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Course:

Artificial Intelligence

Homework:

Numpy Assignment

Document

Season:

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Question 1

number of vectors with their elements are taken from user.

vector generator function creates a random vector in given size.

def euclideanDistance(veclst, singleVec) this function gets list of vectors and a random vector then calculate the distance between this random vector and each vector in the given list. Finally,

the output is a dictionary responding to key: value that is each key is a (v_i, random vector) tuple and the value is the distance between these pairs.

Question 2

Part a

In this part, relative image is loaded and the name part of it is separated from its format. In this code in order to read the image, you have to put the image file in the same directory as you have the code in it.

```
npImg = asarray(img)
```

code above is to transform the image we opened to a nparray form then using method below to change type of the data.

```
npImg_float = np.array(npImg, dtype=float)
```
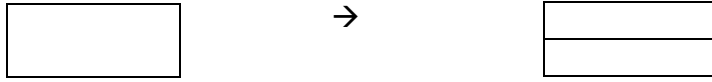
answer:

uint8
float64

Part b

This image is made of 3 2D-matrixs stacked on top of each other, that is, each of them responsible for RGB channel. By using this method npImg [:, :, :], we can access to this matrixes. For instance,

npImg [:, :, 0] is channel R which is a 2D array. To answer this question, we should change the value of each element in R and G channel to 0 (each element corresponds to pixels in the image) and channel B to 255. The resulting image is saved in the same directory where the original image is.
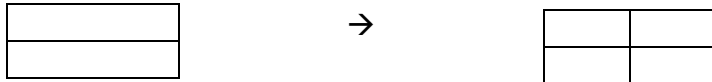
Part c

In this approach, first I split this given picture to 2 slices from its width.

Then by splitting each piece from last part vertically we have 4 pieces of our image equally divided.

These images are saved in the same way I save Blue image.

Part d

Using one of the pieces for instance top left piece to answer this question have results similar to turning the image blue. By multiplying the whole array (wight, height, channel) in -1, we actualy can transform this image to its contrast.

Part e

What I did in part d is saving one piece of this image as answering this part of question

Part f

After slicing image, we should transform each piece back to unit8 format and structure in order to save it.

Answer:

$$(1632, 1224)$$
$$uint8$$

Question 3

Creating array part of this question is done , using a python list of integers in range of 1 to 25.

Lst = [1, 2, 3, .., 24, 25]

Then reshaped in to 5*5 nparray

To swap columns this methods is used.

arr[:   , [first , last]]   =   arr[:   , [last - 1,   first - 1]]

to access elements in an array:

nparr[:   ,   :   ]

Question 4

x = np.array([2, 4, 6])

y = np.array([30, 40, 50])

inner = np.inner(x, y)

outer = np.outer(x, y)

cross = np.cross(x, y)

using highlighted codes on given arrays are results as I printed in my codes.

Question 5

from numpy.linalg import inv

using code above allow us to use inv method from numpy. As we know from linear algebra, matrix m is inversible if |m| != 0.

In order to code this and handle the error we might get, I used try except methodology.

As I searched for this error (singlular Matrix), it simply means that the det(m) is equal to zero, which means that matrix is not inversible.

Linalg class have all errors that might occur. Just returning a txt message instead of interruption is more convenient way to inform the problem.

Done