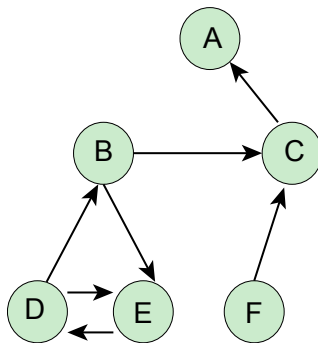


Concept Quiz May 1, 2020

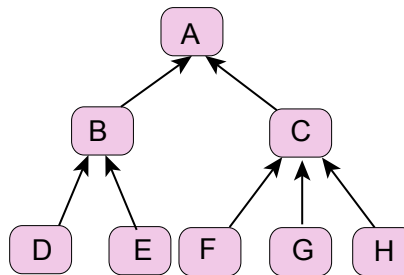
Directions: Complete the following and submit your R code.

Consider the following webgraphs.

Webgraph A



Webgraph B



(1) Compute the PageRank vector of Webgraph A for damping constants $p = 0.05, 0.25, 0.50, 0.75$, and 0.95 .

- a. How sensitive is the PageRank vector, and overall ranking of importance, to the damping constant?

Ans:

For $p = 0.05$,

- (a) PageRank vector (round to 3)

$A = 0.168$ $B = 0.164$ $C = 0.172$ $D = 0.168$ $E = 0.168$ $F = 0.160$

- (b) Ranking of importance: $C > A > D > E > B > F$

For $p = 0.25$

- (a) PageRank vector (round to 3)

$A = 0.179$ $B = 0.154$ $C = 0.185$ $D = 0.176$ $E = 0.174$ $F = 0.132$

- (b) Ranking of importance: $C > A > D > E > B > F$

For $p = 0.50$

- (a) PageRank vector (round to 3)

$A = 0.192$ $B = 0.147$ $C = 0.186$ $D = 0.191$ $E = 0.184$ $F = 0.099$

- (b) Ranking of importance: $A > D > C > E > B > F$

For $p = 0.75$,

- (a) PageRank vector (round to 3)

$A = 0.194$ $B = 0.148$ $C = 0.171$ $D = 0.218$ $E = 0.203$ $F = 0.066$

- (b) Ranking of importance: $D > E > A > C > B > F$

For $p = 0.95$,

- (a) PageRank vector (round to 3)

$A = 0.173$ $B = 0.158$ $C = 0.145$ $D = 0.257$ $E = 0.232$ $F = 0.036$

(b) Ranking of importance: $D > E > A > B > C > F$

I think that the damping constant is really sensitive to the PageRank vector and overall ranking of importance. We can observe that instead of F, most orders have changed with different damping constants because of the existence of the no outgoing edge (A) and the disconnected group (such as D and E).

- a. Does the relative ranking of importance according to PageRank support your intuition?

Ans: No, I was thought that the highest-ranking node will be E or C, because they both have two incoming links and one outgoing link. But it is obvious that F is the lowest ranking of importance because there is no link to F and only exists one outgoing link.

(2) Compute the PageRank vector of Webgraph B for damping constant $p = 0.15$. Interpret your results in terms of the relationship between the number of incoming links that each node has. Does the relative ranking of importance according to PageRank support your intuition?

Ans: The relative ranking of importance is $C > A > B > D = E = F = G = H$ with the PageRank vector 0.158, 0.154, 0.142, 0.109, 0.109, 0.109, 0.109, 0.109.

D, E, F, G, H are the nodes with only one outgoing and no incoming links which have the lowest Pagerank value. C has the highest number of incoming links, so the value is the highest too. A, B are the nodes that have 2 incoming links, but A has an incoming link from C, so A's value will greater than B's.

In this case, the relative ranking of importance support my intuition, because there are no disconnected components exists, it is easier to predict the ranking than the previous problem.