data mining2

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پکیج مورد نظر و داده ها را فراخوانی می کنیم و برای اینکه حس بیشتری نسبت به داده ها بگیریم دستورات زیر را اجرا می کنیم

متغیر پاسخ باید رده ای باشد زیرا در الگدریتم نزدیک ترین همسایگی نیاز به متغیر مورد علاقه رده ای داریم و آنرا به دیتا فریم مان اضافه میکنیم(توجه کنیم متغیر مورد علاقه صفر و یکی می شود یعنی آنهایی که بیش تر از میانه اند عدد1 و کمتراند عدد صفر را اختیار می کنند)

#Q1

#install.packages("ISLR")  
library(ISLR)

## Warning: package 'ISLR' was built under R version 4.2.2

#Auto  
head(Auto,10)

## mpg cylinders displacement horsepower weight acceleration year origin  
## 1 18 8 307 130 3504 12.0 70 1  
## 2 15 8 350 165 3693 11.5 70 1  
## 3 18 8 318 150 3436 11.0 70 1  
## 4 16 8 304 150 3433 12.0 70 1  
## 5 17 8 302 140 3449 10.5 70 1  
## 6 15 8 429 198 4341 10.0 70 1  
## 7 14 8 454 220 4354 9.0 70 1  
## 8 14 8 440 215 4312 8.5 70 1  
## 9 14 8 455 225 4425 10.0 70 1  
## 10 15 8 390 190 3850 8.5 70 1  
## name  
## 1 chevrolet chevelle malibu  
## 2 buick skylark 320  
## 3 plymouth satellite  
## 4 amc rebel sst  
## 5 ford torino  
## 6 ford galaxie 500  
## 7 chevrolet impala  
## 8 plymouth fury iii  
## 9 pontiac catalina  
## 10 amc ambassador dpl

summary(Auto)

## mpg cylinders displacement horsepower weight   
## Min. : 9.00 Min. :3.000 Min. : 68.0 Min. : 46.0 Min. :1613   
## 1st Qu.:17.00 1st Qu.:4.000 1st Qu.:105.0 1st Qu.: 75.0 1st Qu.:2225   
## Median :22.75 Median :4.000 Median :151.0 Median : 93.5 Median :2804   
## Mean :23.45 Mean :5.472 Mean :194.4 Mean :104.5 Mean :2978   
## 3rd Qu.:29.00 3rd Qu.:8.000 3rd Qu.:275.8 3rd Qu.:126.0 3rd Qu.:3615   
## Max. :46.60 Max. :8.000 Max. :455.0 Max. :230.0 Max. :5140   
##   
## acceleration year origin name   
## Min. : 8.00 Min. :70.00 Min. :1.000 amc matador : 5   
## 1st Qu.:13.78 1st Qu.:73.00 1st Qu.:1.000 ford pinto : 5   
## Median :15.50 Median :76.00 Median :1.000 toyota corolla : 5   
## Mean :15.54 Mean :75.98 Mean :1.577 amc gremlin : 4   
## 3rd Qu.:17.02 3rd Qu.:79.00 3rd Qu.:2.000 amc hornet : 4   
## Max. :24.80 Max. :82.00 Max. :3.000 chevrolet chevette: 4   
## (Other) :365

a<-median(Auto$mpg)  
attach(Auto)  
mpg01<-mpg  
mpg01[mpg>a]=1  
mpg01[mpg<=a]=0  
mpg01<-ifelse(mpg>a,yes=1,no=0)  
mpg01

## [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 1 1 1 1 0 0 0 0 0 1 1 1 0 0 0 0 0  
## [38] 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
## [75] 0 0 0 0 1 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0  
## [112] 0 0 1 0 0 1 1 0 0 0 1 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1  
## [149] 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 1 1 1 0 1 0 1 1 0 1 1 1 1 1 1 1  
## [186] 0 0 0 0 0 0 1 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 1 1 1 1 1 0 0 0  
## [223] 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 0 0 0 0 0 0 1 0 0 0 0 0  
## [260] 0 0 0 0 0 1 1 1 1 0 1 1 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1  
## [297] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
## [334] 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 0 1 0 0 1 1 1 1 1 1 1 1  
## [371] 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1

class(mpg01)

## [1] "numeric"

mpg02<-as.factor(mpg01)  
Auto01<-data.frame(Auto,mpg02)  
str(Auto01)

## 'data.frame': 392 obs. of 10 variables:  
## $ mpg : num 18 15 18 16 17 15 14 14 14 15 ...  
## $ cylinders : num 8 8 8 8 8 8 8 8 8 8 ...  
## $ displacement: num 307 350 318 304 302 429 454 440 455 390 ...  
## $ horsepower : num 130 165 150 150 140 198 220 215 225 190 ...  
## $ weight : num 3504 3693 3436 3433 3449 ...  
## $ acceleration: num 12 11.5 11 12 10.5 10 9 8.5 10 8.5 ...  
## $ year : num 70 70 70 70 70 70 70 70 70 70 ...  
## $ origin : num 1 1 1 1 1 1 1 1 1 1 ...  
## $ name : Factor w/ 304 levels "amc ambassador brougham",..: 49 36 231 14 161 141 54 223 241 2 ...  
## $ mpg02 : Factor w/ 2 levels "0","1": 1 1 1 1 1 1 1 1 1 1 ...

در سوال2 نمودار هایی باکس پلاتی که معنای خاصی ندارند و یا جعبه های بسیار نزدیکی دارند حذف میشوند زیرا متغیر مورد نظر اثر چندانی روی متغیر مورد علاقه مان نداشته است.متغیر های زیر را حذف میکنیم:

Mpg,weight,year,origin,name,namenum

متغیر ام پی جی را تنها در حالت رده ای نیاز داریم نه در حالت پیوسته وعددی!

