class09

Zhuohang Wu

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wisc.df <- read.csv("WisconsinCancer.csv")  
  
wisc.data <- as.matrix(wisc.df[,3:32])  
row.names(wisc.data) <- wisc.df$id  
diagnosis <- as.numeric(wisc.df$diagnosis)  
table(wisc.df$diagnosis)

##   
## B M   
## 357 212

View(diagnosis)

tmp <- rep(0,nrow(wisc.df))  
as.numeric(wisc.df$diagnosis=="M")

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cbind(diagnosis,wisc.df$diagnosis)

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colMeans(wisc.data)

## radius\_mean texture\_mean perimeter\_mean   
## 1.412729e+01 1.928965e+01 9.196903e+01   
## area\_mean smoothness\_mean compactness\_mean   
## 6.548891e+02 9.636028e-02 1.043410e-01   
## concavity\_mean concave.points\_mean symmetry\_mean   
## 8.879932e-02 4.891915e-02 1.811619e-01   
## fractal\_dimension\_mean radius\_se texture\_se   
## 6.279761e-02 4.051721e-01 1.216853e+00   
## perimeter\_se area\_se smoothness\_se   
## 2.866059e+00 4.033708e+01 7.040979e-03   
## compactness\_se concavity\_se concave.points\_se   
## 2.547814e-02 3.189372e-02 1.179614e-02   
## symmetry\_se fractal\_dimension\_se radius\_worst   
## 2.054230e-02 3.794904e-03 1.626919e+01   
## texture\_worst perimeter\_worst area\_worst   
## 2.567722e+01 1.072612e+02 8.805831e+02   
## smoothness\_worst compactness\_worst concavity\_worst   
## 1.323686e-01 2.542650e-01 2.721885e-01   
## concave.points\_worst symmetry\_worst fractal\_dimension\_worst   
## 1.146062e-01 2.900756e-01 8.394582e-02

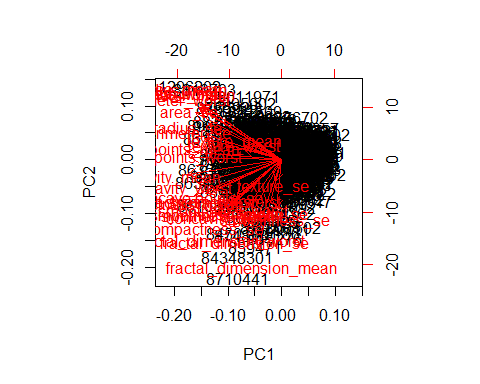
apply(wisc.data,2,sd)

## radius\_mean texture\_mean perimeter\_mean   
## 3.524049e+00 4.301036e+00 2.429898e+01   
## area\_mean smoothness\_mean compactness\_mean   
## 3.519141e+02 1.406413e-02 5.281276e-02   
## concavity\_mean concave.points\_mean symmetry\_mean   
## 7.971981e-02 3.880284e-02 2.741428e-02   
## fractal\_dimension\_mean radius\_se texture\_se   
## 7.060363e-03 2.773127e-01 5.516484e-01   
## perimeter\_se area\_se smoothness\_se   
## 2.021855e+00 4.549101e+01 3.002518e-03   
## compactness\_se concavity\_se concave.points\_se   
## 1.790818e-02 3.018606e-02 6.170285e-03   
## symmetry\_se fractal\_dimension\_se radius\_worst   
## 8.266372e-03 2.646071e-03 4.833242e+00   
## texture\_worst perimeter\_worst area\_worst   
## 6.146258e+00 3.360254e+01 5.693570e+02   
## smoothness\_worst compactness\_worst concavity\_worst   
## 2.283243e-02 1.573365e-01 2.086243e-01   
## concave.points\_worst symmetry\_worst fractal\_dimension\_worst   
## 6.573234e-02 6.186747e-02 1.806127e-02

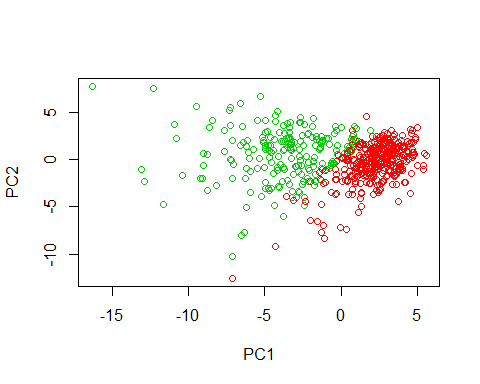
wisc.pr <- prcomp(wisc.data, scale=TRUE)  
summary(wisc.pr)

