DSC520 Week11-12 Exercise 11.2.2

Anjani Bonda

March 4th 2022

```
# Load the packages
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.6     v dplyr   1.0.7
## v tidyr   1.1.4     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(cluster)
library(factoextra)
```

```
## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
```

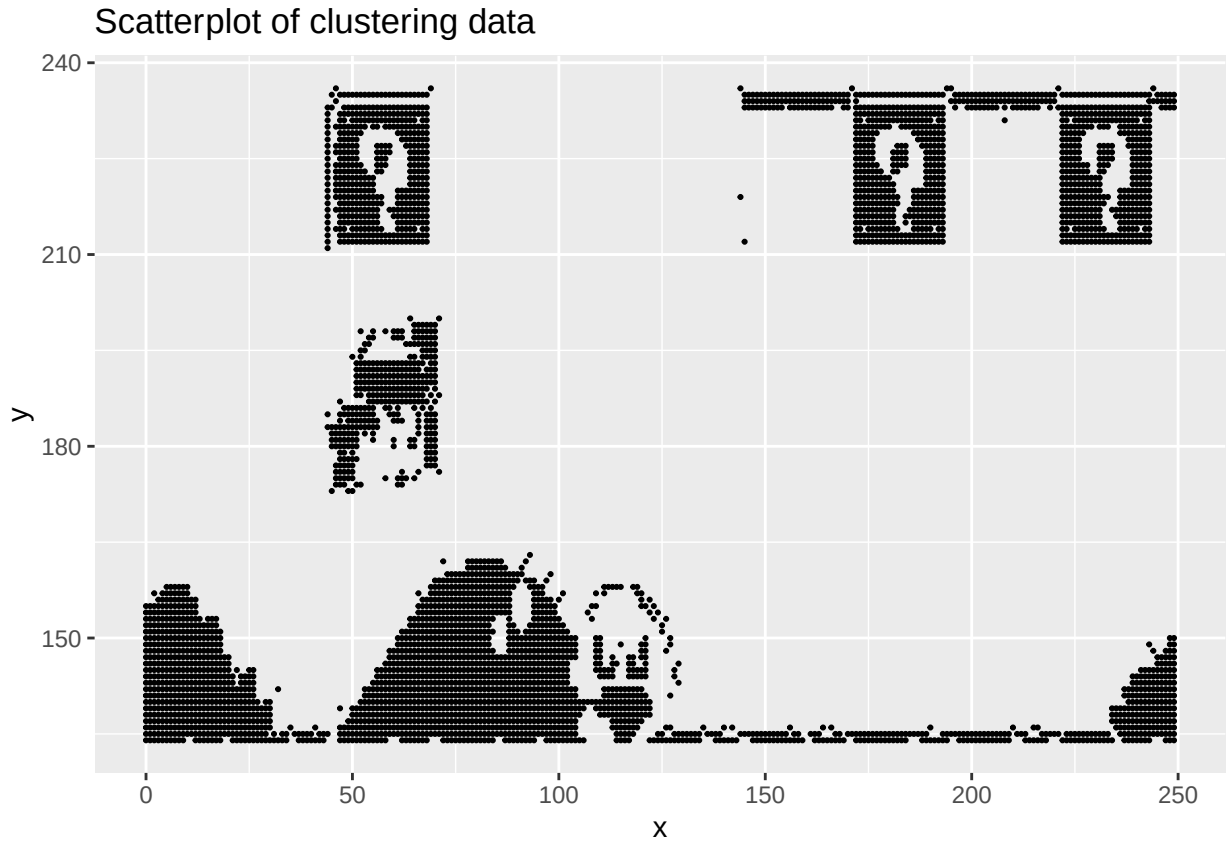
```
setwd("/Users/anjanibonda/DSC520/dsc520")
# Load the clustering dataset to dataframe
cluster_df <- read.csv("data/clustering-data.csv")
# Examine the structure
str(cluster_df)
```

```
## 'data.frame':    4022 obs. of  2 variables:
##  $ x: int  46 69 144 171 194 195 221 244 45 47 ...
##  $ y: int  236 236 236 236 236 236 236 236 235 235 ...
```

```
# Check sample rows
head(cluster_df)
```