#Q2

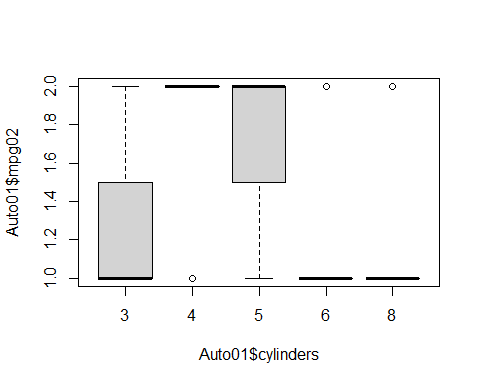
b<-table(Auto01$mpg02,Auto01$cylinders)  
b

##   
## 3 4 5 6 8  
## 0 3 20 1 72 100  
## 1 1 179 2 11 3

proportions(b)

##   
## 3 4 5 6 8  
## 0 0.007653061 0.051020408 0.002551020 0.183673469 0.255102041  
## 1 0.002551020 0.456632653 0.005102041 0.028061224 0.007653061

boxplot(Auto01$mpg02~Auto01$cylinders)



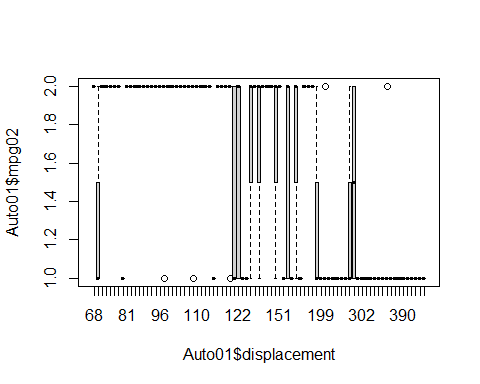
################  
c<-table(Auto01$mpg02,Auto01$displacement)  
c

##   
## 68 70 71 72 76 78 79 80 81 83 85 86 88 89 90 91 96 97 97.5 98 101 104 105  
## 0 0 2 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0  
## 1 1 1 2 1 1 1 6 0 1 1 7 4 1 5 8 12 1 20 1 17 1 1 7  
##   
## 107 108 110 111 112 113 114 115 116 119 120 121 122 130 131 134 135 140 141  
## 0 0 1 0 0 0 0 1 0 0 0 2 6 3 1 1 1 0 4 0  
## 1 5 4 1 1 4 3 0 1 4 6 7 5 4 0 0 3 5 11 2  
##   
## 144 145 146 151 155 156 163 168 171 173 181 183 198 199 200 225 231 232 250  
## 0 0 0 1 0 1 2 2 1 1 0 0 0 2 2 6 13 8 11 17  
## 1 1 1 2 9 0 4 0 2 0 3 1 1 1 0 1 0 0 0 0  
##   
## 258 260 262 267 302 304 305 307 318 340 350 351 360 383 390 400 429 440 454  
## 0 5 2 1 1 11 7 4 3 17 1 16 8 4 2 1 13 3 2 1  
## 1 0 1 1 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0  
##   
## 455  
## 0 3  
## 1 0

proportions(c)

##   
## 68 70 71 72 76 78  
## 0 0.000000000 0.005102041 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.005102041 0.002551020 0.002551020 0.002551020  
##   
## 79 80 81 83 85 86  
## 0 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.015306122 0.000000000 0.002551020 0.002551020 0.017857143 0.010204082  
##   
## 88 89 90 91 96 97  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020  
## 1 0.002551020 0.012755102 0.020408163 0.030612245 0.002551020 0.051020408  
##   
## 97.5 98 101 104 105 107  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.043367347 0.002551020 0.002551020 0.017857143 0.012755102  
##   
## 108 110 111 112 113 114  
## 0 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020  
## 1 0.010204082 0.002551020 0.002551020 0.010204082 0.007653061 0.000000000  
##   
## 115 116 119 120 121 122  
## 0 0.000000000 0.000000000 0.000000000 0.005102041 0.015306122 0.007653061  
## 1 0.002551020 0.010204082 0.015306122 0.017857143 0.012755102 0.010204082  
##   
## 130 131 134 135 140 141  
## 0 0.002551020 0.002551020 0.002551020 0.000000000 0.010204082 0.000000000  
## 1 0.000000000 0.000000000 0.007653061 0.012755102 0.028061224 0.005102041  
##   
## 144 145 146 151 155 156  
## 0 0.000000000 0.000000000 0.002551020 0.000000000 0.002551020 0.005102041  
## 1 0.002551020 0.002551020 0.005102041 0.022959184 0.000000000 0.010204082  
##   
## 163 168 171 173 181 183  
## 0 0.005102041 0.002551020 0.002551020 0.000000000 0.000000000 0.000000000  
## 1 0.000000000 0.005102041 0.000000000 0.007653061 0.002551020 0.002551020  
##   
## 198 199 200 225 231 232  
## 0 0.005102041 0.005102041 0.015306122 0.033163265 0.020408163 0.028061224  
## 1 0.002551020 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000  
##   
## 250 258 260 262 267 302  
## 0 0.043367347 0.012755102 0.005102041 0.002551020 0.002551020 0.028061224  
## 1 0.000000000 0.000000000 0.002551020 0.002551020 0.000000000 0.000000000  
##   
## 304 305 307 318 340 350  
## 0 0.017857143 0.010204082 0.007653061 0.043367347 0.002551020 0.040816327  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.005102041  
##   
## 351 360 383 390 400 429  
## 0 0.020408163 0.010204082 0.005102041 0.002551020 0.033163265 0.007653061  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 440 454 455  
## 0 0.005102041 0.002551020 0.007653061  
## 1 0.000000000 0.000000000 0.000000000

boxplot(Auto01$mpg02~Auto01$displacement)



