

Suhaas HW 3 ISLR

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Homework 3

Question 8

```
install.packages('ISLR') library(ISLR) ### a
```

```
data(USArrests)
states = row.names(USArrests)
names(USArrests)
```

```
## [1] "Murder" "Assault" "UrbanPop" "Rape"
```

```
dim(USArrests)
```

```
## [1] 50 4
```

```
apply(USArrests, 2, mean)
```

```
## Murder Assault UrbanPop Rape
## 7.788 170.760 65.540 21.232
```

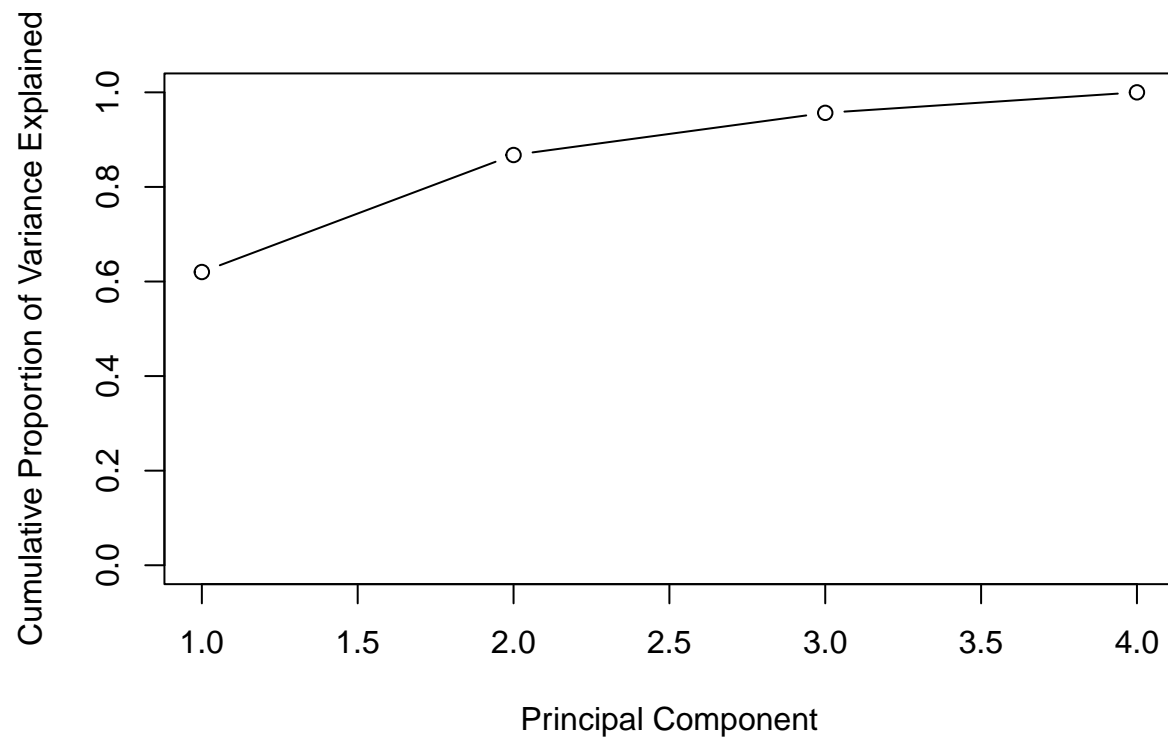
```
apply(USArrests, 2, var)
```

```
## Murder Assault UrbanPop Rape
## 18.97047 6945.16571 209.51878 87.72916
```

```
pr.out = prcomp(USArrests, scale=TRUE)
pr.var = pr.out$sdev^2
PVE = pr.var/sum(pr.var)
PVE
```

```
## [1] 0.62006039 0.24744129 0.08914080 0.04335752
```

```
plot(cumsum(PVE), xlab="Principal Component", ylab = "
Cumulative Proportion of Variance Explained", ylim=c(0,1),
type='b')
```



b

```
pr.loadings = pr.out$rotation
PC1var = var(pr.out$x[,1])
PC2var = var(pr.out$x[,2])
PC3var = var(pr.out$x[,3])
PC4var = var(pr.out$x[,4])

totalVar = (PC1var+PC2var+PC3var+PC4var)

PC1.PVEhand = PC1var/totalVar
PC2.PVEhand = PC2var/totalVar
PC3.PVEhand = PC3var/totalVar
PC4.PVEhand = PC4var/totalVar
PC1.PVEhand
```

```
## [1] 0.6200604
```

```
PC2.PVEhand
```

```
## [1] 0.2474413
```

```
PC3.PVEhand
```

```
## [1] 0.0891408
```