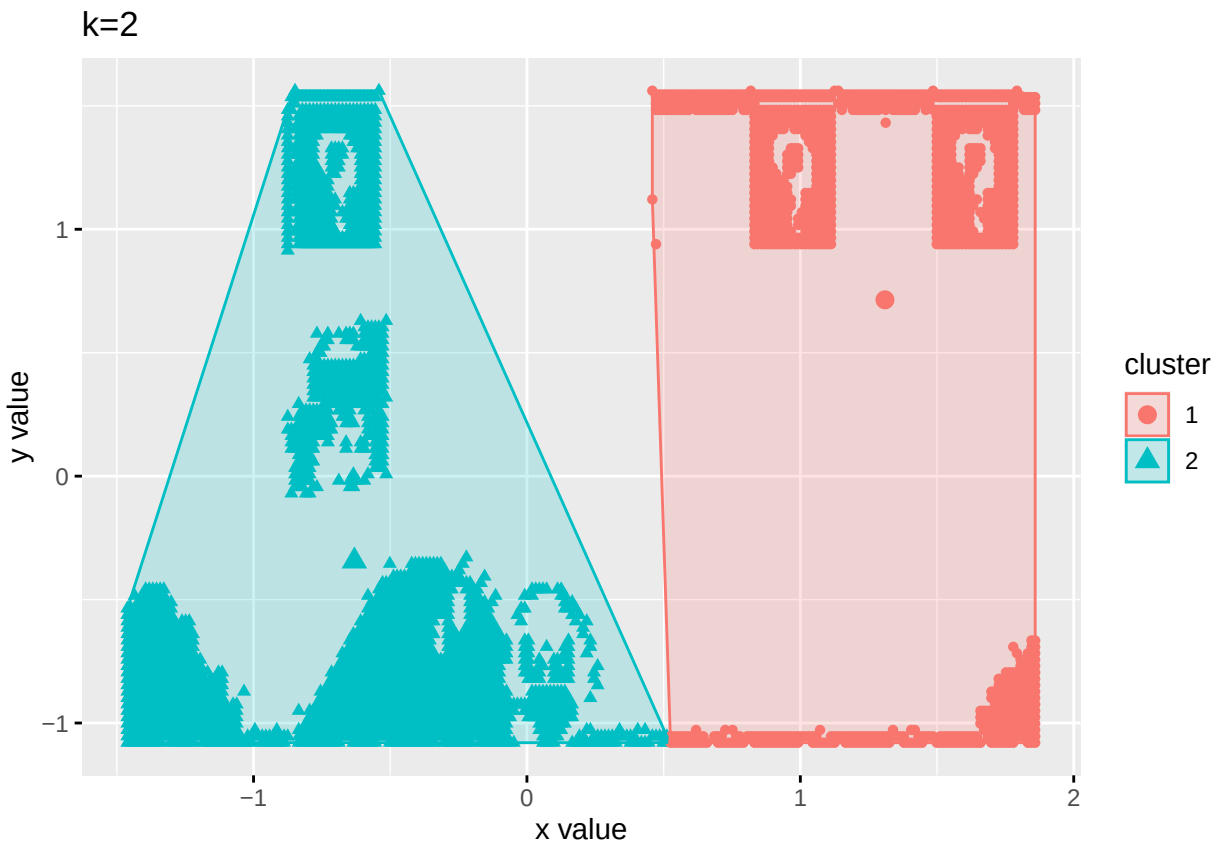
```
##     x   y
## 1  46 236
## 2  69 236
## 3 144 236
## 4 171 236
## 5 194 236
## 6 195 236
```

```r
# i.Plot the dataset using a scatter plot.
library(ggplot2)
ggplot(data=cluster_df,aes(x=x,y=y)) + geom_point(size=0.4) + ggtitle("Scatterplot of clustering data")
```

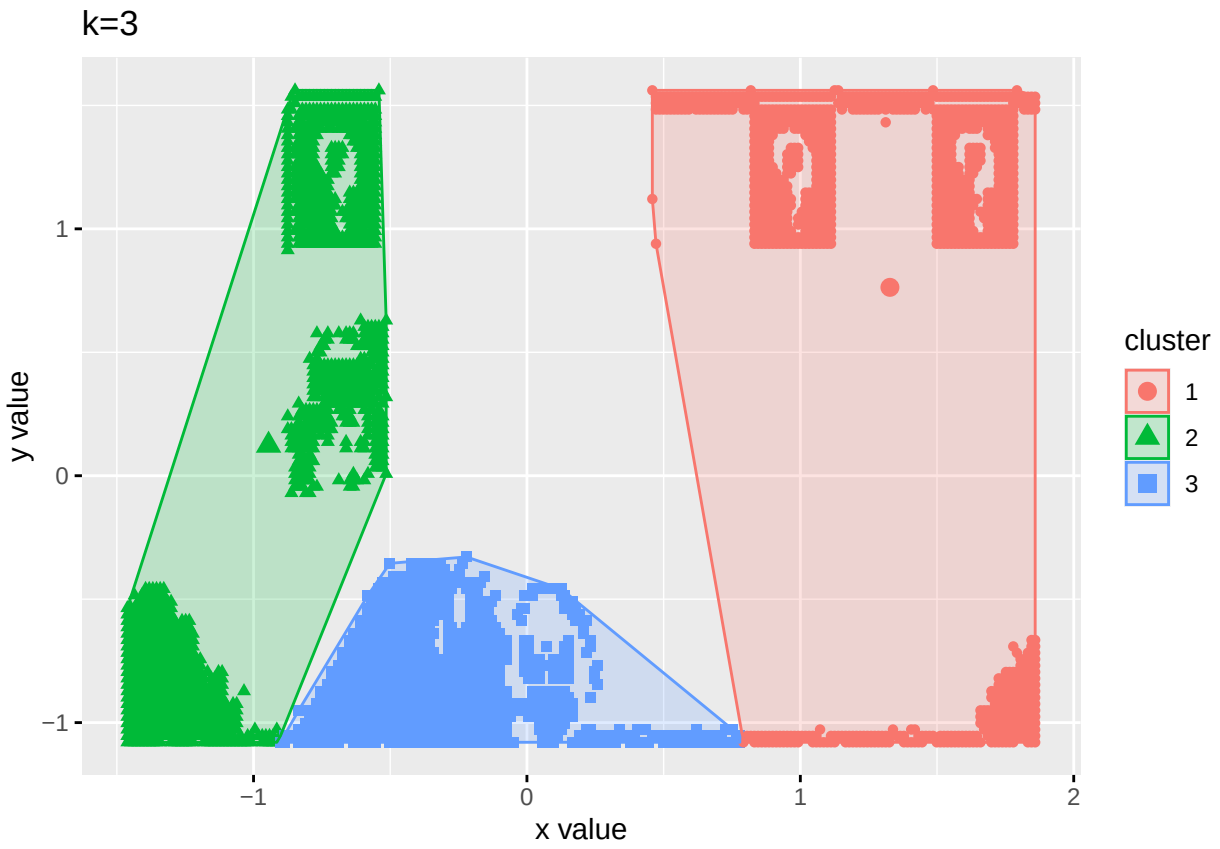



```r
# ii.Fit the dataset using the k-means algorithm from k=2 to k=12. Create a scatter plot of the resulta
set.seed(123)
kmeans_2 <- kmeans(cluster_df, 2, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_3 <- kmeans(cluster_df, 3, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_4 <- kmeans(cluster_df, 4, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_5 <- kmeans(cluster_df, 5, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_6 <- kmeans(cluster_df, 6, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_7 <- kmeans(cluster_df, 7, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_8 <- kmeans(cluster_df, 8, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_9 <- kmeans(cluster_df, 9, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_10 <- kmeans(cluster_df, 10, iter.max = 300, nstart = 10)
set.seed(123)
kmeans_11 <- kmeans(cluster_df, 11, iter.max = 300, nstart = 10)
```

