Lecture 8 Outline:

Textbook Reading: ESL Chapter 4.1 - 4.3 or ISL 4.1-4.2 and 4.4.

1. From regression to classification:
   - Why not perform regression on indicators?

2. Simple methods:
   - (a) $K$-nearest neighbor classifier.
   - (b) Nearest centroid classifier.
     - Geometry: Linear decision boundaries.

3. Naive Bayes Classifier.
   - Generative classifiers.
   - Bayes Theorem.
   - Naive Bayes diagonal covariance model.

4. Three views of Linear Discriminant Analysis (LDA).
   - (1) Bayes classifier: Each class a multivariate normal with common covariance.
   - (2) Fisher’s Discriminant Analysis.
   - (3) Optimal Scoring.

5. Bayes classifier & multivariate normal approach.
   - Class probabilities.
   - Derivation of discriminant functions.
   - Sample estimation of centroids and pooled covariance.

   - Within and between class covariances.
   - Optimization problem & solution.
   - Generalized Eigenvalue problem.
   - Supervised dimension reduction.

7. Optimal Scoring.
   - Optimization problem & solution.

8. Strengths & Weaknesses of LDA.