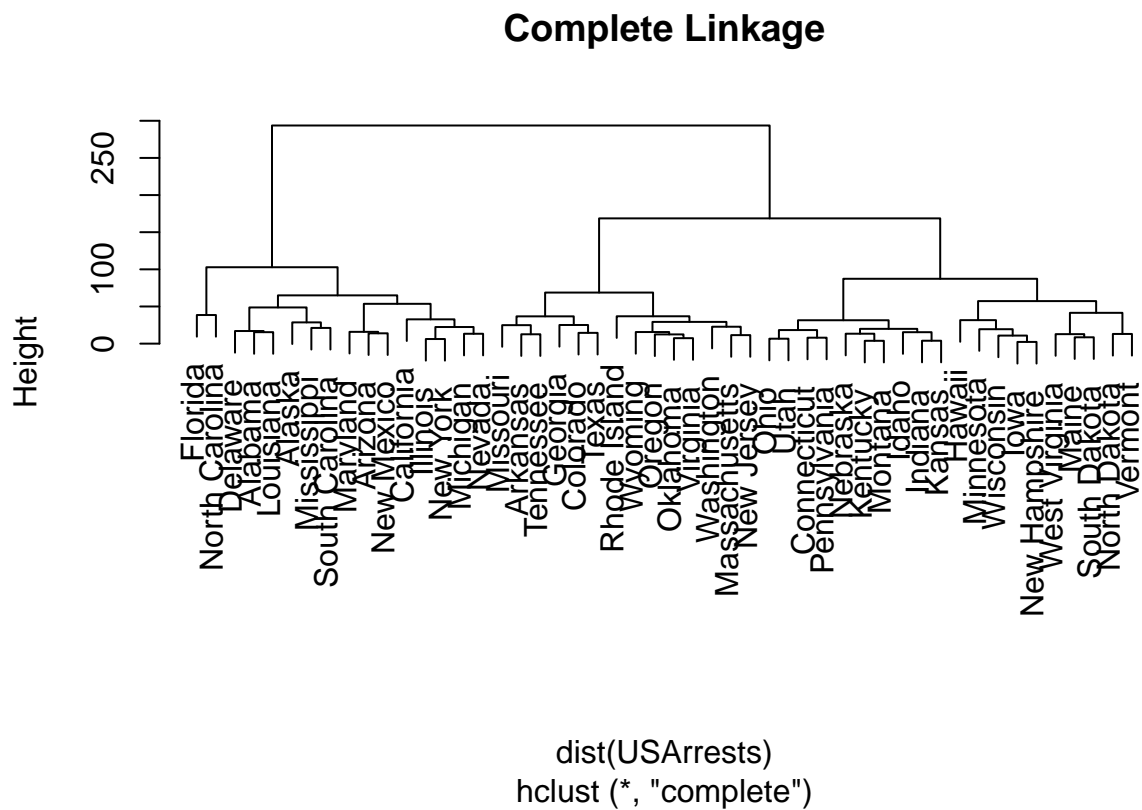
```
PC4.PVEhand
```

```
## [1] 0.04335752
```

Question 9

a

```
Arr.complete = hclust(dist(USArrests),method='complete')  
plot(Arr.complete,main="Complete Linkage")
```



b

```
print(sort(cutree(Arr.complete,3),decreasing=TRUE))
```

```
##      Connecticut      Hawaii      Idaho      Indiana      Iowa
##           3           3           3           3           3
##      Kansas      Kentucky      Maine      Minnesota      Montana
##           3           3           3           3           3
##      Nebraska New Hampshire North Dakota      Ohio      Pennsylvania
##           3           3           3           3           3
##      South Dakota      Utah      Vermont West Virginia      Wisconsin
##           3           3           3           3           3
##      Arkansas      Colorado      Georgia Massachusetts      Missouri
##           2           2           2           2           2
##      New Jersey      Oklahoma      Oregon      Rhode Island      Tennessee
##           2           2           2           2           2
##      Texas      Virginia      Washington      Wyoming      Alabama
##           2           2           2           2           1
##      Alaska      Arizona      California      Delaware      Florida
##           1           1           1           1           1
##      Illinois      Louisiana      Maryland      Michigan      Mississippi
##           1           1           1           1           1
##      Nevada      New Mexico      New York North Carolina South Carolina
##           1           1           1           1           1
```

c

```
Arrest.scaled = scale(USArrests)
sd(Arrest.scaled[,1])
```

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

```
sd(Arrest.scaled[,2])
```

