CSC 546/746

Assignment 2

(25 points)

1. Let u and v be 3-dimensional vectors, where

   $u = \begin{bmatrix} 1 \\ 2 \\ 5 \end{bmatrix}$ and $v = \begin{bmatrix} 9 \\ 3 \\ -2 \end{bmatrix}$

   a. (2 points)What is $u^T v$? (Show your work)
   b. (2 points)What is vu^T? (Show your work)

2. (3 points) Let A and B be 3 x3 matrices, where

   $A = \begin{bmatrix} 3 & 2 & 0 \\ 4 & 2 & -1 \\ -4 & -1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -5 & 6 & 2 \\ 8 & -9 & -3 \\ -4 & 5 & 2 \end{bmatrix}$

   Is B the inverse matrix of A? Prove your answer. (Show your work)

3. (1 point) Create a new Jupyter Notebook project and name it as "hw02.ipynb".
4. (8 points) NumPy exercise:
   a. Import necessary libraries.
   b. Read data from the "hw02_a.csv" and assign it to the variable "dataset_a".
   c. Assign the first column data to the variable "x" and the second column data to the variable "y".
   d. Use NumPy functions to find out the maximum and minimum values of x.
   e. Use NumPy functions to find out the mean and median values of y.
   f. Create a subset of "dataset_a" and assign it to the variable "high_profit". In this subset, the value of the field in the second column should be greater than 300000.
   g. Use "plot" function to plot "x" and "y" with the following criteria:
      i. Line style and color: blue dot
      ii. Title: dataset a
      iii. xlabel: investment
      iv. ylabel: profit
5. (9 points) Pandas exercise:
   a. Import necessary libraries.
   b. Read data from the "hw02_b.csv" and assign it to the variable "dataset_b".
   c. Display the first 3 and last 5 rows of data.
   d. Display a summary of each column's contents. (hint: a dataframe function call)
   e. Display an overview of the main aggregated values over each column. (hint: a dataframe function call)
   f. Create a histogram graph for the column "median_house_value". (set "bins" to 50)

    g. There is one column of data that has null (NAN) values. Replace null with the median value of this column. (The original dataset should be updated)
6. Submit your answers for question 1 and 2 to the blackboard. (You can write the answers on a paper and upload a picture of the paper, or you can use an electronic tool and upload the file.)
7. Submit “hw02.ipynb” to the Blackboard.