Recitation 4 Outline

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Binary Hypothesis Tests: Receiver Operating Characteristic (ROC)

1. Partially Singular Hypothesis Test

$$H_0 : \mathbf{y} \text{ uniformly distributed on } [-1, 1]$$
$$H_1 : \mathbf{y} \text{ uniformly distributed on } [0, 2]$$

- Derivation of ROC: discrete points achievable using likelihood ratio tests
- Achieve other points on ROC using randomized tests
- Randomization provides the optimal decision rule under the Neyman-Pearson criterion

2. Performance analysis: given ROC & threshold minimizing probability of error, find

- Prior probabilities
- Minimum achievable probability of error
- Achievable tests given MPE rule and a fair coin
- Given additional assumptions, the likelihood function for each hypothesis

Geometry of M-ary Hypothesis Tests

1. Decomposition to sets of pairwise comparisons

2. Gaussian distributions with different means, shared covariance

- Minimum distance rule
- Voronoi diagram construction by intersection of halfspaces

3. Geometry on the conditional probability simplex (§2.8.4)

- Decision boundaries are hyperplanes defined by costs
- Visualization of these boundaries when M=2,3