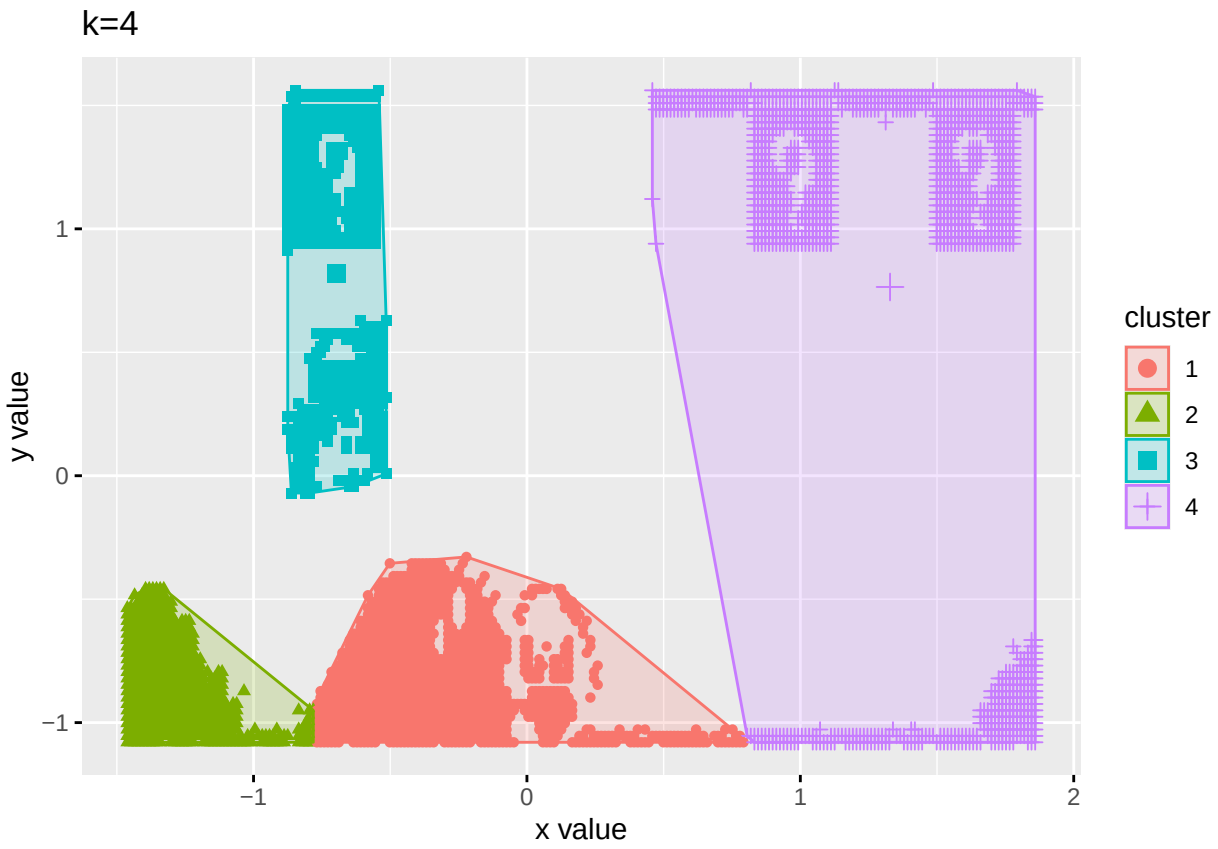
```
set.seed(123)
kmeans_12 <- kmeans(cluster_df, 12, iter.max = 300, nstart = 10)
# Plots to compare
fviz_cluster(kmeans_2, geom="point",data=cluster_df) + ggtitle("k=2")
```



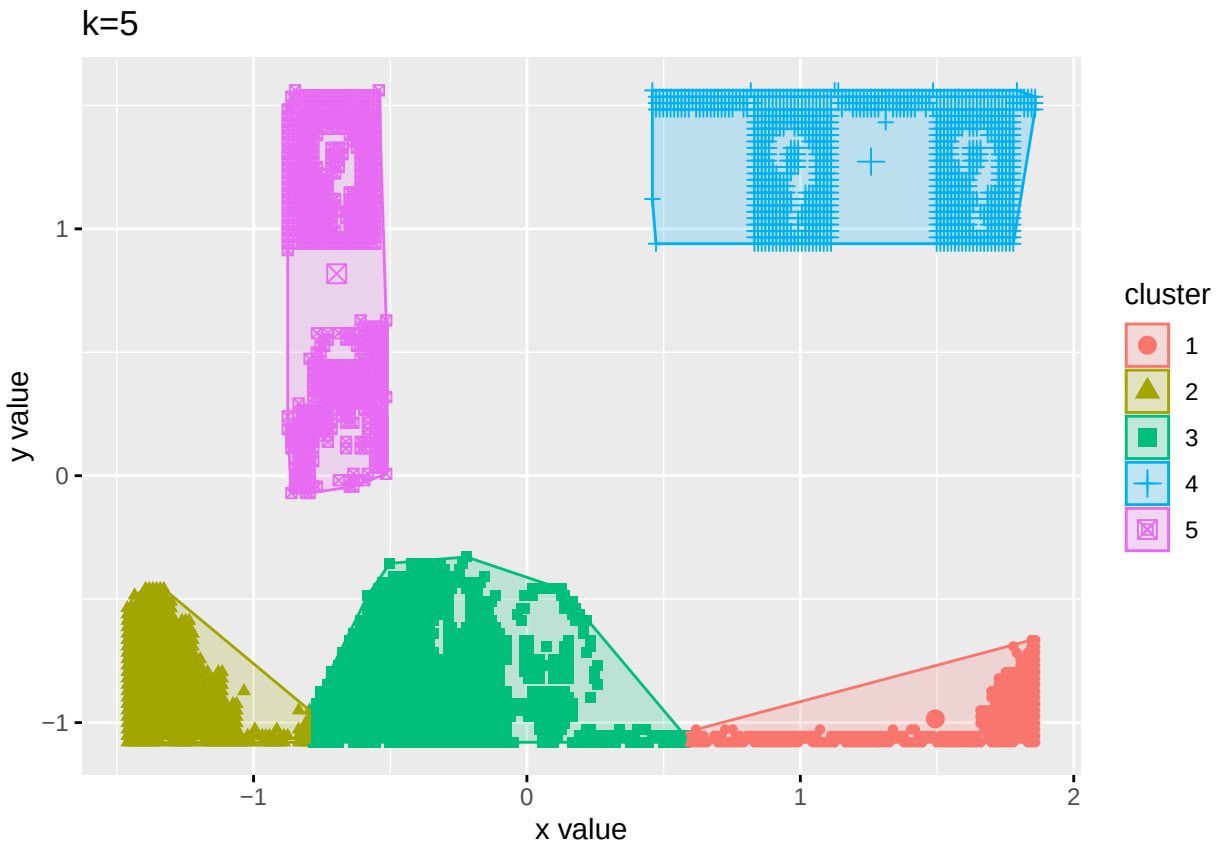

```
fviz_cluster(kmeans_3, geom="point",data=cluster_df) + ggtitle("k=3")
```



