# Clustering (2022 Jun)

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2022 9 15

# SOM cluster

## reference1 : https://data-make.tistory.com/91 (https://data-make.tistory.com/91)

## reference2 : https://www.statmethods.net/advstats/cluster.html (https://www.statmethods.net/advstats/cluster.html)

```
water <- read.csv("C:/Users/HSY/Desktop/영산강 수질악화 관련 데이터 정리_결과 포함(220915)/월별 평균 자료/2022년 6월.csv",
sep=",", header=T)
water_name <- water[,1]
water <- water[,-1]
rownames(water) <- water_name
```

## Distance matrix

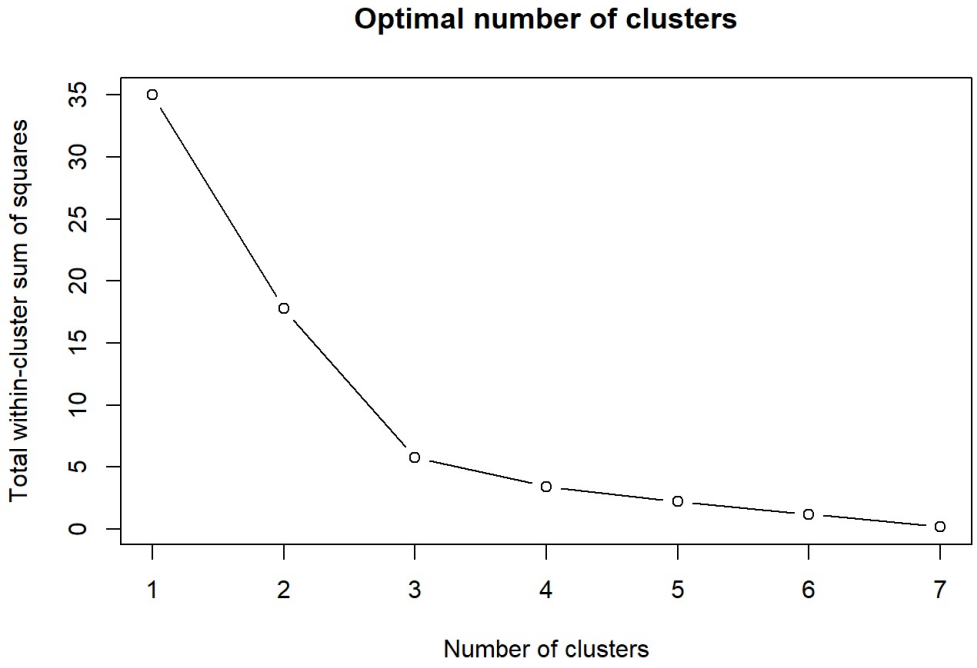
```
water_scale <- scale(water)
d <- dist(water_scale, method="euclidean")
as.matrix(d)
```

```
##              우치    광주1   방류수  광주천2    광주2    광주3   황룡강5
## 우치    0.0000000 1.232633 3.550713 1.283161 3.172916 4.518500 0.5730267
## 광주1   1.2326327 0.000000 4.205244 1.461996 3.091207 4.438276 1.3123899
## 방류수  3.5507132 4.205244 0.000000 4.080642 4.739425 5.966159 3.6069235
## 광주천2 1.2831607 1.461996 4.080642 0.000000 2.575080 3.601081 1.2870846
## 광주2   3.1729163 3.091207 4.739425 2.575080 0.000000 1.846856 3.1704217
## 광주3   4.5185005 4.438276 5.966159 3.601081 1.846856 0.000000 4.5798000
## 황룡강5 0.5730267 1.312390 3.606923 1.287085 3.170422 4.579800 0.0000000
## 광산    1.8038644 1.581120 4.033775 1.443359 1.532386 3.065551 1.8305005
##              광산
## 우치    1.803864
## 광주1   1.581120
## 방류수  4.033775
## 광주천2 1.443359
## 광주2   1.532386
## 광주3   3.065551
## 황룡강5 1.830500
## 광산    0.000000
```

