CS594: Python Programming Lab
Take Home Assignment - 6 (2 Questions, 100 Points)
Submission Dead Line: 19-Nov-2019 23:59 Hours   Pages: 2
IIT Guwahati
05 Nov 2019 (Tue)

Question 1:   (0 points)
Reading the following

NumPy https://docs.scipy.org/doc/numpy/reference/

Question 2:   (100 points)
Using the `numpy` package, perform the following tasks:

1. Generate a random array of size 10×10. Numbers in the array should be between 1 and 10 (both inclusive). Your task is: for each row in the random array, count the number of times 1 is appearing, count the number of times 2 is appearing, $\cdots$, count the number of times 10 is appearing. Store the counts in an output array and print the output array.

2. Generate a random array of size 12×12. Every element of this array corresponds to one of the following member category values {Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec}.

   `one-hot encoding` takes as input one of the categorical variables given above (Jan to Dec) and produce a one-dimensional of size 12. All the elements of this array are set to zero except one element that correspond to the input of the one-hot encoding. Example `one-hot encoding(Apr)` is 0 0 0 1 0 0 0 0 0 0 0 0.

   Given the 12×12 two dimensional categorical variable array, your task is to generate `one-hot encoding` for two dimensional array. The resulting output array is a three dimensional array.

3. Generate a square matrix of a specified size (given by the user) whose entries must be integer values between 1 and 100. Your task is to compute:
   - matrix transpose
   - matrix determinant
   - matrix trace
   - inverse of matrix
   - Moore-Penrose pseudo-inverse of the matrix
   - QR decomposition of the matrix
   - eigenvalues and eigenvectors

4. Generate a system of simultaneous equations randomly and solve them.

5. Random number generators and plotting. Generate 10^5 data points from the following distribution and draw them. Read the following material: https://docs.scipy.org/doc/numpy/reference/random/generator.html

- Normal distribution
- Multivariate normal distribution
- Exponential distribution
- Dirichlet distribution
- Logistic distribution
- Lognormal distribution
- Power law distribution
- Uniform distribution

File Naming Convention Create a directory with your roll number. Inside this directory, place all the above python programs and input files (if any). Prefix the file name with your roll number followed by "_" followed by question number followed by ".py". Example: 194161000_q1.py.

README.txt Write a short notes on sequence of steps involved to run the your programs. Include what is the input for the program (with an example) and what will be the output from the program (with an example).

tar gzip Create (roll number).tar.gz file using the above directory.

Submission Email the above tar gzip file to the CS594 TA `vaibhav18@iitg.ac.in` as per the above given dead line

Copying You should avoid indulging in copying. Every submission will be subject to software similarity using the tool `Measure of Software Similarity` available at `https://theory.stanford.edu/~aiken/moss/`. Two submissions having similarity score equal to or more than 40.0% will be declared copied. If you are found involved in copying act, your name will be referred to disciplinary committee. Therefore you are requested to place individual efforts and avoid copying.

Marking Scheme Your implementation will be evaluated as described below.

Q1. 25 Marks
Q2. 25 Marks
Q3. 25 Marks
Q4. 25 Marks