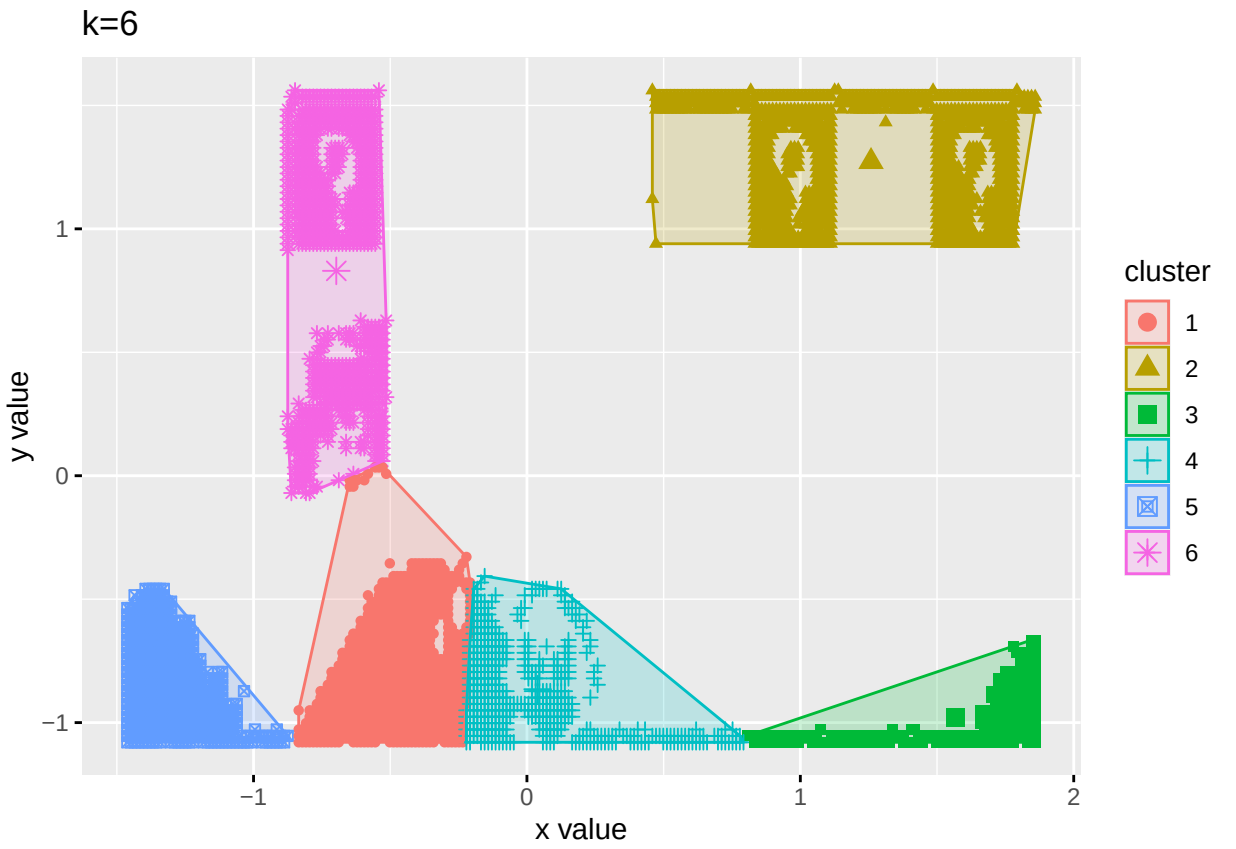

```
fviz_cluster(kmeans_4, geom="point",data=cluster_df) + ggtitle("k=4")
```



