

# Project 1

CSE 402 - Biometrics and Pattern Recognition

Instructor: Dr. Arun Ross

Due Date: October 10, 2018 (12:40 pm)

Total Points: 50

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**Note:**

(a) While you may discuss this project with others, the final submission *must be your own effort*. **Any indication to the contrary will be considered an act of academic dishonesty.**

(b) Your zipped code (labelled as proj01\_yourname.zip) should be sent to rossarun at cse.msu.edu with the subject line "cse402: proj01\_yourname" before the lecture begins on the due date.

(c) A hard-copy showing the results of your work should be turned in before the lecture begins on the due date. The appendix of your report should include the code developed in this project.

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This exercise involves generating match score distributions and ROC curves for two different modalities/matchers - fingerprint and hand. The fingerprint scores are *similarity-based*, while the hand scores are *distance-based*. The set of scores can be accessed [here](#).

1. How many genuine and impostor scores are available for the fingerprint matcher and the hand matcher?
2. What are the maximum and minimum scores generated by each matcher?
3. Report the mean and variance of the (a) genuine scores and (b) impostor scores for the fingerprint matcher. Repeat this for the hand matcher.
4. Report the d-prime value for each matcher.
5. For each matcher, plot the histogram of genuine and impostor scores in the same graph. So there will be two graphs - one for the fingerprint matcher and the other for the hand matcher.
6. Write a program that inputs a threshold value,  $\eta$ , for each matcher and outputs the False Match Rate (FMR) and False Non-match Rate (FNMR) at that threshold. Use this program to compute the FMR and FNMR for the following scenarios:
  - (a) Fingerprint Matcher:  $\eta = 32$
  - (b) Hand Matcher:  $\eta = 45$

7. Based on the program designed in (6), write another program that inputs a set of genuine scores and impostor scores and plots the Receiver Operating Characteristic (ROC) curve. Use this program to plot the ROC curve for both the matchers and report the Equal Error Rate (EER) and the Area Under the Curve (AUC).
  8. For each of the two matchers determine what the FNMR is at (a) FMR = 10%; (b) FMR = 1%; (c) FMR = 0.1%. You can determine these values from the ROC curve.
  9. Which matcher, in your opinion, has performed well? Justify your answer.
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