p8106_hw6_yg2625

Yue Gu

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Cluster analysis

We perform hierarchical clustering on the states using the USArrests data in the ISLR package. For each of the 50 states in the United States, the data set contains the number of arrests per 100,000 residents for each of three crimes: Assault, Murder, and Rape. The data set also contains the percent of the population in each state living in urban areas, UrbanPop. The four variables will be used as features for clustering.

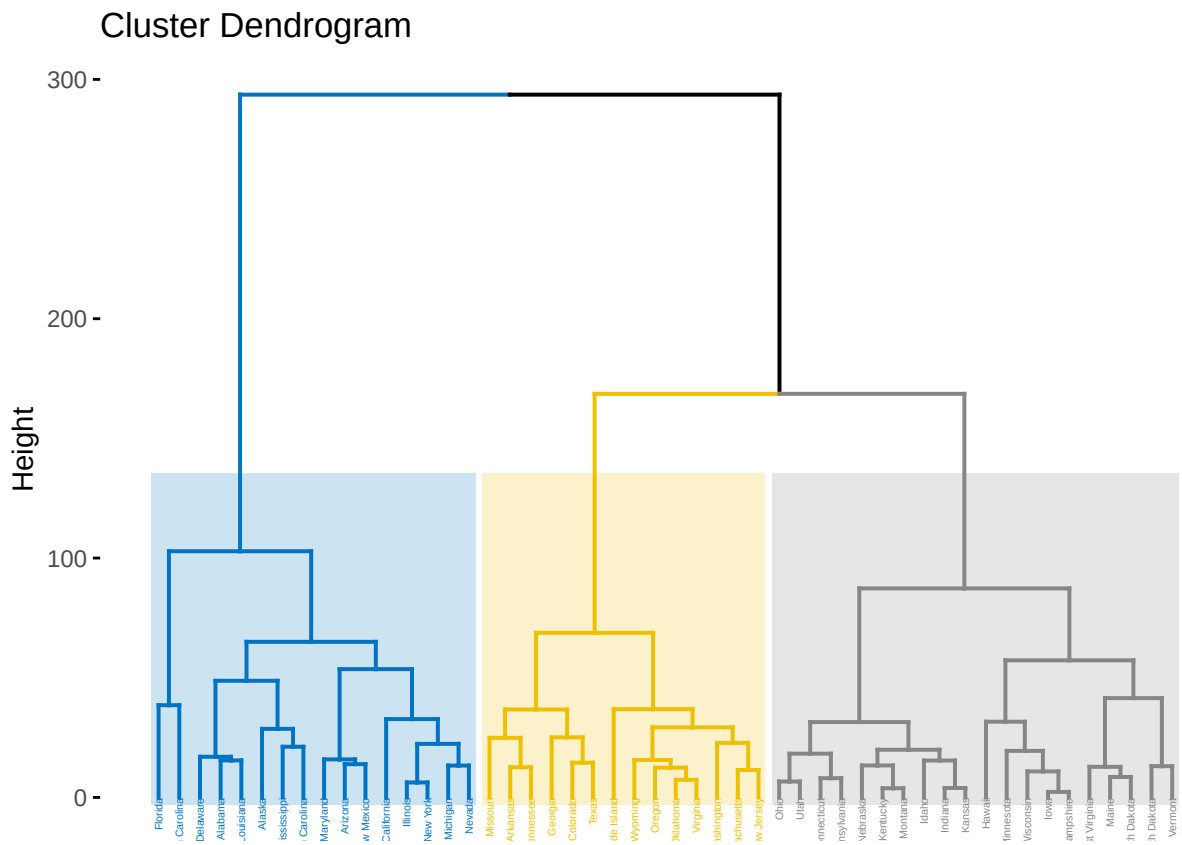
(a) Using hierarchical clustering with complete linkage and Euclidean distance, cluster the states.

```
# load data
data(USArrests)
arr_data = USArrests %>%
  janitor::clean_names()

# fit hierarchical cluster
hc.complete <- hclust(dist(arr_data), method = "complete")
```

(b) Cut the dendrogram at a height that results in three distinct clusters. Which states belong to which clusters?

```
# visualize dendrogram in 3 distinct clusters
fviz_dend(hc.complete, k = 3,
          cex = 0.3,
          palette = "jco",
          color_labels_by_k = TRUE,
          rect = TRUE, rect_fill = TRUE, rect_border = "jco",
          labels_track_height = 2.5)
```




```
# show the states in clusters
ind3.complete <- cutree(hc.complete, 3)
# name of states in cluster 1
arr_data[ind3.complete == 1,] %>% row.names()
```

```
##  [1] "Alabama"        "Alaska"         "Arizona"        "California"
##  [5] "Delaware"       "Florida"        "Illinois"       "Louisiana"
##  [9] "Maryland"       "Michigan"       "Mississippi"    "Nevada"
## [13] "New Mexico"     "New York"       "North Carolina" "South Carolina"
```

```
# name of states in cluster 2
arr_data[ind3.complete == 2,] %>% row.names()
```

```
##  [1] "Arkansas"      "Colorado"      "Georgia"       "Massachusetts"
##  [5] "Missouri"      "New Jersey"    "Oklahoma"      "Oregon"
##  [9] "Rhode Island"  "Tennessee"     "Texas"         "Virginia"
## [13] "Washington"    "Wyoming"
```

```
# name of states in cluster 3
arr_data[ind3.complete == 3,] %>% row.names()
```

```
##  [1] "Connecticut"   "Hawaii"        "Idaho"         "Indiana"
##  [5] "Iowa"          "Kansas"        "Kentucky"      "Maine"
##  [9] "Minnesota"     "Montana"       "Nebraska"      "New Hampshire"
## [13] "North Dakota"  "Ohio"          "Pennsylvania"  "South Dakota"
## [17] "Utah"          "Vermont"       "West Virginia" "Wisconsin"
```

(c) Hierarchically cluster the states using complete linkage and Euclidean distance, after scaling the variables to have standard deviation one.