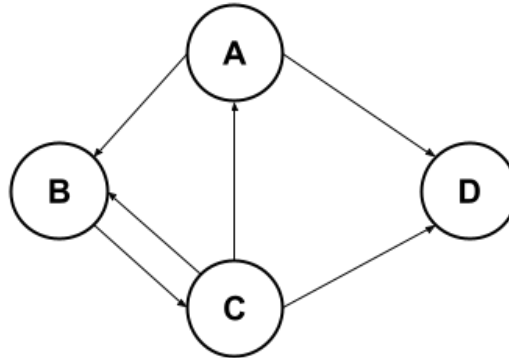


Question 4 - GraphProcessing

[20 Points]



- a) Given the above graph, write down the adjacency matrix used to compute the PageRank of the graph. (Use the naive formulation without using teleportation) [4 points]

[2 points] Has the right entries in the matrix filled in

[2 points] Entries have the correct weights

Subtract one point for minor errors

$$\begin{bmatrix}
 0 & 0 & \frac{1}{3} & 0 \\
 \frac{1}{2} & 0 & \frac{1}{3} & 0 \\
 0 & 1 & 0 & 0 \\
 \frac{1}{2} & 0 & \frac{1}{3} & 0
 \end{bmatrix}$$

- b) State the initial condition r_0 for power iteration. Perform 3 iterations of power iteration to find r_1 , r_2 , and r_3 . [4 points]

[1 point] Has the right initial condition

[1 point] for each iteration that is correct (still give credit if answer is correct given an incorrect adjacent matrix)

Subtract one point if most entries are correct but there are some minor mistakes

$$r_0 = [\frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}]$$

$$r_1 = [\frac{1}{4} * \frac{1}{3}, \frac{1}{4} * \frac{1}{2} + \frac{1}{4} * \frac{1}{3}, \frac{1}{4} * 1, \frac{1}{4} * \frac{1}{2} + \frac{1}{4} * \frac{1}{3}] = [\frac{1}{12}, \frac{5}{24}, \frac{1}{4}, \frac{5}{24}]$$

$$r_2 = [\frac{1}{4} * \frac{1}{3}, \frac{1}{12} * \frac{1}{2} + \frac{1}{4} * \frac{1}{3}, \frac{5}{24} * 1, \frac{1}{12} * \frac{1}{2} + \frac{1}{4} * \frac{1}{3}] = [\frac{1}{12}, \frac{3}{24}, \frac{5}{24}, \frac{3}{24}]$$

$$r_3 = [\frac{5}{24} * \frac{1}{3}, \frac{1}{12} * \frac{1}{2} + \frac{5}{24} * \frac{1}{3}, \frac{3}{24} * 1, \frac{1}{12} * \frac{1}{2} + \frac{5}{24} * \frac{1}{3}] = [\frac{5}{72}, \frac{8}{72}, \frac{3}{24}, \frac{8}{72}]$$

- c) Will the power iteration solution for the above graph converge to what we want? [6 points]