## Importance of components:  
## PC1 PC2 PC3 PC4 PC5 PC6  
## Standard deviation 3.6444 2.3857 1.67867 1.40735 1.28403 1.09880  
## Proportion of Variance 0.4427 0.1897 0.09393 0.06602 0.05496 0.04025  
## Cumulative Proportion 0.4427 0.6324 0.72636 0.79239 0.84734 0.88759  
## PC7 PC8 PC9 PC10 PC11 PC12  
## Standard deviation 0.82172 0.69037 0.6457 0.59219 0.5421 0.51104  
## Proportion of Variance 0.02251 0.01589 0.0139 0.01169 0.0098 0.00871  
## Cumulative Proportion 0.91010 0.92598 0.9399 0.95157 0.9614 0.97007  
## PC13 PC14 PC15 PC16 PC17 PC18  
## Standard deviation 0.49128 0.39624 0.30681 0.28260 0.24372 0.22939  
## Proportion of Variance 0.00805 0.00523 0.00314 0.00266 0.00198 0.00175  
## Cumulative Proportion 0.97812 0.98335 0.98649 0.98915 0.99113 0.99288  
## PC19 PC20 PC21 PC22 PC23 PC24  
## Standard deviation 0.22244 0.17652 0.1731 0.16565 0.15602 0.1344  
## Proportion of Variance 0.00165 0.00104 0.0010 0.00091 0.00081 0.0006  
## Cumulative Proportion 0.99453 0.99557 0.9966 0.99749 0.99830 0.9989  
## PC25 PC26 PC27 PC28 PC29 PC30  
## Standard deviation 0.12442 0.09043 0.08307 0.03987 0.02736 0.01153  
## Proportion of Variance 0.00052 0.00027 0.00023 0.00005 0.00002 0.00000  
## Cumulative Proportion 0.99942 0.99969 0.99992 0.99997 1.00000 1.00000

biplot(wisc.pr)



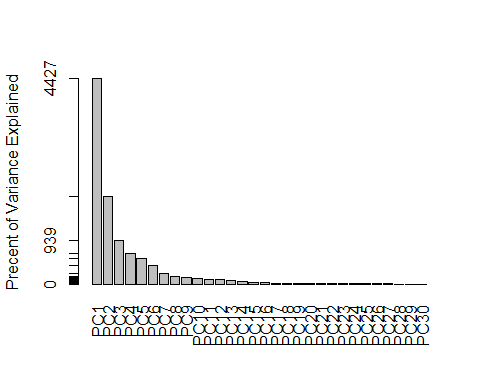
plot(wisc.pr$x[,1],wisc.pr$x[,2],col=diagnosis+1, xlab = "PC1",ylab = "PC2")



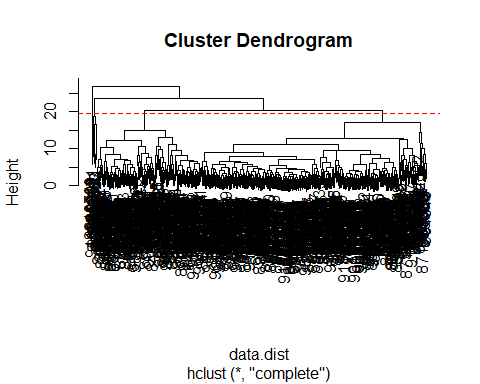
varance <- wisc.pr$sdev^2  
pve <- varance/sum(varance)\*100  
head(varance)

