Lecture 16 Outline:
Textbook Reading: ESL 14.3 - 14.9 and ISL Chapter 10.

1. Review NMF.

2. Independent Components Analysis.
   (a) Decompose a matrix into a set of independent source signals and a mixing matrix.
   (b) Interpretations & Applications - blind source separation, denoising.
   (c) Algorithms - Entropy vs. Negentropy.
   (d) Properties.

3. Multi-Dimensional Scaling.
   (a) Represent distances between points in a lower dimensional space.
   (b) Stress functions.
   (c) Properties.

4. Real data example: Digits.

5. Comparative Strengths & Weaknesses: PCA, SPCA, ICA, NMF, MDS.

6. Clustering (data segmentation; finding groups).
   • Minimize the within-cluster dissimilarity.
   • Dissimilarity measures.
   • Hard vs. Soft clustering.
   • Clustering variables vs. cluster observations vs. clustering both (bi-clustering).

   • Minimizes the within cluster dissimilarity based on Euclidean distance.
   • K-means algorithm.
   • Properties.
   • Simulated examples.

8. Choosing the number of clusters for K-means:
   • Heuristic methods - look for the “kink” in the loss function.
   • Gap statistic.
   • Silhouette Statistic.
   • Prediction Strength.
   • Cluster Stability.