

DATA 200 Spring 2020 Homework 9

Due May 1, 2020 at 11:59pm

Note: Please only use python standard libraries covered in class lectures (i.e. json, csv etc). Numpy and pandas are allowed in this assignment. Please submit your solution for each problem as a standalone python file (.py) and NOT a Jupyter notebook. The TA should be able to run your program as is outside of Jupyter.

1. Write a linear equation solver in python. Your program should prompt user to specify a csv file which contains data for a linear system of equations (i.e. $\mathbf{A} \mathbf{x} = \mathbf{b}$). For instance, for the system of 3 equations as shown here,

$$\begin{bmatrix} 3 & -1 & -1 \\ -1 & 3 & -1 \\ -1 & -1 & 3 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} = \begin{Bmatrix} 5 \\ 3 \\ 8 \end{Bmatrix}$$

the csv file should look as follows:

```
3, -1, -1, 5
-1, 3, -1, 3
-1, -1, 3, 8
```

Use **numpy** to read the csv file, solve the equations and print out the results. Your program should be able to handle those situations when there is no solution.

(10 points)

2. Consider the California city dataset from ***cities.csv***, write python code to answer the following questions:
 - a. The largest and smallest cities in terms of total area
 - b. The top 10 cities in terms of elevation.
 - c. Average land area, water area and total area.
 - d. Cities between latitude of 36° and 38° and longitude of -120° and -116° .
 - e. Cities with total population within interquartile range.

For each of these cases, print out the city names and the quantities of interest.

(10 points)