K-means Clustering method

K-means clustering and implementation in R

```
# Implement it in R
# first of all we have to import dataset

data = read.csv('../input/clustering/Clustering.csv', header = T)
data = as.data.frame(data)
head(data)
class(data)
```

A data.frame: 6 × 3

	X	x	y
	<int>	<dbl>	<dbl>
1	1	3.3675960	3.536694
2	2	2.6678698	4.479919
3	3	1.3441712	3.282591
4	4	1.3894138	4.683227
5	5	1.6446438	4.320822
6	6	0.7760274	2.653667

```
# We remove the first column because it represents the row number.
data = data[, -1]
head(data)
```

A data.frame: 6 × 2

```
# tip: Before Appling dataset to K-means clustering you should better scale your data
data = scale(data)
class(data)
```

'matrix' · 'array'

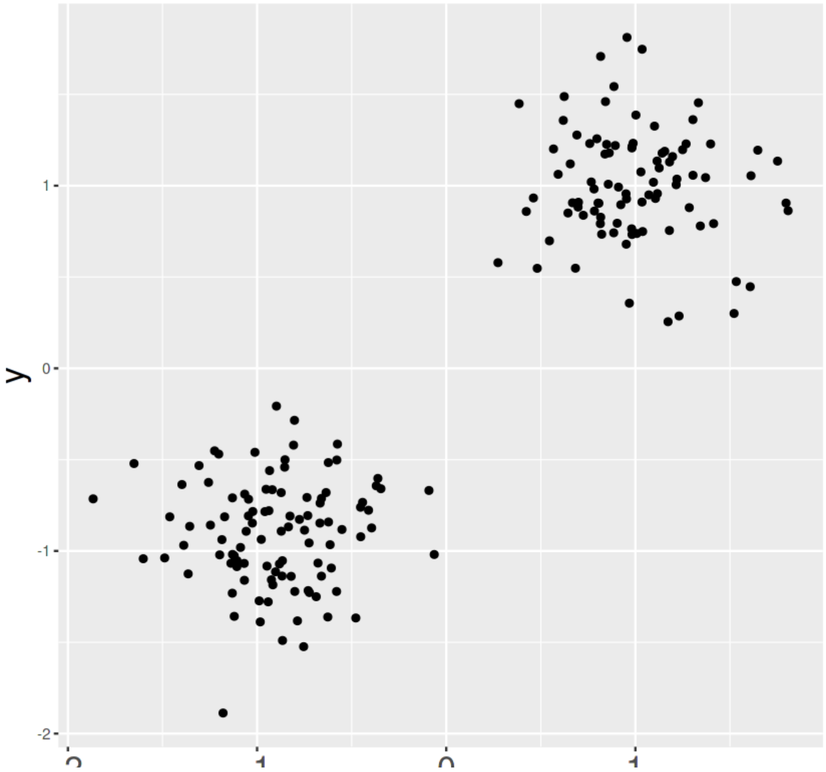
2 2.6678698 4.479919

```
# Becuase the output of scale function is 'matrix''array', I transform it to dataframe

data = as.data.frame(data)
```

5 1.6446438 4.320822

```
# Because This is a simple dataset and I create it for testing the Clustering approach
# let me show you the scatter plot between x, y, and latter applying it to k-means
library(ggplot2)
ggplot(data, aes(x, y)) +
    geom_point() +
    theme(
      axis.title.x = element_text(size = 20),
      axis.text.x = element_text(size = 20),
      axis.title.y = element_text(size = 20))
```



It is obvious we have tow cluster, But we want to test k-means algorithm which can find to two cluster or not.

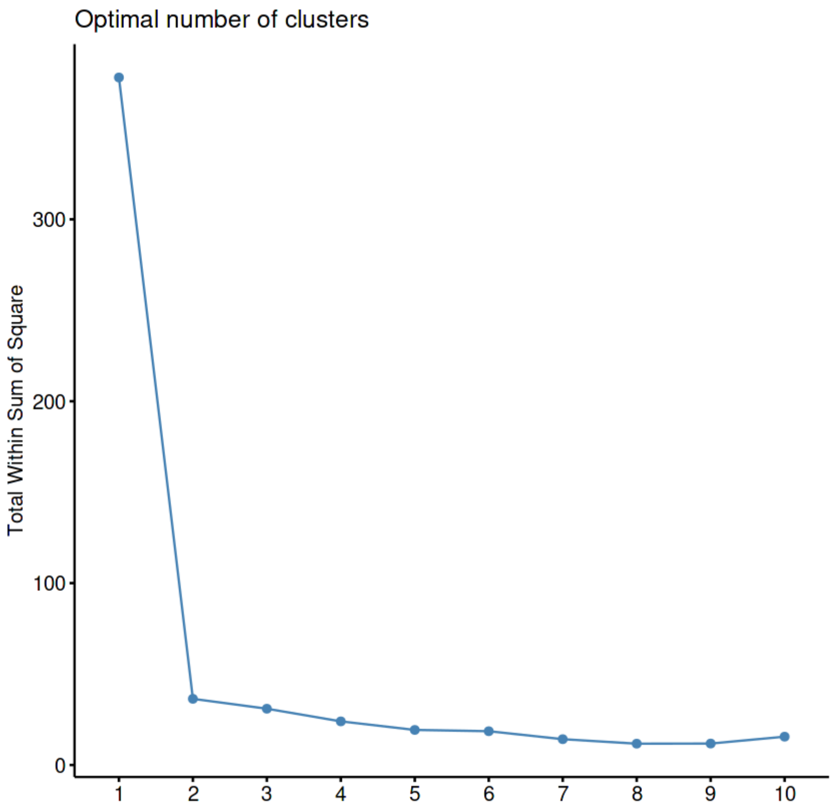
```
# In Kmeans Algorithm we have to define the number of Cluster which represent with k
# fortunatly in R, We have some intersting functions for selecting k.
library(factoextra)
```

```
fviz_nbclust(data, kmeans, method = "wss")
# method can be = 'gap_stat', 'wss', 'silhouette'
```

```
fviz_nbclust(data, kmeans, method = "gap_stat")
```

```
fviz_nbclust(data, kmeans, method = "silhouette")
```

```
Welcome! Want to learn more? See two factoextra-related books at https:/
```



```
# All method('wss', 'silhouette', and gap_stat) show us it's better choose k = 2
```

```
set.seed(123) # set seed for all of us get the same result
km <- kmeans(data, 2)
km
```

```
K-means clustering with 2 clusters of sizes 90, 100

Cluster means:
           x          y
1  0.9961046  1.0027646
2 -0.8964941 -0.9024881

Clustering vector:
  [1] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
2 2 2
 [38] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
2 2 2
 [75] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1
1 1 1
[112] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
[149] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
[186] 1 1 1 1 1

Within cluster sum of squares by cluster:
[1] 17.67945 18.70339
 (between_SS / total_SS =  90.4 %)
```

```
# km$cluster ontained labeled for each observation. We can add another column that represe
dd = data
dd$label = km$cluster

head(dd)
tail(dd)
```

