

Programming Session1: Computer Vision DSE-312: 13th Aug22

1. Define two variables x and y and compute their division and sum. Let $x = 5$ and $y=3.2$, $z=10$. Print out the type as well as the result of the following operations:
 $x, y, z, x/y, x/z, x*y,$ and $x+y, x-y, (x+y)z, x+y-z$, absolute value of $x+y-z$, remainder values of z/x and x/z .
sum of squares of (x,y,z) , $\text{sqrt}(x+z)$
2. Create a list which contains the values 1 to 21. Print out the length of the list and compute the sum of all elements in the list using indexing. Replace the second element with the number 42, last element with -36. Write a code to sum the first and last element, second and second last element and so on (leave out the centre element 5 in this computation). Plot the result as a line.
3. Create the following key-value pairs: City : Bhopal, Institute: IISERB, Hostelname – fill here (the bird names), your Lecture room_number: 4. Get the value of Lecture room_number and print it out. Use dictionary (python), cell/structure arrays (matlab). Append “course: DSE-312” to the list of key-value pairs.
4. i) Generate values of x from 1 to 10, equally spaced at 0.1.
ii) Generate values $[x,y]$ from 1 to 10 spaced at 0.1 (example of 2d grid spacing).
5. You are given: $A = \begin{bmatrix} 22 & -22 & 33 \\ -33 & 44 & 55 \\ -55 & -44 & -2 \end{bmatrix}$. Write a code to compute sum of all entries within A .
6. For the vectors: $\vec{a} = 3\hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = -7\hat{i} + 2\hat{j} + 3\hat{k}$. compute the i) cross product ii) find the angle between the vectors, iii) dot product.
7. Import numpy (for python users) or otherwise (Matlab users). Create and print the following matrices:
 - i. 3x4 matrix with zeros
 - ii. 4x3x3 matrix with ones
 - iii. 3x3 identity matrix
 - iv. 4x6 matrix with uniformly distributed values in the range of $[0,1]$. Hint: For reproducible results set a seed value by the function `np.random.seed (value)` or `rand` function (matlab)
 - v. array with the values from 0 to 4 (integer)
8. Create 5-by-5 matrices A, B, C, D : of i) zeros, ii) ones, iii) 2 randomly generated matrices C & D with 5 rows and columns.
Perform the following:
 - i. Add a constant value =10 to matrix A . Multiply matrix B by 0.5.

- ii. Perform : $E=A*C$.
 - iii. Get the first row and last column of E
 - iv. Lets say matrix E is a sub-image. What is the pixel value at (3,3)?
 - v. What is E-D? what is the minimum and maximum value of this resulting matrix?
 - vi. Transpose the result E-D matrix.
 - vii. Display the size, length of the matrices.
9. Reading images. Download an image from internet. Read the image into a variable, display the image type. Convert the image to grayscale (if not so). Display the image, find the image size.
Perform the following operations on the original image: i) rotate by 30 degree, ii) translate by [10, 20]. iii) scale the image to $\frac{1}{2}$ its size and display the image size. Write the matrix forms and perform the operations (lectures 3-4).
10. Image operations: find the maximum and minimum intensity value in the original image and scaled image. Compute the mean and the sum of all pixels in the original image. Add a constant to the image and display the image. Display options: use the image display option as well the plot the pixel values as surface intensities (read documentations).
11. Show the Histogram of the image, crop a small region (5×5) within the image and display the pixels.
Compute the distances (Euclidean, chessboard and manhattan) between points (51,13) and (5,3).

All the operations have to be performed using computer codes only. You may use inbuilt functions (read the docs carefully) but copying codes from online is strictly not allowed. You have to implement them yourselves.

Please explore the commands by yourself and perform the operations. You may discuss with each other in the class.

Please ensure that you solve all the questions and familiarize yourselves with the commands and any related ones and how they are implemented. Make sure that you have read the documentations properly and carefully. You may explore options around these problems as well.