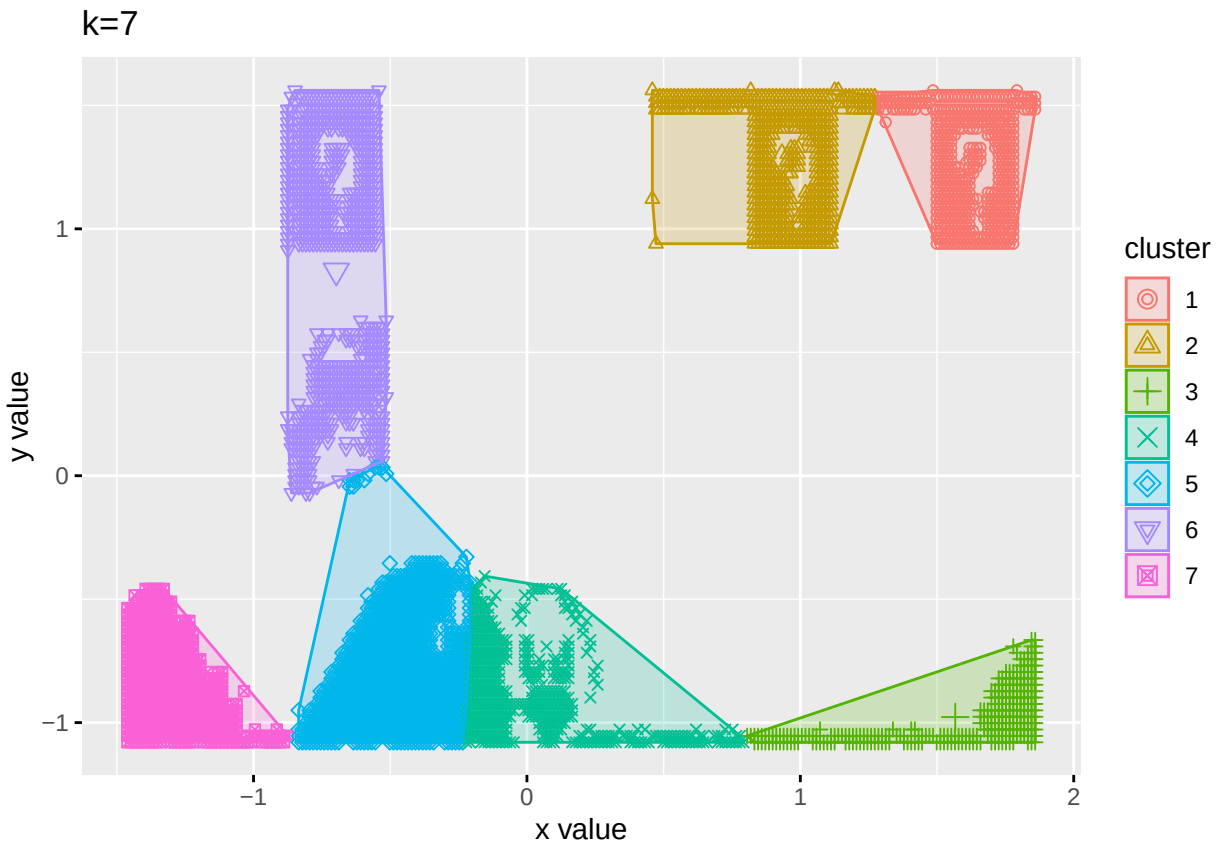

```
fviz_cluster(kmeans_5, geom="point",data=cluster_df) + ggtitle("k=5")
```



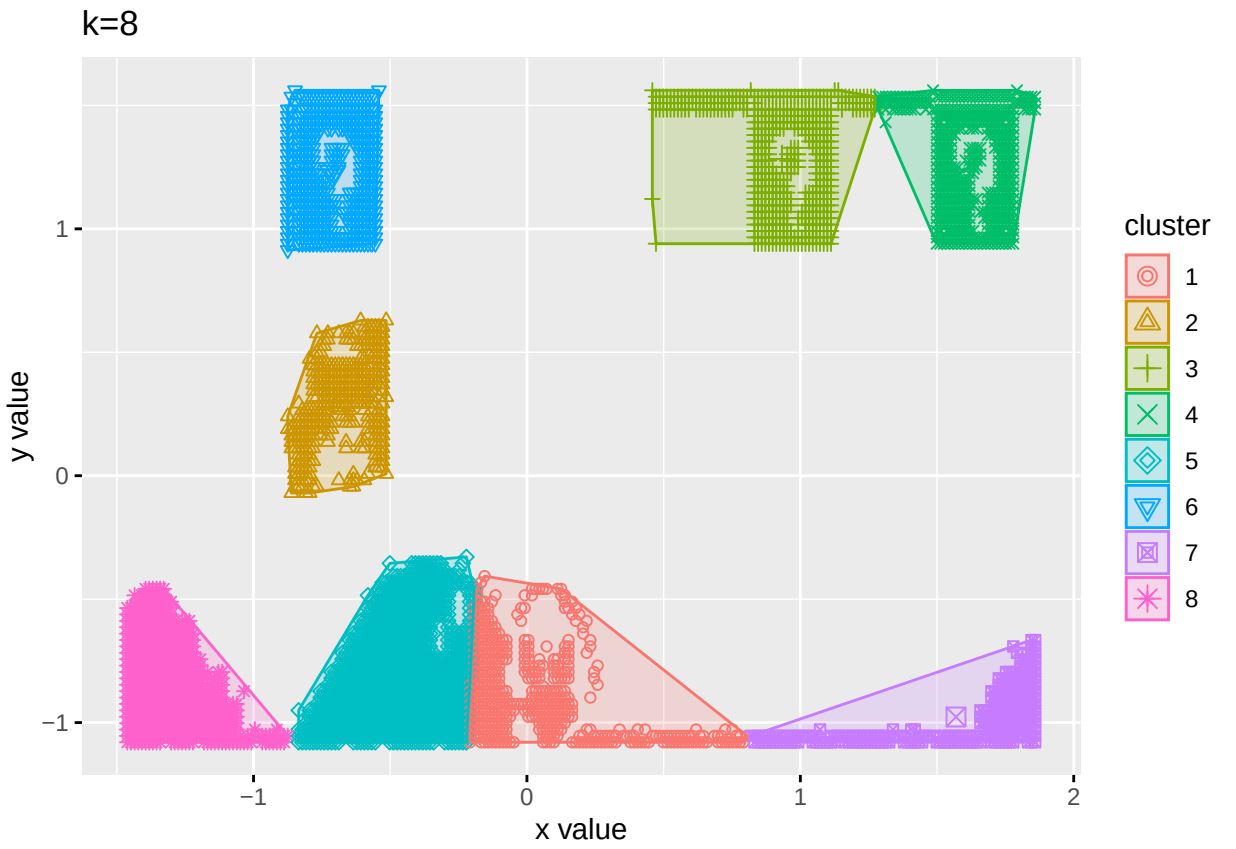

```
fviz_cluster(kmeans_6, geom="point",data=cluster_df) + ggtitle("k=6")
```



