School of Electronic Engineering and Computer Science
**ECS797 Machine Learning for Visual Data Analysis**
Lab 3: Age Estimation by Regression

Sandeep Kaur
190562692

- This lab uses data_age.mat to test and train the model using Linear Regression initially.
- After training and testing using regress() built in matlab function, we have predicted data in the yhat_test variable.
4. To Compute the MAE and CS value (with a cumulative error level of 5) by comparing the estimated ages with the ground truth ages, we used the following matlab code:

```
LRmae = mae(yhat_test,ytest);
LRcum_err = cal_cum_err(yhat_test, ytest);
fprintf('MAE(Linear regression) = %f\n', LRmae);
fprintf('CS(5) = %f\n', LRcum_err(5));
```

5. Vary the cumulative error level from 1 to 15 and generate a plot of the CS value against the cumulative error level using the following line of code and we receive

```
plot(1:15, LRcum_err(1:15))
```
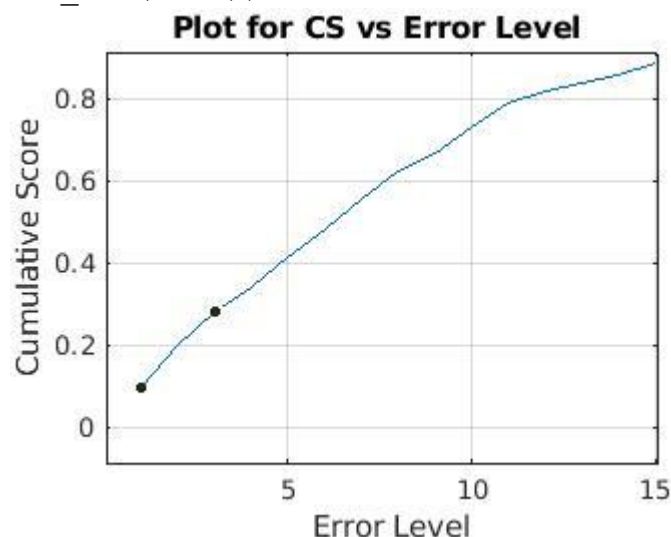

6. Compute the MAE and CS values (with cumulative error level of 5) for both partial least square regression model and the regression tree model by using the Matlab built-in functions. You need to write your own code here.

```
% Partial least square regression
[XL,yl,XS,YS,beta,PCTVAR,MSE,stats] = plsregress(xtrain, ytrain);
```

```matlab
PLSR_yhat_test = [ones(size(xtest,1),1) xtest]*beta;
PLSR_cum_err = cal_cum_err(PLSR_yhat_test, ytest);
PLSR_mae = sum(abs(PLSR_yhat_test-ytest))/size(ytest, 1);
fprintf('MAE(partial least square regression) = %f\n', PLSR_mae);
fprintf('CS(5) = %f\n', PLSR_cum_err(5));


% Regression tree
rt_tree = fitrtree(xtrain, ytrain);
RT_yhat_test = predict(rt_tree, xtest);
RT_cum_err = cal_cum_err(RT_yhat_test, ytest);
RT_mae = sum(abs(RT_yhat_test-ytest))/size(ytest, 1);
fprintf('MAE(regression tree) = %f\n', RT_mae);
fprintf('CS(5) = %f\n', RT_cum_err(5));
```

7. Compute the MAE and CS values (with cumulative error level of 5) for Support Vector Regression by using the LIBSVM toolbox (http://www.csie.ntu.edu.tw/~cjlin/libsvm/). This step is worth 15% of the total mark for this lab.

```matlab
addpath(genpath('libsvm-3.14'));
svm = svmtrain(ytrain, xtrain, '-s 3 -t 0');
SVM_yhat_test = svmpredict(ytest, xtest, svm);
SVM_cum_err = cal_cum_err(SVM_yhat_test, ytest);
SVM_mae = sum(abs(SVM_yhat_test-ytest))/size(ytest, 1);
fprintf('MAE(SVR) = %f\n', SVM_mae);
fprintf('CS(5) = %f\n', SVM_cum_err(5));
```

Model	MAE	CS
Linear Regression	7.7044	0.4124
Partial least Square Regression	7.710329	0.408367
Regression Tree	8.235005	0.503984
Support Vector Machine	5.623867	0.565737