Information Retrieval – Exercise 4
IST 441 - Due Mar 30

This exercise is worth 6 points.

In this exercise, you will illustrate a small network and calculate some of its basic properties. For this case, it will be a social network though any network could do. You will calculate PageRank for the network.

Given the following people (nodes) and relations (edges):

Nodes:
P1: Tom, P2: Jean, P3: Nat, P4: Steven, P5: Vijay, P6: Mary, P7: Oscar, P8: Michelle, P9: Jian, P10: Clark

Edges:
P1 -> P4
P2 -> P1, P2 -> P4
P3 -> P2,
P4 <-> P10
P5 -> P4, P5 -> P1,
P6 -> P7, P6 -> P8, P6 -> P9,
P7 -> P8
P10 -> P6
P10 -> P9

Analyze the network network.

1. (2 points) Network characteristics
   a. (1pt) Draw the network as a graph and a matrix
   b. (1pt) Calculate the following metrics
      i. (1pt) In degree of each node
      ii. (1pt) Out degree of each node

2. (3 points) Given the following modified directed connection, calculate the PageRank scores for each node in the social network. We suggest you use either:

   http://www.webworkshop.net/pagerank_calculator.php
   or the excel sheet available on the course webpage

   1. (1pt) Use initial score of 1 for all nodes. Calculate 10 iterations of the PageRank scores.
   2. (1pt) Change the initial score to 0.15. Calculate 10 iterations of the PageRank scores.
   3. (1pt) Change the initial score to 1.5. Calculate 10 iterations of the PageRank scores.
   4. (1pt) Compare the convergence behavior for the three initial values.