

TMA4268 Statistical Learning

Chapter 10: Recommended exercises

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Recommended exercise 1

- For the New York Times stories dataset:
 - Create a biplot and explain the type of information that you can extract from the plot.
 - Create plots for the PVE and Cumulative PVE. Describe what type of information you can extract from the plots.

The `pca-examples.rdata` can be downloaded from the Blackboard.

Recommended exercise 2

Show that the algorithm below is guaranteed to decrease the value of the objective

$$\underset{C_1, \dots, C_K}{\text{minimize}} \left\{ \sum_{k=1}^K \frac{1}{|C_k|} \sum_{i, i' \in C_k} \sum_{j=1}^p (x_{ij} - x_{i'j})^2 \right\}$$

at each step.

Algorithm 10.1 *K-Means Clustering*

1. Randomly assign a number, from 1 to K , to each of the observations. These serve as initial cluster assignments for the observations.
 2. Iterate until the cluster assignments stop changing:
 - (a) For each of the K clusters, compute the cluster *centroid*. The k th cluster centroid is the vector of the p feature means for the observations in the k th cluster.
 - (b) Assign each observation to the cluster whose centroid is closest (where *closest* is defined using Euclidean distance).
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Recommended exercise 3

Perform k-means clustering in the New York Times stories dataset.

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Recommended exercise 4

Perform hierarchical clustering in the New York Times stories dataset.

The `pca-examples.rdata` can be downloaded from the Blackboard.