

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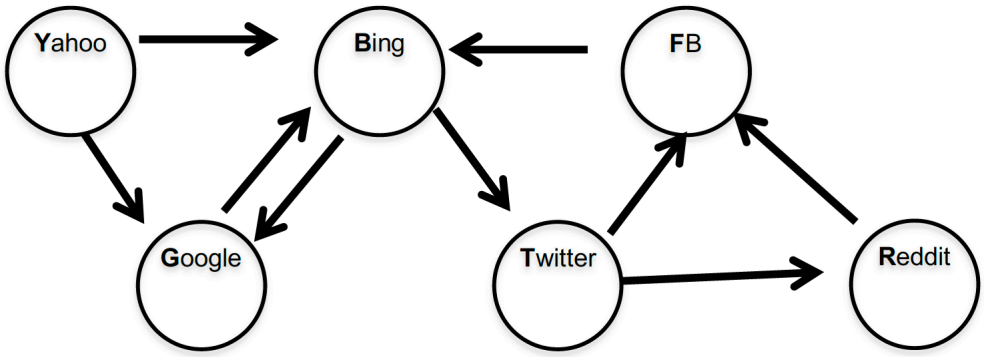
1. (30%) Give a short definition or explanation of the following concepts:

   - web spam
     Answer:
   - Broders' taxonomy
     Answer:
   - out-degree
     Answer:
   - robots exclusion protocol
     Answer:
   - priority queue (in the context of web crawling)
     Answer:

2. (20%) Describe in your own words the process described in the course text to efficiently identify near duplicate documents in a large collection.

   Answer:

3. For this problem work with the directed web graph shown below. In the graph there are six nodes: Y, B, F, G, T, R (for the websites Yahoo, Bing, Facebook, Google, Twitter, and Reddit). Use a teleport probability of 0.20. Assume no other pages or links exist beside those shown in the figure.



(a) (15%) Provide (i.e., write) the six recurrence equations that indicate how to iteratively calculate the PageRank score of each page at time t given scores from time t-1.

Answer:

(b) (25%) Using the brute-force iterative method of calculation shown in the video lecture calculate two iterations of PageRank scores for each page in the graph. Be sure to show scores at times t=0, t=1, and finally at t=2. Report scores using three digits of precision (e.g., 0.247, not 0.2 or 0.24696485932). Show work and do not merely provide a table of values.

Answer:

(c) (5%) Which page (or pages) has/have the lowest PageRank score after two iterations?

Answer:

(d) (5%) Which page (or pages) has/have the highest PageRank score after two iterations?

Answer: