

PSYGS8867_Homework9

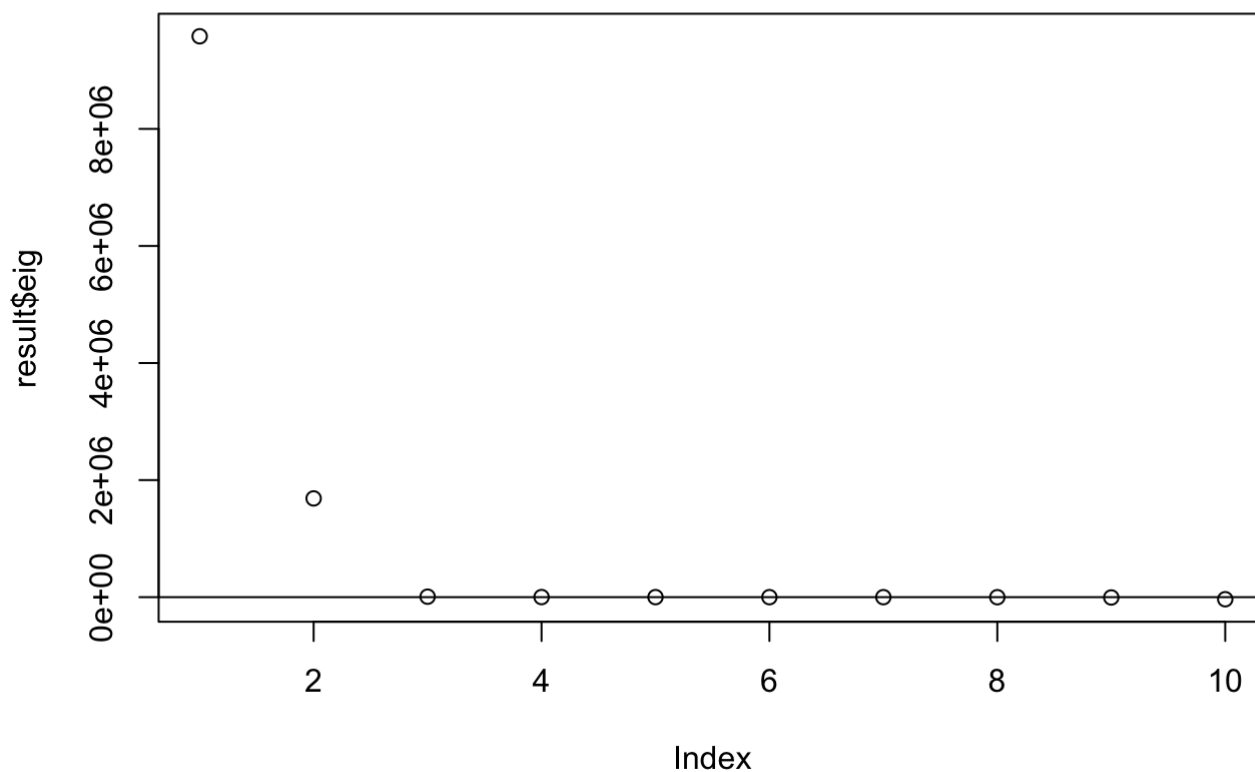
2022-11-17

The data set UScitiesD (in R base) contains distances among 10 U.S. cities.

```
data <- as.matrix(UScitiesD)
```

1 Run classical MDS and plot the eigenvalues. How many dimensions does the plot recommend?

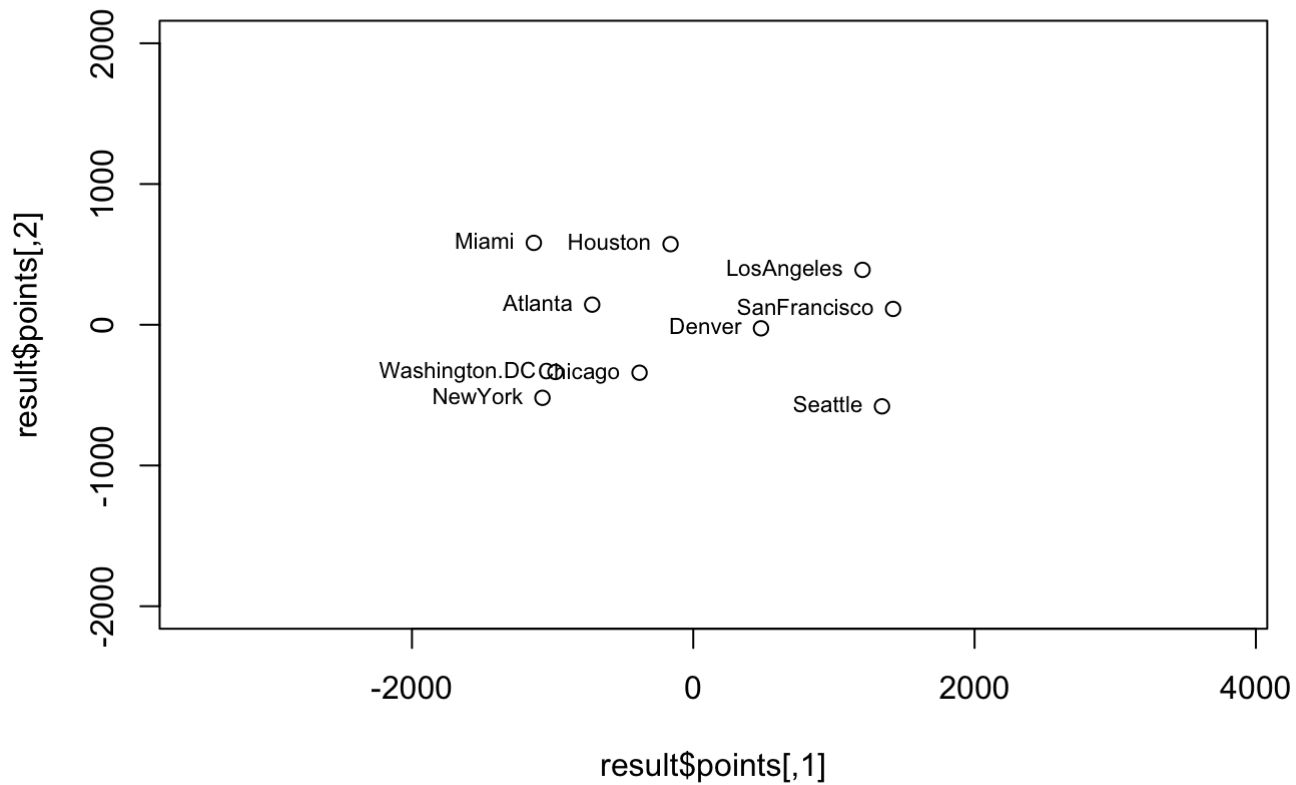
```
result <- cmdscale(data, k=2, eig=TRUE)
plot(result$eig)
abline(h=0)
```



plot suggests 2 dimensions.