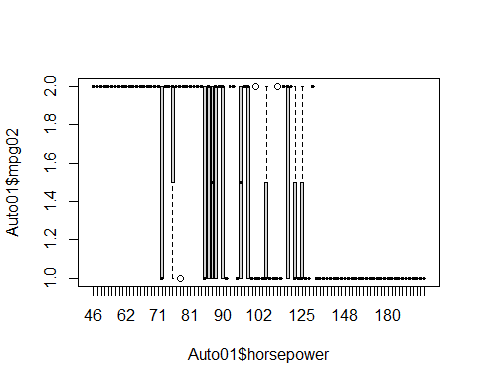
################  
d<-table(Auto01$mpg02,Auto01$horsepower)  
d

##   
## 46 48 49 52 53 54 58 60 61 62 63 64 65 66 67 68 69 70 71 72 74 75 76 77 78  
## 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 1 0 1  
## 1 2 3 1 4 2 1 2 5 1 2 3 1 10 1 12 6 3 12 5 2 3 14 3 1 5  
##   
## 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 100 102 103 105  
## 0 0 0 0 0 0 0 6 2 1 7 0 8 1 0 0 1 7 0 4 2 15 1 1 9  
## 1 2 7 2 1 4 6 3 3 1 12 1 12 0 6 1 0 7 3 5 0 2 0 0 3  
##   
## 107 108 110 112 113 115 116 120 122 125 129 130 132 133 135 137 138 139 140  
## 0 1 1 15 3 0 2 0 3 1 2 2 5 0 1 1 1 1 2 7  
## 1 0 0 3 0 1 3 1 1 0 1 0 0 1 0 0 0 0 0 0  
##   
## 142 145 148 149 150 152 153 155 158 160 165 167 170 175 180 190 193 198 200  
## 0 1 7 1 1 22 1 2 2 1 2 4 1 5 5 5 3 1 2 1  
## 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
##   
## 208 210 215 220 225 230  
## 0 1 1 3 1 3 1  
## 1 0 0 0 0 0 0

proportions(d)

##   
## 46 48 49 52 53 54  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.007653061 0.002551020 0.010204082 0.005102041 0.002551020  
##   
## 58 60 61 62 63 64  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.012755102 0.002551020 0.005102041 0.007653061 0.002551020  
##   
## 65 66 67 68 69 70  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.025510204 0.002551020 0.030612245 0.015306122 0.007653061 0.030612245  
##   
## 71 72 74 75 76 77  
## 0 0.000000000 0.010204082 0.000000000 0.000000000 0.002551020 0.000000000  
## 1 0.012755102 0.005102041 0.007653061 0.035714286 0.007653061 0.002551020  
##   
## 78 79 80 81 82 83  
## 0 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.012755102 0.005102041 0.017857143 0.005102041 0.002551020 0.010204082  
##   
## 84 85 86 87 88 89  
## 0 0.000000000 0.015306122 0.005102041 0.002551020 0.017857143 0.000000000  
## 1 0.015306122 0.007653061 0.007653061 0.002551020 0.030612245 0.002551020  
##   
## 90 91 92 93 94 95  
## 0 0.020408163 0.002551020 0.000000000 0.000000000 0.002551020 0.017857143  
## 1 0.030612245 0.000000000 0.015306122 0.002551020 0.000000000 0.017857143  
##   
## 96 97 98 100 102 103  
## 0 0.000000000 0.010204082 0.005102041 0.038265306 0.002551020 0.002551020  
## 1 0.007653061 0.012755102 0.000000000 0.005102041 0.000000000 0.000000000  
##   
## 105 107 108 110 112 113  
## 0 0.022959184 0.002551020 0.002551020 0.038265306 0.007653061 0.000000000  
## 1 0.007653061 0.000000000 0.000000000 0.007653061 0.000000000 0.002551020  
##   
## 115 116 120 122 125 129  
## 0 0.005102041 0.000000000 0.007653061 0.002551020 0.005102041 0.005102041  
## 1 0.007653061 0.002551020 0.002551020 0.000000000 0.002551020 0.000000000  
##   
## 130 132 133 135 137 138  
## 0 0.012755102 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 139 140 142 145 148 149  
## 0 0.005102041 0.017857143 0.002551020 0.017857143 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 150 152 153 155 158 160  
## 0 0.056122449 0.002551020 0.005102041 0.005102041 0.002551020 0.005102041  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 165 167 170 175 180 190  
## 0 0.010204082 0.002551020 0.012755102 0.012755102 0.012755102 0.007653061  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 193 198 200 208 210 215  
## 0 0.002551020 0.005102041 0.002551020 0.002551020 0.002551020 0.007653061  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 220 225 230  
## 0 0.002551020 0.007653061 0.002551020  
## 1 0.000000000 0.000000000 0.000000000

boxplot(Auto01$mpg02~Auto01$horsepower)



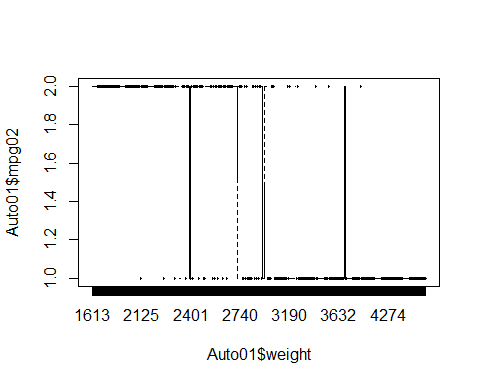
###############  
e<-table(Auto01$mpg02,Auto01$weight)  
e

