

Homework 3

BIOM 693: Advanced Biometrics

Instructor: Dr. Arun Ross

Due Date: April 30, 2009

Note: You are permitted to discuss the following questions with others in the class. However, you *must* write up your *own* solutions to these questions. Any indication to the contrary will be considered an act of academic dishonesty.

1. [30 points] You are given the [similarity scores](#) associated with two modalities - face and hand geometry. For your convenience, the genuine and impostor scores of each modality have been placed in two separate files. Fuse the two modalities at the match score level using the (a) simple sum rule; (b) simple product rule; (c) max rule; (d) min rule; (e) the likelihood ratio; and (f) probabilistic sum rule. Report the d-prime value, the Equal Error Rate (EER) and the ROC curve in each case and compare the performance before and after fusion. For fusion schemes (a) - (d) you can normalize the match scores using the min-max scheme. To conduct fusion using schemes (e) and (f), you may assume the following: $p_{hand}(x | gen) \sim N(94, 4^2)$, $p_{hand}(x | imp) \sim N(77, 13^2)$, $p_{face}(x | gen) \sim N(92, 6^2)$ and $p_{face}(x | imp) \sim N(58, 14^2)$.
 2. [15 points] Discuss (with examples) some of the limitations of unimodal biometric systems.
 3. [15 points] Briefly describe (with examples) the various levels of fusion possible in a multi-biometric system?
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