K-Means Problem

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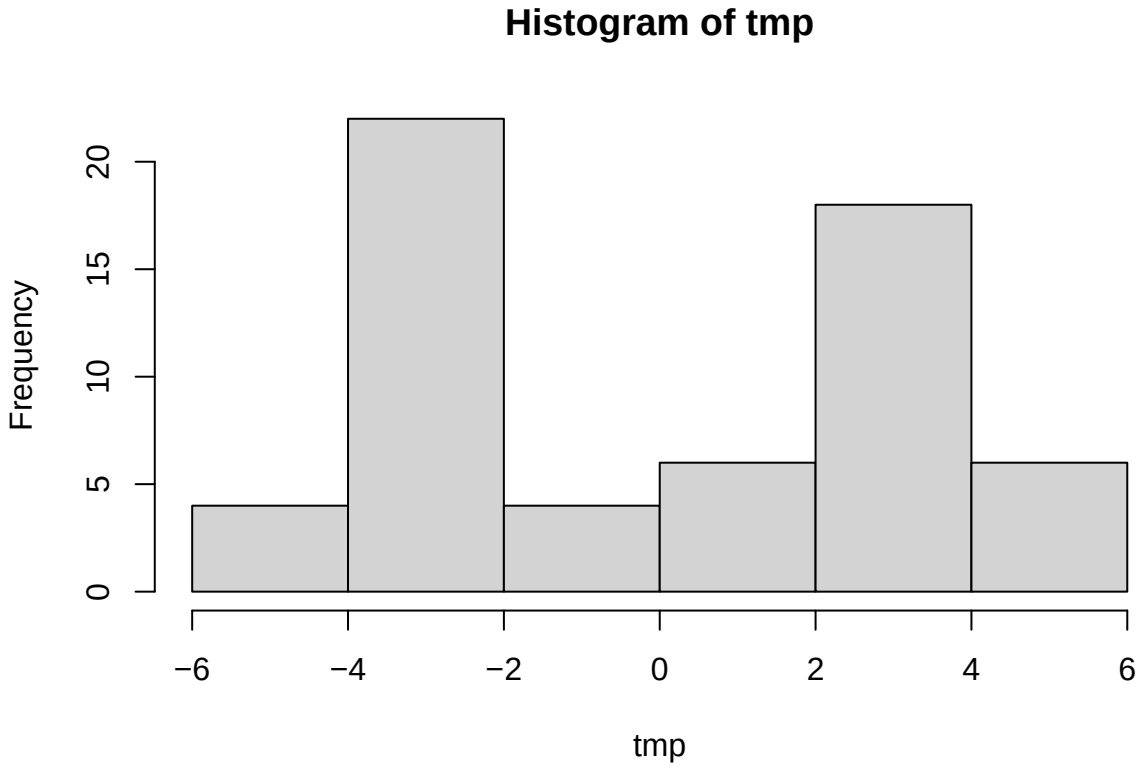
Try K-Means clustering

Generate fake data and explore how the method works.

Generate example data

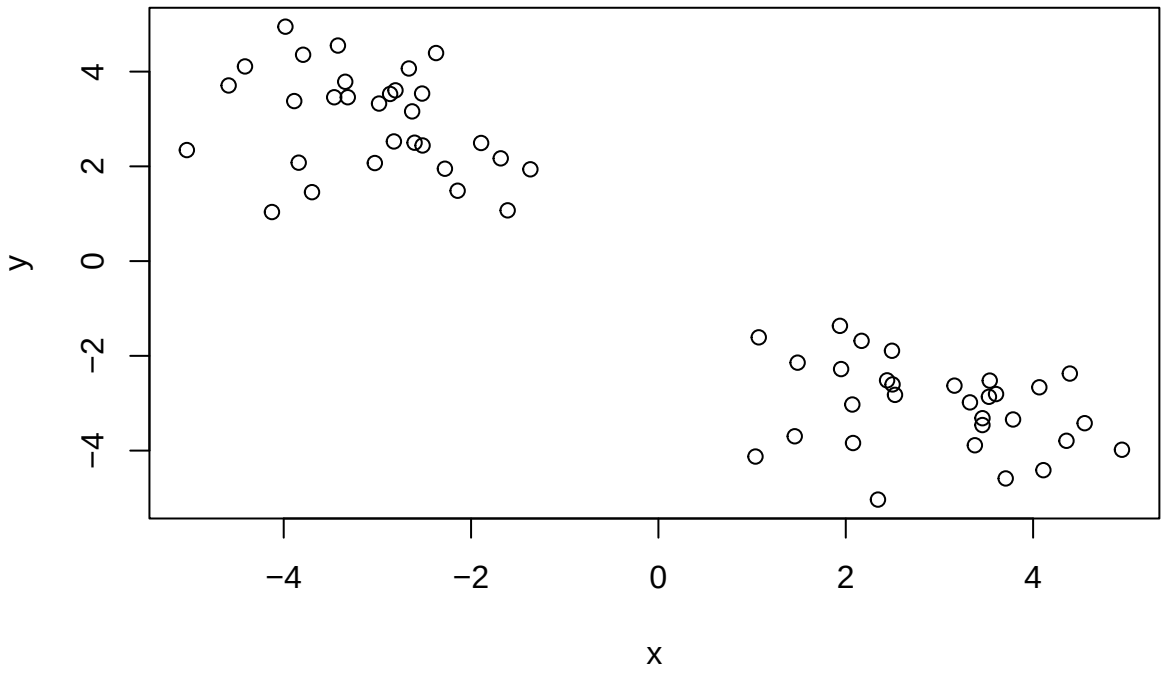
```
tmp <- c(rnorm(30,-3), rnorm(30,3))
hist(tmp)
```