##   
## 1613 1649 1755 1760 1773 1795 1800 1825 1834 1835 1836 1845 1850 1867 1875  
## 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
## 1 1 1 1 1 1 2 2 2 1 1 1 1 1 1 1  
##   
## 1915 1925 1937 1940 1945 1950 1955 1963 1965 1968 1970 1975 1980 1985 1990  
## 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
## 1 1 1 2 1 1 2 1 1 2 1 1 2 1 4 2  
##   
## 1995 2000 2003 2019 2020 2025 2035 2045 2050 2051 2065 2070 2074 2075 2085  
## 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
## 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1  
##   
## 2100 2108 2110 2120 2123 2124 2125 2126 2130 2135 2144 2145 2150 2155 2158  
## 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0  
## 1 1 1 2 1 1 0 3 1 4 1 1 1 1 3 1  
##   
## 2160 2164 2171 2188 2189 2190 2200 2202 2205 2210 2215 2219 2220 2223 2226  
## 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1  
## 1 1 2 1 1 1 2 1 1 1 1 1 1 2 1 0  
##   
## 2228 2230 2234 2245 2246 2254 2255 2264 2265 2278 2279 2288 2290 2295 2300  
## 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0  
## 1 1 1 1 1 1 1 1 1 3 1 0 1 1 1 3  
##   
## 2310 2330 2335 2350 2370 2372 2375 2379 2380 2385 2391 2395 2401 2405 2408  
## 0 1 1 0 0 0 0 0 1 0 0 0 1 1 0 2  
## 1 0 0 1 1 1 1 1 0 1 1 1 1 0 1 0  
##   
## 2420 2430 2434 2451 2464 2472 2489 2490 2500 2506 2511 2515 2525 2542 2545  
## 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0  
## 1 1 1 1 1 1 0 1 1 1 1 0 0 1 2 1  
##   
## 2556 2560 2565 2572 2575 2582 2585 2587 2592 2595 2600 2605 2615 2620 2625  
## 0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 0  
## 1 1 1 1 1 1 0 1 0 1 1 0 1 1 1 1  
##   
## 2634 2635 2639 2640 2648 2660 2665 2670 2671 2672 2678 2694 2700 2702 2711  
## 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0  
## 1 0 2 1 1 0 1 1 2 1 1 1 1 1 1 1  
##   
## 2720 2725 2735 2740 2745 2755 2774 2789 2790 2795 2800 2807 2815 2830 2833  
## 0 1 0 0 0 0 0 1 1 0 1 0 1 1 1 1  
## 1 2 1 1 1 1 1 0 0 1 0 1 0 0 0 0  
##   
## 2835 2855 2865 2868 2870 2890 2900 2901 2904 2910 2914 2930 2933 2945 2950  
## 0 1 0 0 1 0 1 0 1 0 0 1 1 1 2 0  
## 1 0 1 1 0 1 0 1 0 1 1 0 1 0 1 2  
##   
## 2957 2962 2965 2979 2984 2990 3003 3012 3015 3021 3039 3060 3070 3085 3086  
## 0 0 1 1 1 1 1 0 0 0 1 1 1 1 1 1  
## 1 1 0 0 0 0 0 1 1 1 0 0 0 0 0 0  
##   
## 3102 3121 3139 3140 3150 3155 3158 3160 3169 3190 3193 3205 3210 3211 3221  
## 0 1 1 1 1 1 1 1 0 1 0 1 1 1 1 1  
## 1 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0  
##   
## 3230 3233 3245 3250 3264 3265 3270 3278 3282 3288 3302 3329 3336 3353 3360  
## 0 0 1 1 0 1 1 1 1 1 1 1 1 1 1 1  
## 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0  
##   
## 3365 3380 3381 3399 3410 3415 3420 3425 3430 3432 3433 3436 3439 3445 3449  
## 0 1 1 1 1 2 1 0 2 1 1 1 1 1 1 1  
## 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0  
##   
## 3459 3465 3504 3520 3525 3530 3535 3563 3570 3574 3605 3609 3613 3620 3630  
## 0 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1  
## 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0  
##   
## 3632 3645 3651 3664 3672 3693 3725 3730 3735 3755 3761 3777 3781 3785 3820  
## 0 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1  
## 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0  
##   
## 3821 3830 3840 3850 3870 3880 3892 3897 3900 3907 3940 3955 3962 3988 4042  
## 0 1 1 1 1 1 1 1 1 0 1 2 1 1 1 1  
## 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0  
##   
## 4054 4055 4060 4077 4080 4082 4096 4098 4100 4129 4135 4140 4141 4154 4165  
## 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
## 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
##   
## 4190 4209 4215 4220 4237 4257 4274 4278 4294 4295 4312 4325 4335 4341 4354  
## 0 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1  
## 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
##   
## 4360 4363 4376 4380 4382 4385 4422 4425 4440 4456 4457 4464 4498 4499 4502  
## 0 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1  
## 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
##   
## 4615 4633 4638 4654 4657 4668 4699 4732 4735 4746 4906 4951 4952 4955 4997  
## 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
## 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
##   
## 5140  
## 0 1  
## 1 0

proportions(e)

##   
## 1613 1649 1755 1760 1773 1795  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.005102041  
##   
## 1800 1825 1834 1835 1836 1845  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.005102041 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 1850 1867 1875 1915 1925 1937  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.005102041  
##   
## 1940 1945 1950 1955 1963 1965  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.005102041 0.002551020 0.002551020 0.005102041  
##   
## 1968 1970 1975 1980 1985 1990  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.005102041 0.002551020 0.010204082 0.005102041  
##   
## 1995 2000 2003 2019 2020 2025  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 2035 2045 2050 2051 2065 2070  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.005102041 0.002551020 0.002551020 0.005102041 0.002551020  
##   
## 2074 2075 2085 2100 2108 2110  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.005102041  
##   
## 2120 2123 2124 2125 2126 2130  
## 0 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.000000000 0.007653061 0.002551020 0.010204082  
##   
## 2135 2144 2145 2150 2155 2158  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.007653061 0.002551020  
##   
## 2160 2164 2171 2188 2189 2190  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.005102041 0.002551020 0.002551020 0.002551020 0.005102041  
##   
## 2200 2202 2205 2210 2215 2219  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 2220 2223 2226 2228 2230 2234  
## 0 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020  
##   
## 2245 2246 2254 2255 2264 2265  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.007653061  
##   
## 2278 2279 2288 2290 2295 2300  
## 0 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020 0.007653061  
##   
## 2310 2330 2335 2350 2370 2372  
## 0 0.002551020 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.000000000 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 2375 2379 2380 2385 2391 2395  
## 0 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000 0.002551020  
## 1 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 2401 2405 2408 2420 2430 2434  
## 0 0.002551020 0.000000000 0.005102041 0.000000000 0.000000000 0.000000000  
## 1 0.000000000 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020  
##   
## 2451 2464 2472 2489 2490 2500  
## 0 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020  
##   
## 2506 2511 2515 2525 2542 2545  
## 0 0.000000000 0.002551020 0.002551020 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.000000000 0.000000000 0.002551020 0.005102041 0.002551020  
##   
## 2556 2560 2565 2572 2575 2582  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000  
##   
## 2585 2587 2592 2595 2600 2605  
## 0 0.000000000 0.002551020 0.000000000 0.000000000 0.002551020 0.000000000  
## 1 0.002551020 0.000000000 0.002551020 0.002551020 0.000000000 0.002551020  
##   
## 2615 2620 2625 2634 2635 2639  
## 0 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.000000000 0.005102041 0.002551020  
##   
## 2640 2648 2660 2665 2670 2671  
## 0 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.000000000 0.002551020 0.002551020 0.005102041 0.002551020  
##   
## 2672 2678 2694 2700 2702 2711  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 2720 2725 2735 2740 2745 2755  
## 0 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 2774 2789 2790 2795 2800 2807  
## 0 0.002551020 0.002551020 0.000000000 0.002551020 0.000000000 0.002551020  
## 1 0.000000000 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000  
##   
## 2815 2830 2833 2835 2855 2865  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000 0.000000000  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020 0.002551020  
##   
## 2868 2870 2890 2900 2901 2904  
## 0 0.002551020 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000  
## 1 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000 0.002551020  
##   
## 2910 2914 2930 2933 2945 2950  
## 0 0.000000000 0.002551020 0.002551020 0.002551020 0.005102041 0.000000000  
## 1 0.002551020 0.000000000 0.002551020 0.000000000 0.002551020 0.005102041  
##   
## 2957 2962 2965 2979 2984 2990  
## 0 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3003 3012 3015 3021 3039 3060  
## 0 0.000000000 0.000000000 0.000000000 0.002551020 0.002551020 0.002551020  
## 1 0.002551020 0.002551020 0.002551020 0.000000000 0.000000000 0.000000000  
##   
## 3070 3085 3086 3102 3121 3139  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3140 3150 3155 3158 3160 3169  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000  
##   
## 3190 3193 3205 3210 3211 3221  
## 0 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3230 3233 3245 3250 3264 3265  
## 0 0.000000000 0.002551020 0.002551020 0.000000000 0.002551020 0.002551020  
## 1 0.002551020 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000  
##   
## 3270 3278 3282 3288 3302 3329  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3336 3353 3360 3365 3380 3381  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3399 3410 3415 3420 3425 3430  
## 0 0.002551020 0.005102041 0.002551020 0.000000000 0.005102041 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000  
##   
## 3432 3433 3436 3439 3445 3449  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3459 3465 3504 3520 3525 3530  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020  
##   
## 3535 3563 3570 3574 3605 3609  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3613 3620 3630 3632 3645 3651  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3664 3672 3693 3725 3730 3735  
## 0 0.002551020 0.005102041 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000  
##   
## 3755 3761 3777 3781 3785 3820  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3821 3830 3840 3850 3870 3880  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 3892 3897 3900 3907 3940 3955  
## 0 0.002551020 0.002551020 0.000000000 0.002551020 0.005102041 0.002551020  
## 1 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000  
##   
## 3962 3988 4042 4054 4055 4060  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4077 4080 4082 4096 4098 4100  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4129 4135 4140 4141 4154 4165  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4190 4209 4215 4220 4237 4257  
## 0 0.002551020 0.002551020 0.005102041 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4274 4278 4294 4295 4312 4325  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4335 4341 4354 4360 4363 4376  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4380 4382 4385 4422 4425 4440  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4456 4457 4464 4498 4499 4502  
## 0 0.002551020 0.002551020 0.005102041 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4615 4633 4638 4654 4657 4668  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4699 4732 4735 4746 4906 4951  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 4952 4955 4997 5140  
## 0 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000

boxplot(Auto01$mpg02~Auto01$weight)



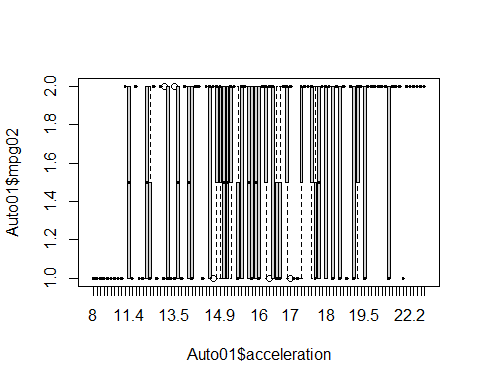
################  
f<-table(Auto01$mpg02,Auto01$acceleration)  
f

##   
## 8 8.5 9 9.5 10 10.5 11 11.1 11.2 11.3 11.4 11.5 11.6 12 12.1 12.2 12.5  
## 0 1 2 1 2 4 1 7 1 1 0 1 7 0 10 1 1 6  
## 1 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1 2  
##   
## 12.6 12.8 12.9 13 13.2 13.4 13.5 13.6 13.7 13.8 13.9 14 14.1 14.2 14.3 14.4  
## 0 0 3 0 11 4 2 13 1 2 0 1 9 0 0 1 0  
## 1 2 0 2 1 2 0 2 1 0 2 1 7 1 3 0 5  
##   
## 14.5 14.7 14.8 14.9 15 15.1 15.2 15.3 15.4 15.5 15.6 15.7 15.8 15.9 16 16.1  
## 0 11 1 1 2 7 1 1 0 3 10 0 2 4 1 9 0  
## 1 12 4 2 5 7 1 2 3 1 11 1 2 2 1 7 1  
##   
## 16.2 16.4 16.5 16.6 16.7 16.8 16.9 17 17.1 17.2 17.3 17.4 17.5 17.6 17.7  
## 0 1 1 6 2 2 0 1 3 1 2 1 0 0 1 2  
## 1 3 8 7 1 1 2 3 10 0 0 3 2 4 3 1  
##   
## 17.8 17.9 18 18.1 18.2 18.3 18.5 18.6 18.7 18.8 19 19.2 19.4 19.5 19.6 19.9  
## 0 1 0 3 0 3 0 3 0 2 0 6 1 0 4 0 0  
## 1 1 1 5 1 2 1 2 4 0 1 5 2 3 2 2 1  
##   
## 20.1 20.4 20.5 20.7 21 21.5 21.7 21.8 21.9 22.1 22.2 23.5 23.7 24.6 24.8  
## 0 0 0 0 0 3 0 0 0 1 0 0 0 0 0 0  
## 1 2 1 2 1 2 1 1 1 0 1 2 1 1 1 1