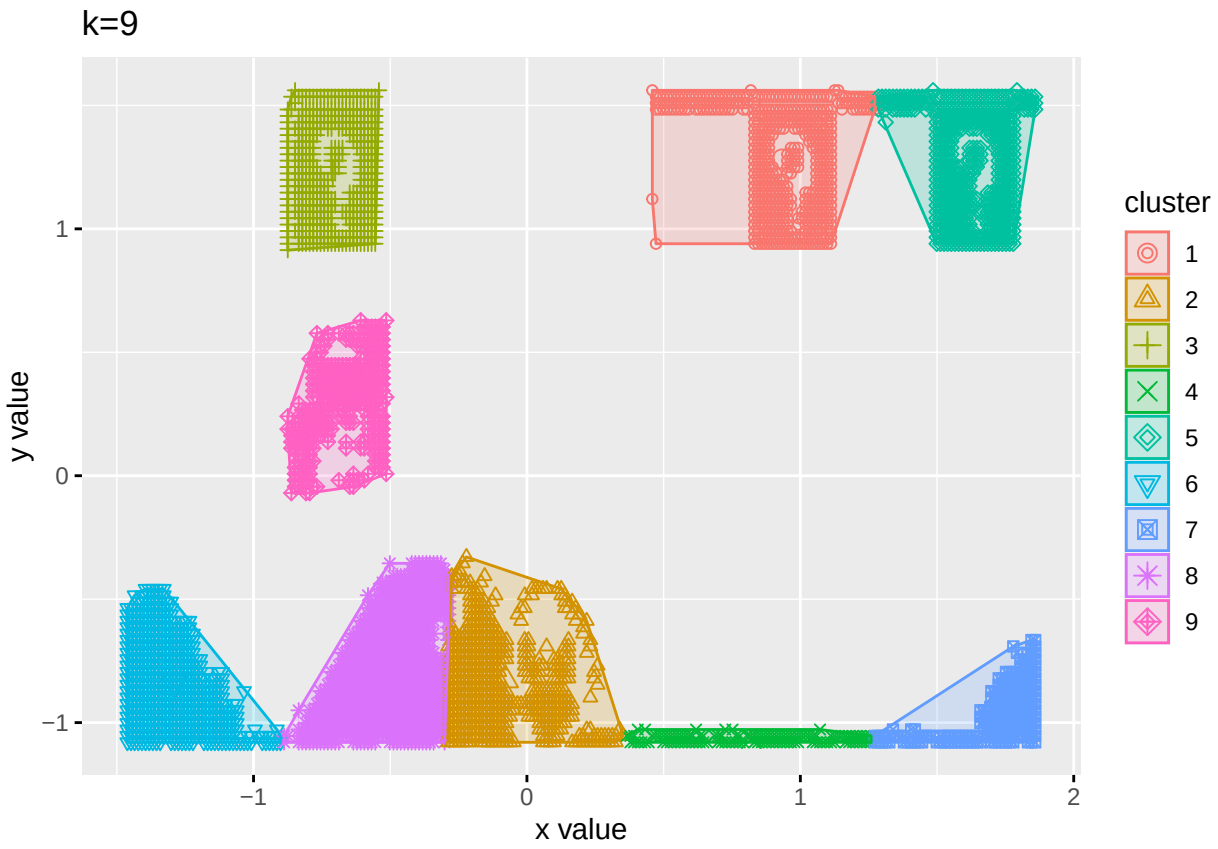

```
fviz_cluster(kmeans_7, geom="point",data=cluster_df) + ggtitle("k=7")
```



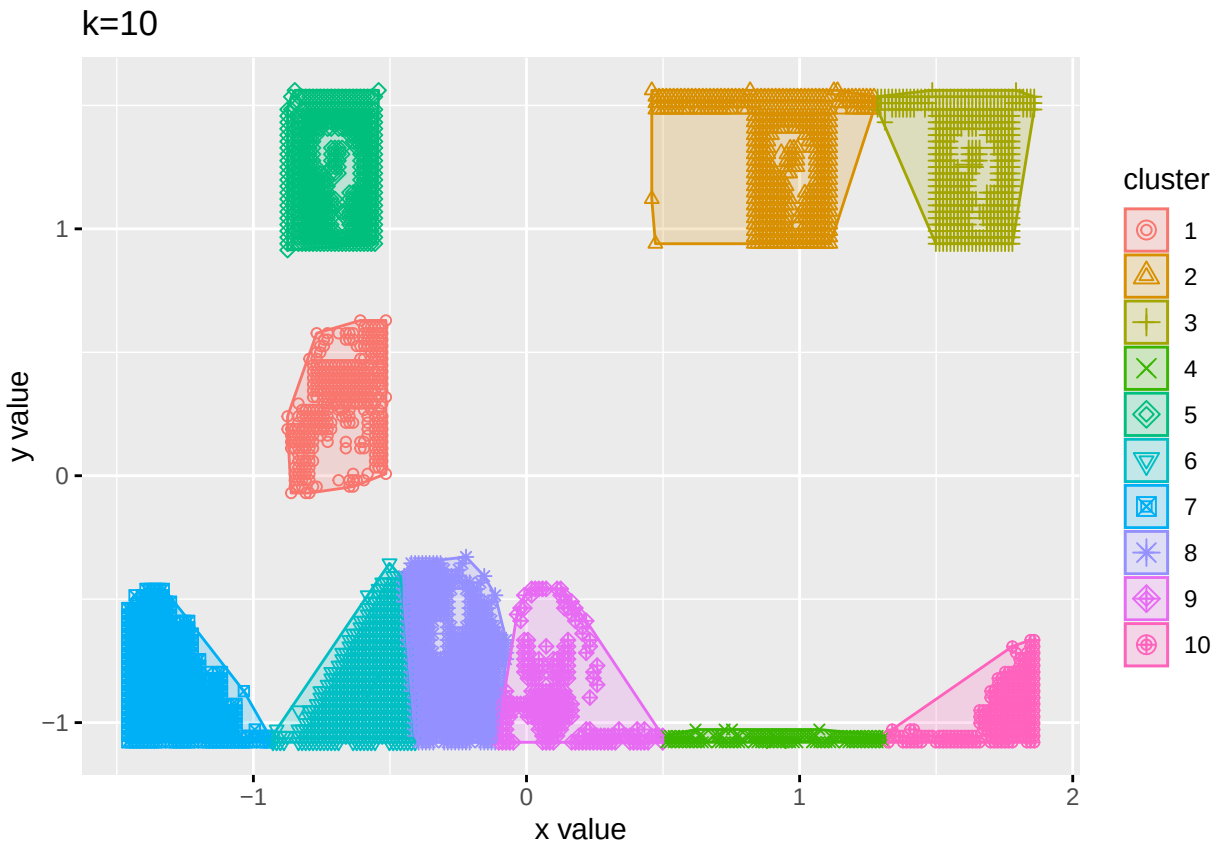

```
fviz_cluster(kmeans_8, geom="point",data=cluster_df) + ggtitle("k=8")
```



