**CM0669 Machine Learning and Computer Vision**

**Homework 1:** Matlab programming, matrix operations, implementation of mathematical equations.

You are provided with a data file ‘data.mat’ which contains two matrices *A* and *B* of the same size. Denote by M×N (M rows, N columns) the size of these matrices. You are required to write Matlab programmes that implement the following equations and compute *output*

**A- Matrix operations**

1-

2-

3-

**Solution:**

clear;

clc;

load data;

[M,N]=size(A); % get the size of matrix A

%\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* calculate output 1

output1=sum(sum(A.^2))/(M\*N);

%display output1

disp('Output 1 is'),output1

%\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* calculate output 2

output2=0.5\*sum(sum(A.\*(1+0.2\*B)))/(M\*N);

%display output2

disp('Output 2 is'),output2

%\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* calculate output 3

output3=0.5\*sum(sum(A.\*(1-(1./(1+0.1\*B).^2))));

%display output3

disp('Output 3 is'),output3

**B- Vector operations**

Convert each of the previous matrices into a column vector using the following syntax:

A=A(:); B=B(:);

Denote by *L* the length of each vector. Write Matlab programmes that implement the following equations and compute *output*

1-

2-

3-

**Solution:**

clear;

clc;

load data;

A=A(:); B=B(:);

L=length(A); % get the length of vector A

%\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* calculate output 1

output1=sum(A.^2)/L;

%display output1

disp('Output 1 is'),output1

%\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* calculate output 2

output2=0.5\*sum(A.\*(1+0.2\*B))/L;

%display output2

disp('Output 2 is'),output2

%\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* calculate output 3

output3=0.5\*sum(A.\*(1-(1./(1+0.1\*B).^2)));

%display output3

disp('Output 3 is'),output3