Generate multidimensional example data

```
x <- cbind(x = tmp, y = rev(tmp))

plot(x)
```



Use the kmeans() function to explore the fake data

```
clusters <- kmeans(x, centers = 2, nstart = 20)

clusters
```

```
## K-means clustering with 2 clusters of sizes 30, 30
##
## Cluster means:
##           x         y
## 1 -3.056496  2.964111
## 2  2.964111 -3.056496
##
## Clustering vector:
##  [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 2 2 2 2 2 2 2 2 2
## [39] 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
##
## Within cluster sum of squares by cluster:
## [1] 57.59532 57.59532
##  (between_SS / total_SS =  90.4 %)
##
## Available components:
##
## [1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss"
## [6] "betweenss"    "size"         "iter"         "ifault"
```

[Q] How many points are in each cluster?

There are 30 points in each cluster.

```
clusters$size
```

```
## [1] 30 30
```

[Q] What component of your results object dteails:

- Cluster size

```
clusters$size
```

```
## [1] 30 30
```

- Cluster assignment

```
clusters$cluster
```

```
##  [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 2 2 2 2 2 2 2 2
## [39] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
```

- Cluster center

```
clusters$centers
```

```
##           x         y
## 1 -3.056496  2.964111
## 2  2.964111 -3.056496
```

Plot x colored by the kmeans cluster centers as blue points

Load ggplot2

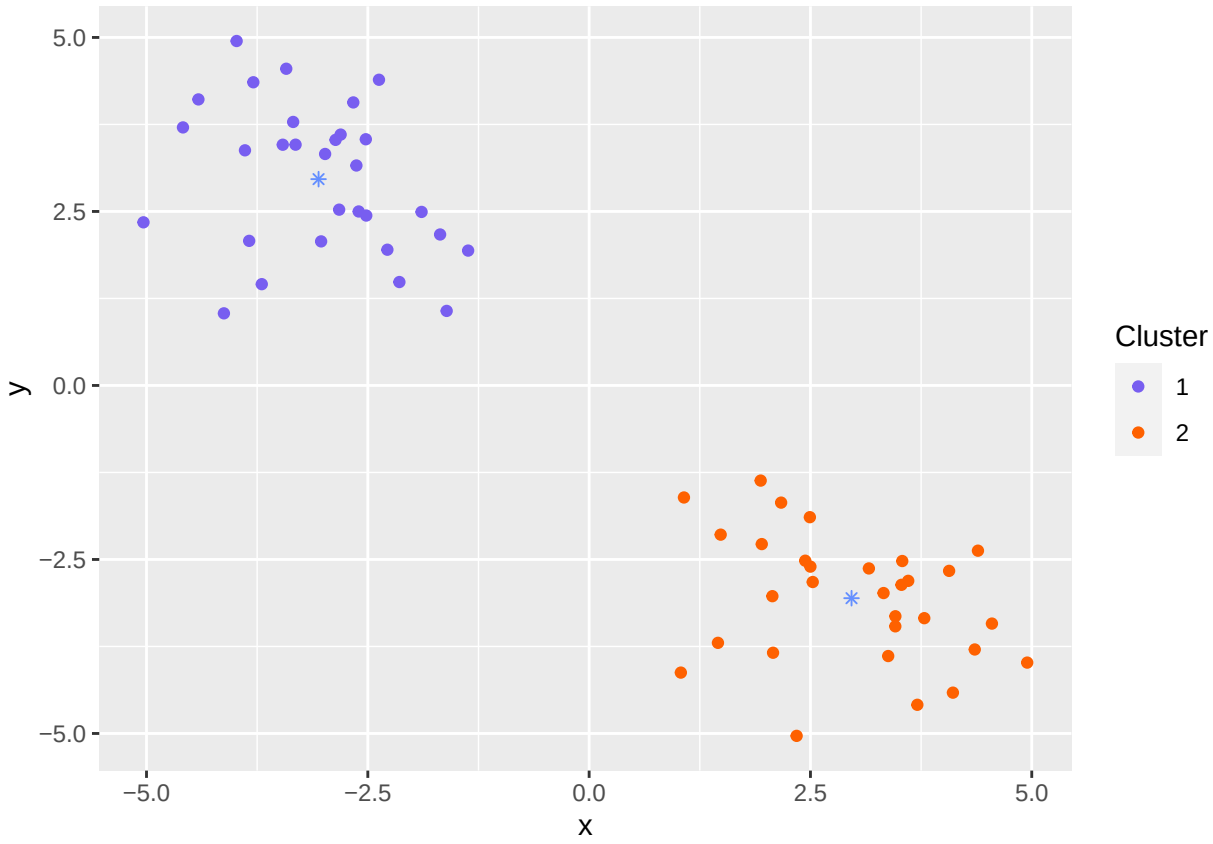
```
library(ggplot2)
```

Convert matrices to be used in ggplot to data frames.

```
df <- data.frame(x)
centroids <- data.frame(clusters$centers)
```

Plot the original data colored by kmenas clusters and add blue centroids. IBM's colorblind palette is used.

```
ggplot(data = df) +
  aes(x = x, y = y, color = factor(clusters$cluster)) +
  geom_point() +
  scale_color_manual(values = c("#785EF0", "#FE6100"), name = "Cluster") +
  geom_point(data = centroids, aes(x = x, y = y), color = "#648FFF", shape = 8)
```


5.0
2.5
0.0
−2.5
−5.0
y
−5.0
−2.5
0.0
2.5
5.0
x
Cluster
1
2