Reflection Essay

This assignment introduces to the basic of python programming, numpy and opencv. It includes basic numpy array manipulations, doing PCA using numpy, reading and displaying videos and images using opencv.

**Q:** How to rearrange (a1, a2, a3, a4, …, a2n, a2n+1) to (a1, a3, a5, a7, …, a2n+1, a2, a4, …, a2n) using permutation matrix P.

**A:** Array (a1, a2, a3, a4, …, a2n, a2n+1) can be permuatated to (a1, a3, a5, a7, …, a2n+1, a2, a4, …, a2n) by multiplying with the permutation matrix (P), which is an Identity matrix of size (2n+1)x(2n+1) rearranged such that odd columns follows even columns.

(1D array \* P = permuted 1D array)

*Output:* $ python3 per\_matrix.py 2 4 5 1 6 7

Permuted array: [2. 5. 6. 4. 1. 7.]

Here in this case

**Shape Manipulation**

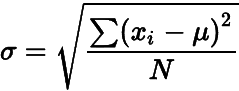
Some basic functions related to array (numpy functions)  
.shape() – gives you the shape of the array  
.empty() – generates empty array with given size  
.zero() – generates array of given size but all the values are zero  
.ones() – generate the array same like zero but the values are one here.  
  
For argument passsing use this [link](https://docs.python.org/3/howto/argparse.html)

Key poin to understand in this question:

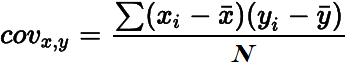
Given array will be 2D array and each element will be replaced by 2D array so the final array will be 4D array.   
By the above logic we can even decide the dimensions of the new 4D array.

Eg:  
 let the 2D array be of dimension (4,5)  
 let M and N be 3 and 2 respectively   
  
 Then the 4D array will be (4,5,3,2).

**Principal Component Analysis**

Some basic formulas

mean =  Standart deviation =

covariance = 

**Feature matrix \* top k eigenvectors = Transformed Data**

Some basic functions used :  
.split – it can be use to split data (eg words from sentence) so this is applied to list.  
.sum – to sum the given input (numpy)  
.mean – to get the mean of the given input (numpy)  
.sqrt – to get the squre root of the given input (numpy)  
  
Some basic matrix info  
A[0] – gives 0th row.  
A[:,0] – gives 0th coloumn.  
.T – gives the transpose of the matrix

Some newly used functions :  
.cov – to get the covariance of the matrix (numpy)  
la.eig – gives the weight and eigen vector of a matric (numpy.linalg)  
.annotate – is used to display coordinates in the matplot figure (matplotlib)

Reading [this](https://medium.com/analytics-vidhya/understanding-principle-component-analysis-pca-step-by-step-e7a4bb4031d9) Theory and the above points we can solve the problem !