A data.frame: 6 × 3

	x	y	label
	<dbl>	<dbl>	<int>
1	-0.4109417	-0.7769707	2
2	-0.6233551	-0.5160380	2
3	-1.0251856	-0.8472654	2
4	-1.0114515	-0.4597951	2
5	-0.9339722	-0.5600503	2
6	-1.1976550	-1.0212504	2

A data.frame: 6 × 3

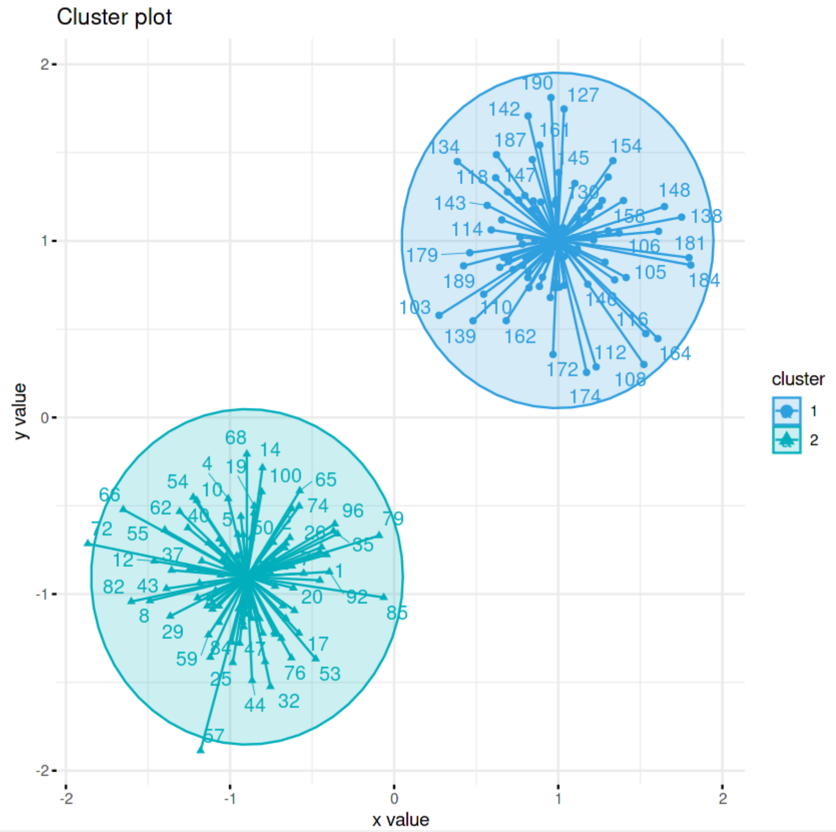
	x	y	label
	<dbl>	<dbl>	<int>
185	1.0381407	0.7489621	1
186	1.1805201	1.1297780	1
187	0.6236404	1.4880627	1
188	0.6988578	0.9092437	1
189	0.4232555	0.8588256	1

Visulize our results

The function fviz_cluster() [factoextra package] can be used to easily visualize k-means clusters. It takes k-means results and the original data as arguments. In the resulting plot, observations are represented by points, using principal components if the number of variables is greater than 2

```
fviz_cluster(km, data = data,
  palette = c("#2E9FDF", "#00AFBB"),
  ellipse.type = "euclid", # Concentration ellipse
  star.plot = TRUE, # Add segments from centroids to items
  repel = TRUE, # Avoid label overplotting (slow)
  ggtheme = theme_minimal())
```

```
Warning message:
“ggrepel: 71 unlabeled data points (too many overlaps). Consider increasing max.overl
```



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