proportions(f)

##   
## 8 8.5 9 9.5 10 10.5  
## 0 0.002551020 0.005102041 0.002551020 0.005102041 0.010204082 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 11 11.1 11.2 11.3 11.4 11.5  
## 0 0.017857143 0.002551020 0.002551020 0.000000000 0.002551020 0.017857143  
## 1 0.000000000 0.000000000 0.000000000 0.002551020 0.002551020 0.000000000  
##   
## 11.6 12 12.1 12.2 12.5 12.6  
## 0 0.000000000 0.025510204 0.002551020 0.002551020 0.015306122 0.000000000  
## 1 0.002551020 0.000000000 0.000000000 0.002551020 0.005102041 0.005102041  
##   
## 12.8 12.9 13 13.2 13.4 13.5  
## 0 0.007653061 0.000000000 0.028061224 0.010204082 0.005102041 0.033163265  
## 1 0.000000000 0.005102041 0.002551020 0.005102041 0.000000000 0.005102041  
##   
## 13.6 13.7 13.8 13.9 14 14.1  
## 0 0.002551020 0.005102041 0.000000000 0.002551020 0.022959184 0.000000000  
## 1 0.002551020 0.000000000 0.005102041 0.002551020 0.017857143 0.002551020  
##   
## 14.2 14.3 14.4 14.5 14.7 14.8  
## 0 0.000000000 0.002551020 0.000000000 0.028061224 0.002551020 0.002551020  
## 1 0.007653061 0.000000000 0.012755102 0.030612245 0.010204082 0.005102041  
##   
## 14.9 15 15.1 15.2 15.3 15.4  
## 0 0.005102041 0.017857143 0.002551020 0.002551020 0.000000000 0.007653061  
## 1 0.012755102 0.017857143 0.002551020 0.005102041 0.007653061 0.002551020  
##   
## 15.5 15.6 15.7 15.8 15.9 16  
## 0 0.025510204 0.000000000 0.005102041 0.010204082 0.002551020 0.022959184  
## 1 0.028061224 0.002551020 0.005102041 0.005102041 0.002551020 0.017857143  
##   
## 16.1 16.2 16.4 16.5 16.6 16.7  
## 0 0.000000000 0.002551020 0.002551020 0.015306122 0.005102041 0.005102041  
## 1 0.002551020 0.007653061 0.020408163 0.017857143 0.002551020 0.002551020  
##   
## 16.8 16.9 17 17.1 17.2 17.3  
## 0 0.000000000 0.002551020 0.007653061 0.002551020 0.005102041 0.002551020  
## 1 0.005102041 0.007653061 0.025510204 0.000000000 0.000000000 0.007653061  
##   
## 17.4 17.5 17.6 17.7 17.8 17.9  
## 0 0.000000000 0.000000000 0.002551020 0.005102041 0.002551020 0.000000000  
## 1 0.005102041 0.010204082 0.007653061 0.002551020 0.002551020 0.002551020  
##   
## 18 18.1 18.2 18.3 18.5 18.6  
## 0 0.007653061 0.000000000 0.007653061 0.000000000 0.007653061 0.000000000  
## 1 0.012755102 0.002551020 0.005102041 0.002551020 0.005102041 0.010204082  
##   
## 18.7 18.8 19 19.2 19.4 19.5  
## 0 0.005102041 0.000000000 0.015306122 0.002551020 0.000000000 0.010204082  
## 1 0.000000000 0.002551020 0.012755102 0.005102041 0.007653061 0.005102041  
##   
## 19.6 19.9 20.1 20.4 20.5 20.7  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.002551020 0.005102041 0.002551020 0.005102041 0.002551020  
##   
## 21 21.5 21.7 21.8 21.9 22.1  
## 0 0.007653061 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000  
## 1 0.005102041 0.002551020 0.002551020 0.002551020 0.000000000 0.002551020  
##   
## 22.2 23.5 23.7 24.6 24.8  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.002551020 0.002551020 0.002551020 0.002551020

boxplot(Auto01$mpg02~Auto01$acceleration)



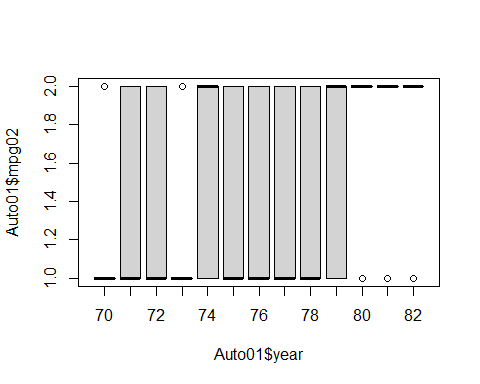
################  
g<-table(Auto01$mpg02,Auto01$year)  
g

##   
## 70 71 72 73 74 75 76 77 78 79 80 81 82  
## 0 22 16 20 34 11 19 20 15 21 13 1 3 1  
## 1 7 11 8 6 15 11 14 13 15 16 26 25 29

proportions(g)

