

Day 7 - NumPy

CIERA Research Group

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1 PROBLEM 0 - LIST OF PYTHON ERRORS

Keep a communal running list of the errors you encounter in Python. This list should be a basic text file and should be stored on the GitHub repository that was used for the group project the previous week. Each time a new error is encountered, it should be added as an entry to this list. There should be two columns - one describing the error message and another describing the solution once it is obtained. When you encounter an error, please pull the latest copy of the error sheet from the repo and use *grep* to determine if your error is there. If not, add it, and commit the new copy of the error sheet.

2 NUMPY

The following exercises should be completed in separate .py files and verified by running them through the terminal after they are written.

2.1 PROBLEM 1 - SOME BASIC NUMPY

Create and print out the following matrices in NumPy.

MATRICES TO BE CREATED

$$Q = \begin{bmatrix} 0 & 1 & 2 \\ 3 & 4 & 5 \\ 6 & 7 & 8 \end{bmatrix} \quad P = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix} \quad R = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 4 & 0 \end{bmatrix} \quad S = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

Note the last one should be created by first creating three 1x2 arrays and combining them with NumPy functions.

2.2 MORE NUMPY

Complete the following exercises:

- Create a length-10 vector of random integers between 0 and 100 and sort it (BONUS: can you do this in one line?)
- Create a length-10 vector of random integers and replace the minimum value by 1,000,000. Print the index of this element.
- Create a 10X10 array representing cartesian coordinates in the plane spanning from -10 to 10 for x and y . Convert the matrix elements to plane polar coordinates and print the output.
- Learn how to read named columns of data from a textfile using `np.genfromtxt`. Download the sample datafile from the github. Read it in and find the minimum and maximum values of the first two columns, as well as the indices of those elements. Find the means and standard deviations in the columns.

2.3 CHALLENGE PROBLEM

Write a function in Python that takes as input an integer (the dimension of the resulting matrix) and produces a checkerboard pattern of ones and zeros, starting always with a one in the upper right hand corner *HINT: You might need some forloops and some % operators!*