Module 10: Recommended Exercises

TMA4268 Statistical Learning V2020

Thiago G. Martins, Department of Mathematical Sciences, NTNU

March 14, 2020

a

Recommended exercise 1

The New York Times stories dataset are contained in the file `pca-exampes.rdata`, which you can load from google drive (https://drive.google.com/open?id=1vaK9GDvMw4Hsuv0T1jHeq9ZyrqLhJ6MR) and store in the directory of your Rmd file. The pca-examples.rdata can be loaded with the following code.

```
load("pca-examples.rdata")

# We will work with nyt.frame
nyt_data = nyt.frame
```

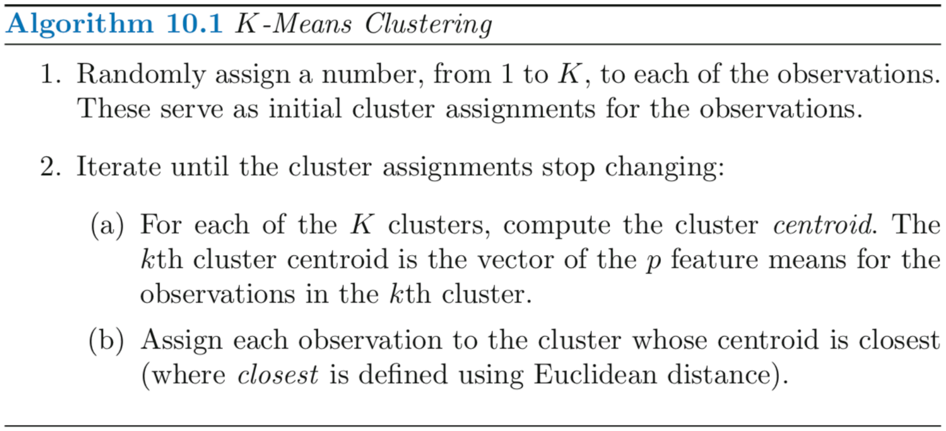
- For the New York Times stories (`nyt_data`) dataset:
  - Create a biplot and explain the type of information that you can extract from the plot.
  - Create plots for the proportion of variance explained (PVE) and cumulative PVE. Describe what type of information you can extract from the plots.

Recommended exercise 2

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

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

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).
```

Recommended exercise 3

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

Recommended exercise 4

Perform hierarchical clustering in the New York Times stories dataset.