##   
## 70 71 72 73 74 75  
## 0 0.056122449 0.040816327 0.051020408 0.086734694 0.028061224 0.048469388  
## 1 0.017857143 0.028061224 0.020408163 0.015306122 0.038265306 0.028061224  
##   
## 76 77 78 79 80 81  
## 0 0.051020408 0.038265306 0.053571429 0.033163265 0.002551020 0.007653061  
## 1 0.035714286 0.033163265 0.038265306 0.040816327 0.066326531 0.063775510  
##   
## 82  
## 0 0.002551020  
## 1 0.073979592

boxplot(Auto01$mpg02~Auto01$year)



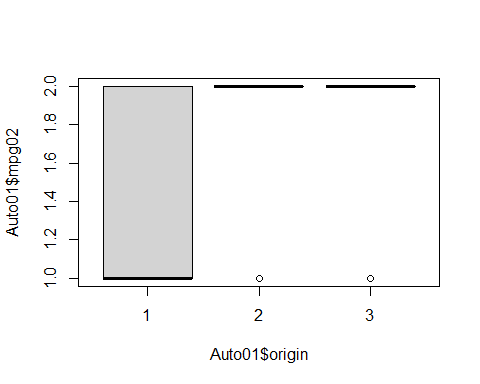
#################  
h<-table(Auto01$mpg02,Auto01$origin)  
h

##   
## 1 2 3  
## 0 173 14 9  
## 1 72 54 70

proportions(h)

##   
## 1 2 3  
## 0 0.44132653 0.03571429 0.02295918  
## 1 0.18367347 0.13775510 0.17857143

boxplot(Auto01$mpg02~Auto01$origin)



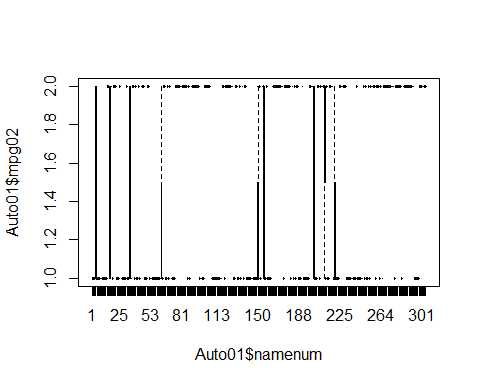
#################  
Auto01$name = as.factor(Auto01$name)  
Auto01$namenum<- as.numeric((Auto01$name))  
i<-table(Auto01$mpg02,Auto01$namenum)  
i

##   
## 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28  
## 0 1 1 1 1 1 1 4 4 1 5 2 1 1 1 0 0 1 0 1 0 0 0 1 2 1 0 1 1  
## 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 1 1 1 0 0 0 1 0 0  
##   
## 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53  
## 0 1 2 1 0 1 1 1 1 0 0 1 0 1 1 0 3 0 0 0 1 2 2 0 0 1  
## 1 0 0 0 1 0 0 1 0 1 1 0 1 0 0 1 0 1 1 1 0 0 0 4 3 0  
##   
## 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78  
## 0 4 2 1 1 2 1 1 3 1 2 1 0 0 1 1 0 1 0 1 1 1 1 0 0 0  
## 1 0 0 0 0 0 0 0 0 0 1 0 1 1 0 0 1 0 1 0 0 0 0 1 1 1  
##   
## 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102  
## 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 2 1 1 1 0  
## 1 2 1 1 1 1 1 1 1 0 2 0 1 1 1 1 1 2 1 1 0 0 0 0 1  
##   
## 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121  
## 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 0 0 1 0  
## 1 3 1 1 1 1 0 0 0 0 0 0 0 0 0 0 1 1 0 1  
##   
## 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140  
## 0 0 0 0 0 0 0 1 2 0 0 1 1 0 1 0 1 0 0 1  
## 1 1 1 2 1 1 1 0 0 1 1 0 0 1 0 1 0 1 1 0  
##   
## 141 142 143 144 145 146 147 148 149 150 151 153 154 155 156 157 158 159 160  
## 0 3 3 2 1 1 1 1 2 1 3 1 0 1 0 2 1 1 0 1  
## 1 0 0 0 0 0 0 0 0 0 1 0 1 0 1 3 0 0 1 0  
##   
## 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179  
## 0 1 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0  
## 1 0 0 0 2 1 1 3 1 1 1 2 1 1 0 2 1 1 1 1  
##   
## 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198  
## 0 0 1 0 1 0 1 0 0 1 1 1 0 1 1 1 1 1 1 0  
## 1 1 0 1 0 1 0 1 1 0 0 0 1 0 0 0 0 0 0 1  
##   
## 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217  
## 0 0 0 1 1 1 1 0 0 1 0 0 0 1 1 0 1 1 0 0  
## 1 1 1 1 0 0 0 1 1 0 2 2 1 3 0 1 0 0 1 1  
##   
## 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236  
## 0 0 1 2 1 1 3 1 0 0 0 0 0 0 1 1 1 1 2 1  
## 1 1 0 1 0 0 0 0 1 1 1 1 2 1 0 0 0 0 0 0  
##   
## 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 256  
## 0 1 1 1 0 3 1 1 1 1 0 1 0 1 1 0 1 0 0 0  
## 1 0 0 0 1 0 0 0 0 0 1 0 2 0 0 1 0 1 1 1  
##   
## 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276  
## 0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 2  
## 1 1 0 2 2 2 0 1 0 5 2 1 1 1 4 1 1 1 1 0  
##   
## 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295  
## 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 1  
## 1 1 1 1 1 1 1 0 3 1 1 2 1 1 1 1 1 1 0 0  
##   
## 296 297 298 299 300 301 302 303 304  
## 0 1 1 1 0 0 0 0 0 0  
## 1 0 0 0 1 1 1 2 1 1

proportions(i)

