CSE353 Assignment 2: Face vs. Non-face

Due Sep 30 2021, 5:00PM, submitted via Blackboard

Main TA for this assignment:
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This project will implement the Generative model for face classification (classifying face images from non-face/background images).

A dataset of faces and non-face background images are uploaded to Blackboard.

Important note: don't re-distribute the dataset. We only use it in our class assignments.

(1). Describe the image data of each class with a multivariate Gaussian distribution ($face: y = 1; non - face: y = 0$):

$$\Pr(x|y = 1) = Norm_x[\mu_1, \Sigma_1]$$

$$\Pr(x|y = 0) = Norm_x[\mu_0, \Sigma_0]$$

Learn the parameters of each class (μ_y, Σ_y) from the training dataset using the Maximum Likelihood. To simplify the generative model, let's assume the covariance matrix is a diagonal matrix. You can visualize the mean and variance of the face and non-face classes.

(2). During the inference, we assume the prior of each class is equal. Apply the Bayesian rule to the testing dataset and report the classification accuracy on the face and non-face classes.

Upload your codes with enough comments and a brief report to Blackboard by the due date & time, including

a) Introduction. Brief summary of what you think the assignment is about,

b) Method. Brief outline of your (algorithmic) approach,

c) Experiments. Tables and/or pictures of intermediate and final results that convince us that the program does what you think it does.

d) Discussions and Conclusions. Any design decisions you had to make and your experimental observations. What do you observe about the behavior of your program when you run it? Does it seem to work the way you think it should? Play around a little with different setting to see what happens. Note, your open-ended exploration is highly valued.

Something to try during the project (optional):

(a) Use the single red, green and blue channel for the generative model, and compare their performance with the three channels together. Try some other color spaces (gray, HSV, YCbCr, etc.);
(b) Try the spatial gradient of the images as input (magnitude and orientation);