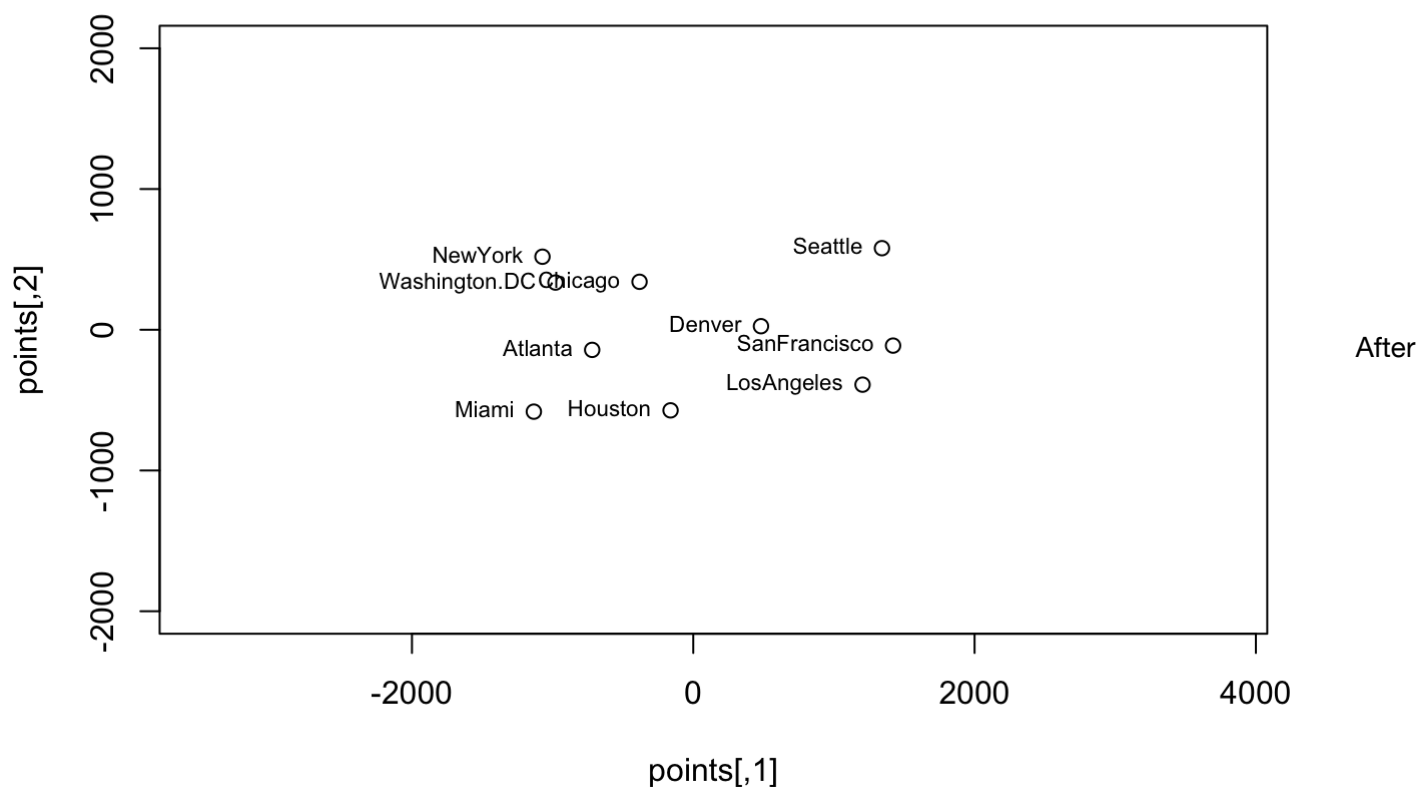
2 Plot the solution for two dimensions. How is it related to the actual map of the U.S.?

```
plot(result$points,asp = 1,ylim=c(-2000,2000))
text(result$points[,1],result$points[,2],labels=rownames(result$points),cex=.7,pos=2)
```



map is similar to a map of the US except that is flipped both vertically and horizontally.

```
points<-result$points
points[,2]<- -points[,2]
plot(points,asp = 1,ylim=c(-2000,2000))
text(points[,1],points[,2],labels=rownames(points),cex=.7,pos=2)
```



rotating the map is now only flipped horizontally.

3. Show how the two GOF values in the solution can be calculated from the eigenvalues.

```
#GOF values in solution
result$GOF
```

```
## [1] 0.9954096 0.9991024
```

```
#The first GOF takes the absolute values of the negative eigenvalues in its calculation
```

```
eig <- result$eig
eig_abs <- abs(eig)
eig_abs
```

```
## [1] 9.582144e+06 1.686820e+06 8.157298e+03 1.432870e+03 5.086687e+02
## [6] 2.514349e+01 4.312942e-10 8.977013e+02 5.467577e+03 3.547889e+04
```

```
#The second GOF treats eigenvalues as 0
eig_0 <- replace(eig, 7:10, 0)
eig_0
```

```
## [1] 9.582144e+06 1.686820e+06 8.157298e+03 1.432870e+03 5.086687e+02
## [6] 2.514349e+01 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00
```

```
#GOF = proportion of total eigenvalues retained by two dimensions
GOF1 <- (eig_abs[1] + eig_abs[2]) / (eig_abs[1] + eig_abs[2] + eig_abs[3] + eig_abs[4] +
eig_abs[5] + eig_abs[6] + eig_abs[7] + eig_abs[8] + eig_abs[9] + eig_abs[10])
GOF1
```

```
## [1] 0.9954096
```

```
GOF2 <- (eig_0[1] + eig_0[2]) / (eig_0[1] + eig_0[2] + eig_0[3] + eig_0[4] + eig_0[5] +
eig_0[6] + eig_0[7] + eig_0[8] + eig_0[9] + eig_0[10])
GOF2
```

```
## [1] 0.9991024
```