Queen Mary
University of London

School of Electronic Engineering and Computer Science

ECS797   Machine Learning for Visual Data Analysis

Lab 3: Age Estimation by Regression

1. Introduction

This coursework is on age estimation from facial images. In particular, you are required to understand and build programs that take the AAM parameters as representation of human faces and learn a regression function to predict age for an unseen face.

The outcomes from the lab are to be handed in as a .zip file that contains a report and programs that show that you have completed the steps of the lab successfully. Details are given at the end of this sheet.

2. Getting Started

Download "ECS797Lab3.zip" from the course website and extract it to your workspace. There are two main files:

a. data_age.mat" contains both the training and testing data. The FG-NET Aging dataset is used (https://qmplus.qmul.ac.uk/mod/resource/view.php?id=1077137). The dataset contain 1,002 high-resolution color or gray-scale face images of 82 multiple-race subjects with large variation of lighting, pose, and expression. The age range is from 0 to 69 years with chronological aging images available for each subject (on average, 12 images per subject). The 1,002 images are split into a training set and a test set, each of which has about half the images. An AAM feature vector is extracted from each image and used as the representation. The .mat file contains both the feature vector and the true age label for each image, but not the image itself.

b. "lab3.m"-> main executable Matlab file. By reading this file, it will be clear to you how the .mat file is organised.

Recommend: create the subdirectories "ecs797" and "ecs797/lab3".

Start Matlab. Use "cd <directory>" to get into the directory "lab3" you have just created.

In Matlab, load the "lab3.m" file in the matlab editor. You will need to edit the code in the file in order to complete the missing parts. Those parts are explained below, as well as in the lab3.m file comments.

3. Complete the lab2.m file

1. Read in the training and test data by loading the .mat file.
2. Call the Matlab built-in function regress(), which takes the training features and labels as input and learn a linear regression model. Read Matlab document to understand which linear regression model is implemented.
3. Read in the test data, and apply the learned linear regression model to estimate the age for each test data point.
4. Compute the MAE and CS value (with a cumulative error level of 5) by comparing the estimated ages with the ground truth ages. You need to write your own code here.
5. Vary the cumulative error level from 1 to 15 and generate a plot of the CS value against the cumulative error level. You need to write your own code here. See the lecture slides for week 6 for an example of the plot.
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.
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.

4. Handing In

Create a folder that will contain:
• A .pdf report that contains plots from experiments, a discussion of the experimental results, and program listings (including comments). In particular, you should include the CS plot for linear regression, and a table to compare the four different regression models using both MAE and CS with an error level of 5.
• The programs files

Create a .zip file and submit electronically.

IMPORTANT: Plagiarism (copying from other students, or copying the work of others without proper referencing) is cheating, and **will not be tolerated**.

IF TWO "FOLDERS" ARE FOUND TO CONTAIN IDENTICAL MATERIAL, <u>BOTH</u> WILL BE GIVEN A MARK OF <u>ZERO</u>.

Resources on partial least square regression:
https://en.wikipedia.org/wiki/Partial_least_squares_regression
https://uk.mathworks.com/help/stats/partial-least-squares.html