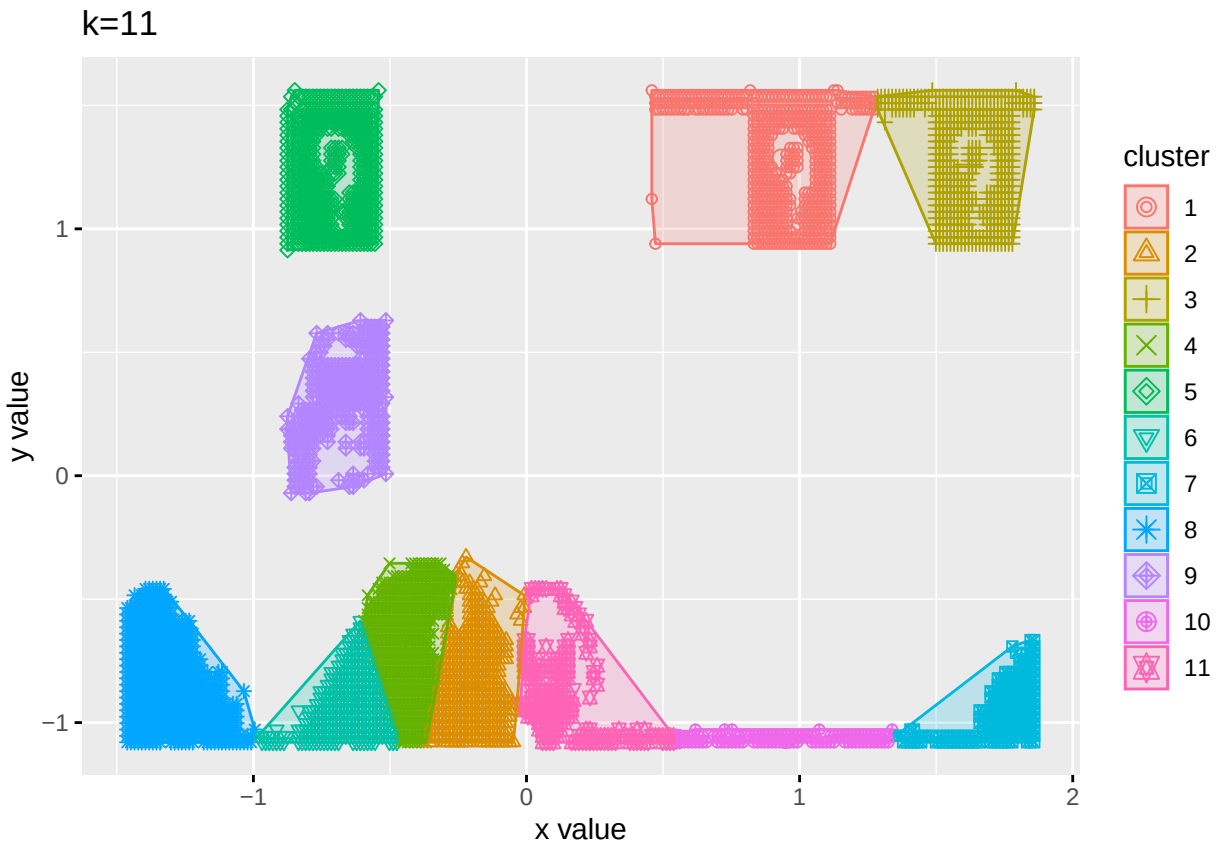

```
fviz_cluster(kmeans_9, geom="point",data=cluster_df) + ggtitle("k=9")
```