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

```
sd(Arrest.scaled[,3])
```

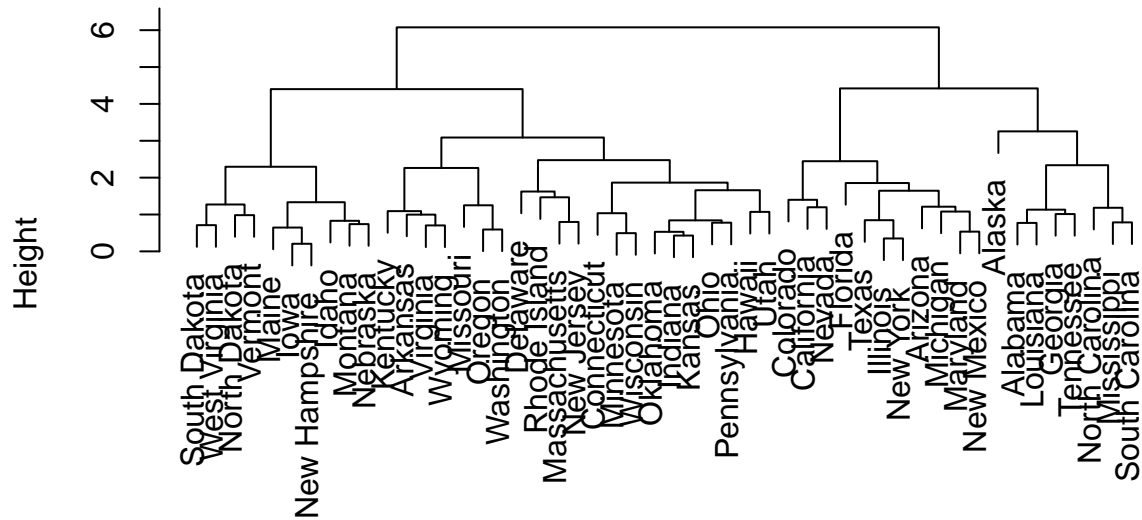
```
## [1] 1
```

```
sd(Arrest.scaled[,4])
```

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

```
Arr.complete.scaled= hclust(dist(Arrest.scaled),method='complete')
plot(Arr.complete.scaled,main="Complete Linkage")
```

Complete Linkage



```
dist(Arrest.scaled)
hclust (*, "complete")
```

```
print(print(sort(cutree(Arr.complete,3),decreasing=TRUE)))
)
```

##	Connecticut	Hawaii	Idaho	Indiana	Iowa
##	3	3	3	3	3
##	Kansas	Kentucky	Maine	Minnesota	Montana
##	3	3	3	3	3
##	Nebraska	New Hampshire	North Dakota	Ohio	Pennsylvania
##	3	3	3	3	3
##	South Dakota	Utah	Vermont	West Virginia	Wisconsin
##	3	3	3	3	3
##	Arkansas	Colorado	Georgia	Massachusetts	Missouri
##	2	2	2	2	2
##	New Jersey	Oklahoma	Oregon	Rhode Island	Tennessee
##	2	2	2	2	2
##	Texas	Virginia	Washington	Wyoming	Alabama
##	2	2	2	2	1
##	Alaska	Arizona	California	Delaware	Florida
##	1	1	1	1	1
##	Illinois	Louisiana	Maryland	Michigan	Mississippi
##	1	1	1	1	1
##	Nevada	New Mexico	New York	North Carolina	South Carolina
##	1	1	1	1	1
##	Connecticut	Hawaii	Idaho	Indiana	Iowa
##	3	3	3	3	3
##	Kansas	Kentucky	Maine	Minnesota	Montana

##	3	3	3	3	3
##	Nebraska	New Hampshire	North Dakota	Ohio	Pennsylvania
##	3	3	3	3	3
##	South Dakota	Utah	Vermont	West Virginia	Wisconsin
##	3	3	3	3	3
##	Arkansas	Colorado	Georgia	Massachusetts	Missouri
##	2	2	2	2	2
##	New Jersey	Oklahoma	Oregon	Rhode Island	Tennessee
##	2	2	2	2	2
##	Texas	Virginia	Washington	Wyoming	Alabama
##	2	2	2	2	1
##	Alaska	Arizona	California	Delaware	Florida
##	1	1	1	1	1
##	Illinois	Louisiana	Maryland	Michigan	Mississippi
##	1	1	1	1	1
##	Nevada	New Mexico	New York	North Carolina	South Carolina
##	1	1	1	1	1

d