Assignment 4

Linear Algebra and Page Rank

Due: November 13th, 2019 at the end of class.

For any doubts or queries regarding assignment please attend office hours on Monday 9:30-10:30 in CIWW 412. The assignment can we written or typed. Please write your name and netID on the assignment.

1. If you are given a system of equations in n variables then it can be solved using matrices. The coefficients of the variables can be written in a Matrix denoted by A. The variables can be written as a vector denoted by x and constants can be written as a vector denoted by b.

   So the equations:

   $2y + 3z = 1$

   $4y + 2z = 2$

   Can be rewritten as

   $Ax = b$ where

   $$A = \begin{bmatrix} 2 & 3 \\ 4 & 2 \end{bmatrix} \quad x = \begin{bmatrix} y \\ z \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

   And solved by

   $x = A^{-1}b$

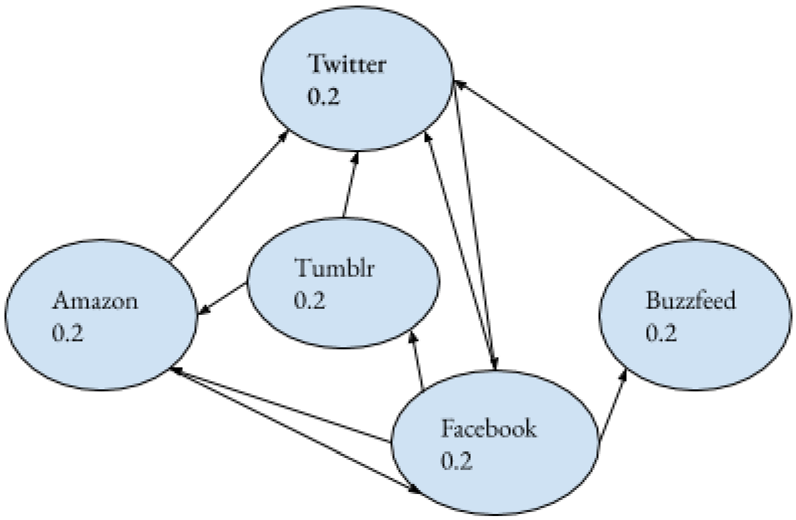
   $$A^{-1} = \begin{bmatrix} -0.25 & 0.375 \\ 0.5 & -0.25 \end{bmatrix}$$

   $$x = \begin{bmatrix} -0.25 & 0.375 \\ 0.5 & -0.25 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 0.5 \\ 0 \end{bmatrix}$$

   Solve the following by converting into a system of equations and solving using matrices:
   A chocolatier is making **5** identical boxes. She has **$610** to spend (including tax) and wants **24** chocolates for each bouquet. Roches cost **$6** each, Toblerone cost **$4** each, and Lindor cost **$3** each. She wants to have twice as many Roches as the other **2** chocolates combined in each box. How many Roches, Toblerones, and Lindors are in each box?

2. Write the matrix obtained by the chocolate equations in question 1 as a sum of a symmetric and skew symmetric matrix. Find such matrices.
   Hint: Any matrix can be written as a sum of symmetric and skew-symmetric matrix. (Google it)

3. Consider the following graph:



   The page rank algorithm will initialize each node with a rank of 1/N where N is the number of nodes (5). Compute the page rank of each node after one iteration.