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Homework 3

Critical Thinking Questions

1. Score Distributions and Interpretation:
   a. Why is it important to plot both genuine and impostor score distributions? What insights can be drawn from visually comparing their distributions?
   Plotting both genuine and impostor score distributions is important because it shows how well the system can separate genuine from impostor scores. A clear separation indicates good system performance.

   b. How does d-prime relate to the separation between genuine and impostor scores, and why is it a key metric for system performance?
   D-prime measures the separation between genuine and impostor scores, with a higher d-prime indicating better separation and therefore better system performance.

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2. Thresholding and Performance Metrics:
   a. What is the significance of evaluating FPR, FNR, and TPR across a range of threshold values? How does this inform the performance of a biometric system?
   Evaluating FPR, FNR, and TPR across thresholds shows how performance changes at different cutoff points, helping to understand the trade-off between security and usability.

   b. When selecting a threshold for a real-world biometric system, what trade-offs would you need to consider between false acceptance and false rejection rates?
   The trade-off is between security (low false acceptance rate) and user convenience (low false rejection rate); a stricter threshold reduces false acceptance but may increase false rejection.

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3. DET and ROC Curves:
   a. How do DET and ROC curves provide complementary perspectives on system performance? Under what conditions might one curve provide more useful insights than the other?
   DET curves focus on error rates, useful for high-security needs, while ROC curves show the trade-off between true positive and false positive rates, useful for overall performance. DET is more useful for error-sensitive applications.

   b. What does the EER (Equal Error Rate) represent, and why is it useful for com- paring different biometric systems?
   The EER is where false acceptance and false rejection are equal, providing a single measure to compare systems; a lower EER means better performance.

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4. System Comparison:
    a. After generating results for Systems A, B, and C, what factors would you consider when comparing their performance? How might the underlying distributions of genuine and impostor scores explain differences in their DET and ROC curves?
    When comparing systems A, B, and C, I'd look at d-prime, EER, and score distributions. Differences in the distributions can show why one system may have better DET or ROC curves than others, revealing how well each system separates genuine and impostor scores