## [1] 13.281608 5.691355 2.817949 1.980640 1.648731 1.207357

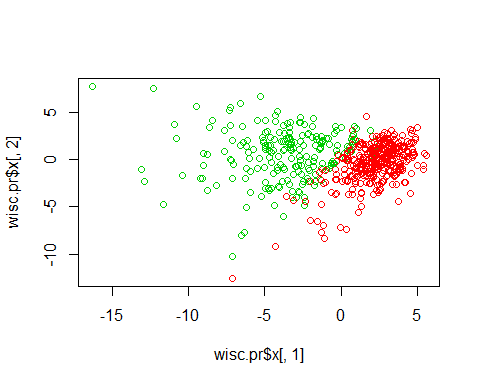
barplot(pve, ylab = "Precent of Variance Explained",  
 names.arg=paste0("PC",1:length(pve)), las=2, axes = FALSE)  
axis(2, at=pve, labels=round(pve,2)\*100 )



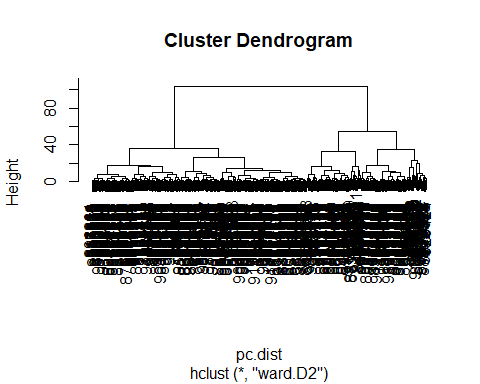
data.scaled <- scale(wisc.data)  
data.dist <- dist(data.scaled)  
wisc.hclust <- hclust(data.dist, method = "complete")  
plot(wisc.hclust)  
abline(h=19.4, col="red", lty=2)



plot(wisc.pr$x[,1],wisc.pr$x[,2], col=diagnosis+1)



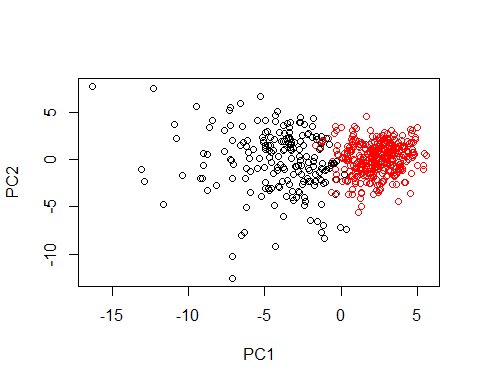
pc.dist <- dist(wisc.pr$x[,1:3])  
pc.hclust <- hclust(pc.dist, method="ward.D2")  
plot(pc.hclust)



grps <- cutree(pc.hclust, k=2)  
table(grps,diagnosis)

## diagnosis  
## grps 1 2  
## 1 24 179  
## 2 333 33

plot(wisc.pr$x[,1:2], col=grps)



new <- read.csv("new\_samples.csv")  
npc <- predict(wisc.pr, newdata=new)  
npc

## PC1 PC2 PC3 PC4 PC5 PC6  
## [1,] 2.576616 -3.135913 1.3990492 -0.7631950 2.781648 -0.8150185  
## [2,] -4.754928 -3.009033 -0.1660946 -0.6052952 -1.140698 -1.2189945  
## PC7 PC8 PC9 PC10 PC11 PC12  
## [1,] -0.3959098 -0.2307350 0.1029569 -0.9272861 0.3411457 0.375921  
## [2,] 0.8193031 -0.3307423 0.5281896 -0.4855301 0.7173233 -1.185917  
## PC13 PC14 PC15 PC16 PC17 PC18  
## [1,] 0.1610764 1.187882 0.3216974 -0.1743616 -0.07875393 -0.11207028  
## [2,] 0.5893856 0.303029 0.1299153 0.1448061 -0.40509706 0.06565549  
## PC19 PC20 PC21 PC22 PC23 PC24  
## [1,] -0.08802955 -0.2495216 0.1228233 0.09358453 0.08347651 0.1223396  
## [2,] 0.25591230 -0.4289500 -0.1224776 0.01732146 0.06316631 -0.2338618  
## PC25 PC26 PC27 PC28 PC29  
## [1,] 0.02124121 0.078884581 0.220199544 -0.02946023 -0.015620933  
## [2,] -0.20755948 -0.009833238 -0.001134152 0.09638361 0.002795349  
## PC30  
## [1,] 0.005269029  
## [2,] -0.019015820

plot(wisc.pr$x[,1:2], col=grps)  
points(npc[,1], npc[,2], col="blue", pch=16)

