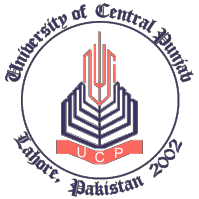
**University of Central Punjab**

**Faculty of Information Technology**

PF Project

*Matrix Manipulator*

**Project:**

You are required to create a program that provides near-complete functionality over the matrix space. Users should be given a simple and smooth work flow that implements following details according to specs:

**Front end:**

 User can enter matrix personally or though files of their choosing

 User can get output on console or through files of their choosing

 Program should not end until user wishes to end their task

 User can enter Matrix of any size

 In case of file data entry each file will contain single matrix and you must use auto- grow techniques to read data

**Functional Requirements:**

 Sum of Matrix (sum of all values)

 Product of Matrix (product of all values)

 Row-wise Average

 Column-wise Average

 Average or whole Matrix

 Row-wise sorting of Matrix

 Column-wise sorting of Matrix

 Addition of two Matrices

 Subtraction of two Matrices

 Matrix transpose

**Back end:**

 Use separate function for every task listed above that is controlled by menu function which guides users through the various options

 Use separate functions for helping tasks such as file input/output

 Handle any and all sanity checks such as “size < 1”

 In case there are any operations the program cannot perform, show a proper error message on screen to user to clearly state what is wrong with the input

 Code should be thoroughly commented with appropriate details

 There should be no memory leakage at all throughout the program

 All code must be 100% generic

**Useful links:**

[ https://www.shelovesmath.com/algebra/advanced-algebra/matrices-and-solving](https://www.shelovesmath.com/algebra/advanced-algebra/matrices-and-solving-systems-with-matrices/)- [systems-with-matrices](https://www.shelovesmath.com/algebra/advanced-algebra/matrices-and-solving-systems-with-matrices/)/

 [https://en.wikipedia.org/wiki/Matrix\_(mathematics](https://en.wikipedia.org/wiki/Matrix_(mathematics)))

 [https://www.khanacademy.org/math/algebra-home/alg-matric](https://www.khanacademy.org/math/algebra-home/alg-matrices)es

 [https://www.mathsisfun.com/algebra/matrix-introduction.ht](https://www.mathsisfun.com/algebra/matrix-introduction.html)ml

[ https://courses.lumenlearning.com/boundless-algebra/chapter/introduction-to](https://courses.lumenlearning.com/boundless-algebra/chapter/introduction-to-matrices/)- [matrices](https://courses.lumenlearning.com/boundless-algebra/chapter/introduction-to-matrices/)/

 [http://mathworld.wolfram.com/Matrix.ht](http://mathworld.wolfram.com/Matrix.html)ml