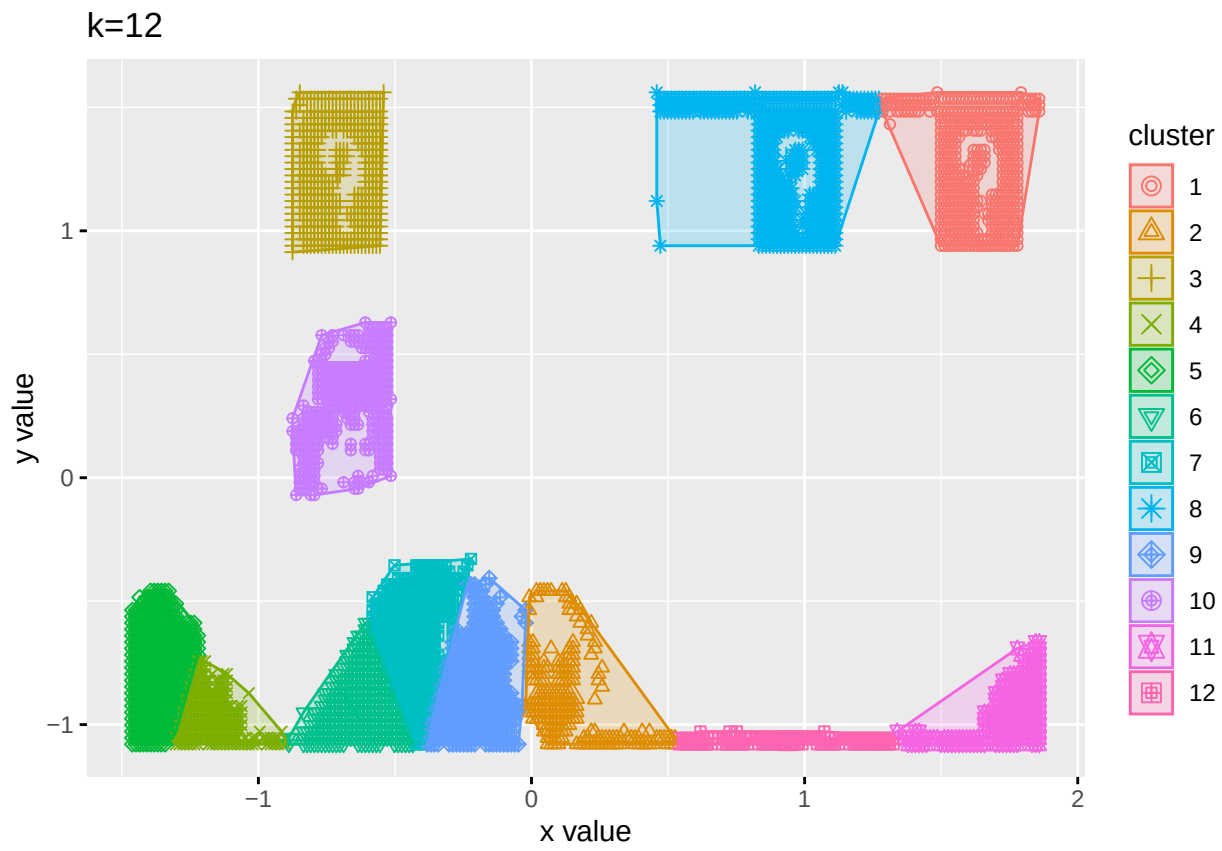

```
fviz_cluster(kmeans_10, geom="point",data=cluster_df) + ggtitle("k=10")
```



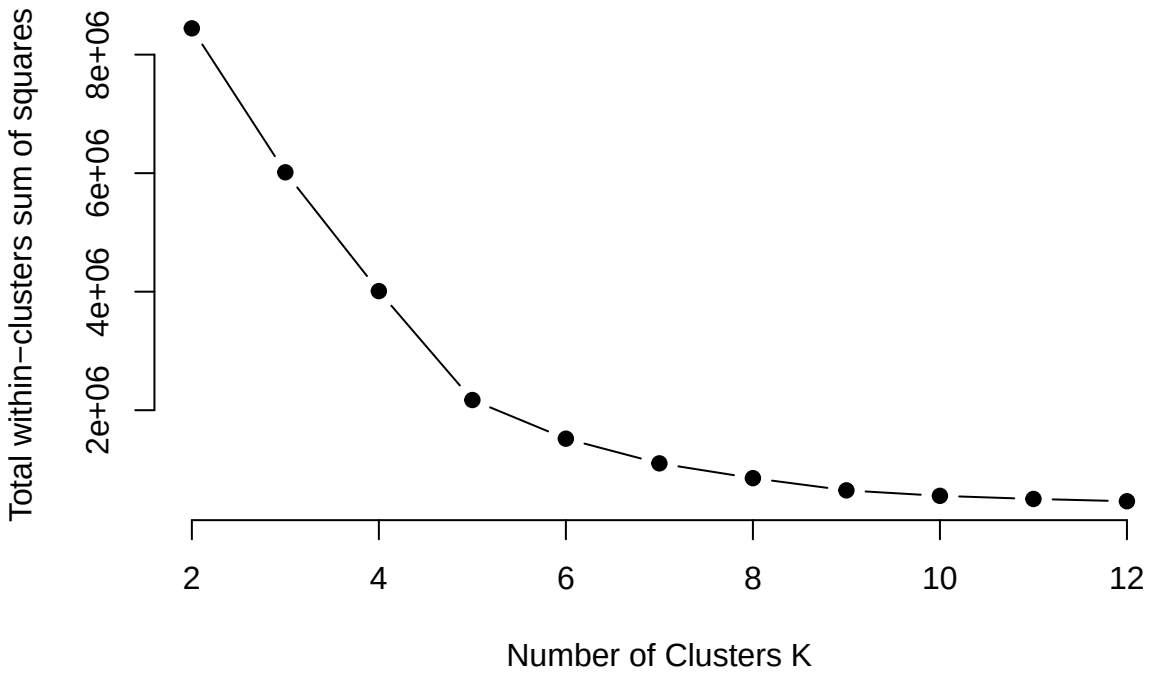

```
fviz_cluster(kmeans_11, geom="point",data=cluster_df) + ggtitle("k=11")
```




```
fviz_cluster(kmeans_12, geom="point",data=cluster_df) + ggtitle("k=12")
```




```
set.seed(123)
# Function to calculate total within-cluster sum of square
wss <- function(k){
  kmeans(cluster_df,k,nstart=25)$tot.withinss
}
# Compute and plot wss for k=1 to k=15
k.values <- 2:12
# Extract wss for 2-15 clusters
wss_values <- map_dbl(k.values, wss)
# Plot elbow curve
plot(k.values, wss_values,
     type="b", pch=19, frame=FALSE,
     xlab = "Number of Clusters K",
     ylab = "Total within-clusters sum of squares")
```




```
## The results suggest that 6 is the optimal number of clusters as it appears to
## be the bend of the elbow curve.
```