CITS4402 Computer Vision

Project: Linear Regression for Face Recognition

Due: Wednesday, 1st June 2016, 6pm (NO EXTENSIONS)

Grouping

Form groups of 2 or 3 students and email the names of your group members to afaq.shah@uwa.edu.au.

Timeline

Thursday 15th April 2016: Last day to email your group names.
Week 7 to Week 13 (until Wednesday): You have 7 weeks to work on your project. For project related queries, consult Dr. Afaq Shah. **Consultation Day/Time: Wednesday, 1:30PM to 2:30PM.** Room 1.10 (CSSE).
Wednesday 1st June 2016: Presentation of the projects from 2:00PM to 3:55PM
Wednesday 1st June 2016 6:00PM: Final deadline to submit your project on cssubmit.

THE PROJECT

You are required to develop an automatic face recognition system. The idea is to develop intelligent computer vision software to process the images and recognize faces in the images. You will divide your images into training and test data. In practice, the test data will have different images from the training dataset. For example, if there are 10 images of a subject A, use 5 images for training and the remaining 5 images for testing. Assuming there is a total of 40 subjects, you will have 40x5 images in the training set and 40x5 images in the test set. For the implementation of this system, please read the following article, "Linear Regression for Face Recognition" (Implement the Linear Regression Classification –LRC-- Algorithm proposed in Section 2.1 for this project). During implementation, focus on the pseudocode of the LRC algorithm provided in Section 2 of the paper.

Paper: PDF copy attached.

Image dataset: Use the attached image dataset (zipped folder)

There are two phases to develop this face recognition system (1) the training phase (also called learning phase) and (2) the testing phase.

Training / Learning Phase

In the training phase, you will develop a class-specific model for training images as explained in the above article. For a given image dataset, you can use 50% of the images for training. Remember, 50% per subject i.e., if there are 10 images per subject, use 5 images for training. Once you have your training set, down-sample and normalize your training images as per the

procedure outlined in the attached manuscript ("linear regression for face recognition"). Use this normalized data to train your system.

Testing Phase

Use the remaining 50% images for testing. Down-sample and normalize the test images as you did during the training phase. Compute the original response/label (training data/model will be required) and the predicted response (label) for the test image. Compare these responses using the distance measure, used in the paper, to predict the class of the test image. Based on the quality and consistency of the prediction, decide which class corresponds best to the test image. Once you have predicted the classes of all test images, report your overall recognition accuracy.

Repeat the above steps 5 times for different combinations of the training and test data. Calculate the recognition rate of your system. What happens when you use different combinations of training and test data?

Now capture new images (yours and your friends) from different viewpoints and expressions (a minimum of 5 individuals with 5 images per individual). Define your new training and test data. Give these images as input to your face recognition system for training and testing. What recognition accuracy do you get?

Develop a simple GUI for testing your algorithm. The GUI should load a test image one by one, predict the class of the test face/image and display the results. The sample video provided on the project page can be used as an example. The recognition should be fully automatic and you may only specify the directory where the test images are present. Your code should already know where to find the training data.

Distribution of Marks [total=25 marks]

1. Image Data: 50% images for training and remaining 50% for testing. For a given subject with 10 images in a folder, your code should be able to automatically read 5 images for training and 5 images for testing from the same folder [3 marks]
2. GUI to test your code showing the testing phase only (see attached video as an example). [3 marks]
3. Computation of class-specific prediction model 'X_i' called the predictor for a class (in the paper), original and predicted responses/labels i.e., 'y' and 'y_i'. [10 marks]
4. Implementation, comparison of responses, and display of recognition results. [3 marks]
5. Results with different combinations of training and test data, and your new images. [6 marks]

FAQS

How do I form a group?
Try talking to fellow students before and after the lectures and during the labs. Try posting on Discussion Forum (CITS4402 Forum on lms) that you are looking for group members.

Presentations

In your final lab (week 13, Wednesday 1st June, 2016), each group will present their system and demonstrate that their face recognition system is working properly.

Submission Requirements

Soon after the presentation (or before it) you are required to upload (on cssubmit) a folder containing your code and new face images. Marks will be based on your presentation and the submitted code.