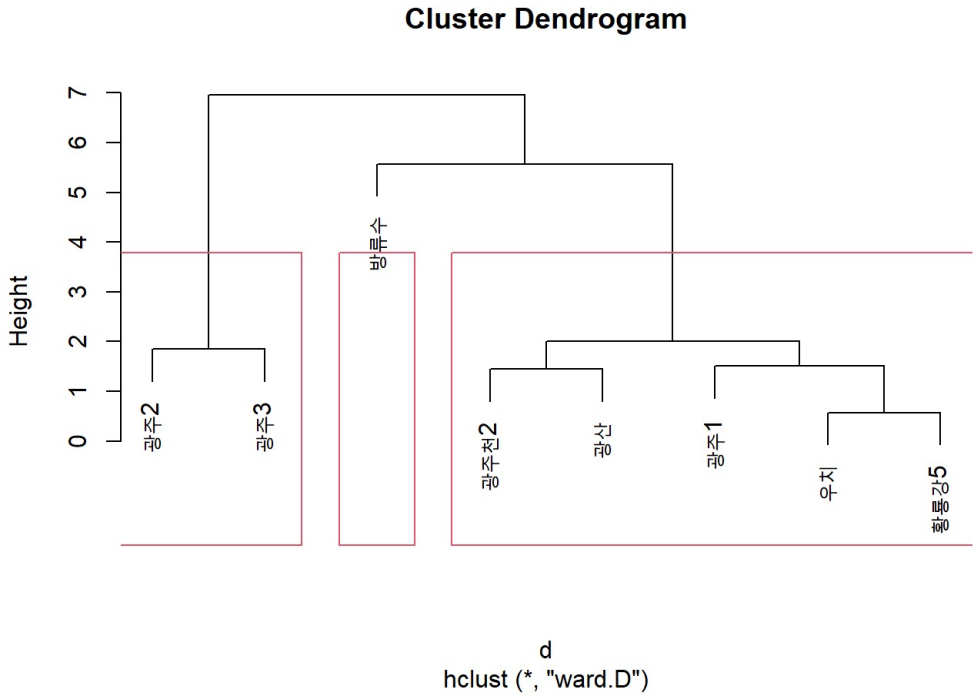
## Decide number of clusters

find the optimal number of clusters using Total within-cluster sum of squares

```
tot_withinss <- c()
for (i in 1:7){
  set.seed(1004) # for reproducibility
  kmeans_cluster <- kmeans(water_scale, centers = i, iter.max = 1000)
  tot_withinss[i] <- kmeans_cluster$tot.withinss}
plot(c(1:7), tot_withinss, type="b",
     main="Optimal number of clusters",
     xlab="Number of clusters",
     ylab="Total within-cluster sum of squares")
```




```
fit <- hclust(d, method="ward.D")
plot(fit)
rect.hclust(fit, k=3)
```




## SOM cluster

```
library(SOMbrero)
```

```
## Warning: 패키지 'SOMbrero'는 R 버전 4.1.3에서 작성되었습니다
```

```
## 필요한 패키지를 로딩중입니다: igraph
```

```
## Warning: 패키지 'igraph'는 R 버전 4.1.2에서 작성되었습니다
```

```
##
## 다음의 패키지를 부착합니다: 'igraph'
```

```
## The following objects are masked from 'package:stats':
##
##     decompose, spectrum
```

```
## The following object is masked from 'package:base':
##
##     union
```

```
## 필요한 패키지를 로딩중입니다: markdown
```

```
##
```

```
## ************************************************************
```

```
##
```

```
##       This is 'SOMbrero' package, v 1.4.1
```

```
##
```

```
## Citation details with citation('SOMbrero')
```

```
##
```

```
## Further information with help(SOMbrero)...
```

```
##
```

```
## Use sombreroGUI() to start the Graphical Interface.
```

```
##
```

```
## ************************************************************
```

```
library(kohonen)
```

```
## Warning: 패키지 'kohonen'는 R 버전 4.1.3에서 작성되었습니다
```

### Normalization of data

```
water_scale <- data.frame(scale(water))
water_scale_matrix <- as.matrix(water_scale)
```

### Training the SOM model

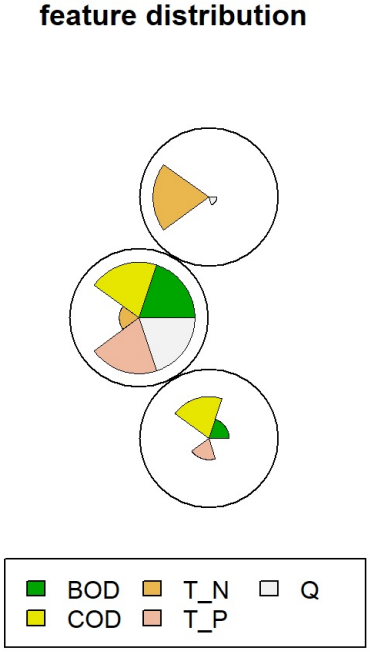
```
som_grid <- somgrid(xdim=1, ydim=3, topo="hexagonal")
som_model1 <- som(water_scale_matrix, grid=som_grid)
som_model2 <- trainSOM(x.data=water_scale, dimension=c(1,3),
                       nb.save=10, maxit=2000, scaling="none",
                       radius.type="letremy")
```

### Visualization

```
table(som_model2$clustering)
```

```
##
## 1 2 3
## 4 2 2
```

```
plot(som_model1, main="feature distribution")
```




```
plot(som_model2, what="obs", type="names", print.title=T, scale=c(1,1))
```

```
## Warning in plot.somRes(som_model2, what = "obs", type = "names", print.title =
## T, : 'print.title' will be deprecated, please use 'show.names' instead
```