##   
## 1 2 3 4 5 6  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000  
##   
## 7 8 9 10 11 12  
## 0 0.010204082 0.010204082 0.002551020 0.012755102 0.005102041 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 13 14 15 16 17 18  
## 0 0.002551020 0.002551020 0.000000000 0.000000000 0.002551020 0.000000000  
## 1 0.000000000 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 19 20 21 22 23 24  
## 0 0.002551020 0.000000000 0.000000000 0.000000000 0.002551020 0.005102041  
## 1 0.000000000 0.002551020 0.002551020 0.002551020 0.000000000 0.000000000  
##   
## 25 26 27 28 29 30  
## 0 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020 0.005102041  
## 1 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 31 32 33 34 35 36  
## 0 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.002551020 0.000000000 0.000000000 0.002551020 0.000000000  
##   
## 37 38 39 40 41 42  
## 0 0.000000000 0.000000000 0.002551020 0.000000000 0.002551020 0.002551020  
## 1 0.002551020 0.002551020 0.000000000 0.002551020 0.000000000 0.000000000  
##   
## 43 44 45 46 47 48  
## 0 0.000000000 0.007653061 0.000000000 0.000000000 0.000000000 0.002551020  
## 1 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020 0.000000000  
##   
## 49 50 51 52 53 54  
## 0 0.005102041 0.005102041 0.000000000 0.000000000 0.002551020 0.010204082  
## 1 0.000000000 0.000000000 0.010204082 0.007653061 0.000000000 0.000000000  
##   
## 55 56 57 58 59 60  
## 0 0.005102041 0.002551020 0.002551020 0.005102041 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 61 62 63 64 65 66  
## 0 0.007653061 0.002551020 0.005102041 0.002551020 0.000000000 0.000000000  
## 1 0.000000000 0.000000000 0.002551020 0.000000000 0.002551020 0.002551020  
##   
## 67 68 69 70 71 72  
## 0 0.002551020 0.002551020 0.000000000 0.002551020 0.000000000 0.002551020  
## 1 0.000000000 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000  
##   
## 73 74 75 76 77 78  
## 0 0.002551020 0.002551020 0.002551020 0.000000000 0.000000000 0.000000000  
## 1 0.000000000 0.000000000 0.000000000 0.002551020 0.002551020 0.002551020  
##   
## 79 80 81 82 83 84  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 85 86 87 88 89 90  
## 0 0.000000000 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000  
## 1 0.002551020 0.002551020 0.000000000 0.005102041 0.000000000 0.002551020  
##   
## 91 92 93 94 95 96  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.005102041 0.002551020  
##   
## 97 98 99 100 101 102  
## 0 0.000000000 0.005102041 0.002551020 0.002551020 0.002551020 0.000000000  
## 1 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020  
##   
## 103 104 105 106 107 108  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020  
## 1 0.007653061 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000  
##   
## 109 110 111 112 113 114  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 115 116 117 118 119 120  
## 0 0.002551020 0.002551020 0.002551020 0.000000000 0.000000000 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.002551020 0.002551020 0.000000000  
##   
## 121 122 123 124 125 126  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.005102041 0.002551020 0.002551020  
##   
## 127 128 129 130 131 132  
## 0 0.000000000 0.002551020 0.005102041 0.000000000 0.000000000 0.002551020  
## 1 0.002551020 0.000000000 0.000000000 0.002551020 0.002551020 0.000000000  
##   
## 133 134 135 136 137 138  
## 0 0.002551020 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000  
## 1 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000 0.002551020  
##   
## 139 140 141 142 143 144  
## 0 0.000000000 0.002551020 0.007653061 0.007653061 0.005102041 0.002551020  
## 1 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 145 146 147 148 149 150  
## 0 0.002551020 0.002551020 0.002551020 0.005102041 0.002551020 0.007653061  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020  
##   
## 151 153 154 155 156 157  
## 0 0.002551020 0.000000000 0.002551020 0.000000000 0.005102041 0.002551020  
## 1 0.000000000 0.002551020 0.000000000 0.002551020 0.007653061 0.000000000  
##   
## 158 159 160 161 162 163  
## 0 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 164 165 166 167 168 169  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.005102041 0.002551020 0.002551020 0.007653061 0.002551020 0.002551020  
##   
## 170 171 172 173 174 175  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000  
## 1 0.002551020 0.005102041 0.002551020 0.002551020 0.000000000 0.005102041  
##   
## 176 177 178 179 180 181  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020  
## 1 0.002551020 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000  
##   
## 182 183 184 185 186 187  
## 0 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000 0.000000000  
## 1 0.002551020 0.000000000 0.002551020 0.000000000 0.002551020 0.002551020  
##   
## 188 189 190 191 192 193  
## 0 0.002551020 0.002551020 0.002551020 0.000000000 0.002551020 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000  
##   
## 194 195 196 197 198 199  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000 0.000000000  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020 0.002551020  
##   
## 200 201 202 203 204 205  
## 0 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000  
## 1 0.002551020 0.002551020 0.000000000 0.000000000 0.000000000 0.002551020  
##   
## 206 207 208 209 210 211  
## 0 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000 0.002551020  
## 1 0.002551020 0.000000000 0.005102041 0.005102041 0.002551020 0.007653061  
##   
## 212 213 214 215 216 217  
## 0 0.002551020 0.000000000 0.002551020 0.002551020 0.000000000 0.000000000  
## 1 0.000000000 0.002551020 0.000000000 0.000000000 0.002551020 0.002551020  
##   
## 218 219 220 221 222 223  
## 0 0.000000000 0.002551020 0.005102041 0.002551020 0.002551020 0.007653061  
## 1 0.002551020 0.000000000 0.002551020 0.000000000 0.000000000 0.000000000  
##   
## 224 225 226 227 228 229  
## 0 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020 0.005102041  
##   
## 230 231 232 233 234 235  
## 0 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020 0.005102041  
## 1 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 236 237 238 239 240 241  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000 0.007653061  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000  
##   
## 242 243 244 245 246 247  
## 0 0.002551020 0.002551020 0.002551020 0.002551020 0.000000000 0.002551020  
## 1 0.000000000 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000  
##   
## 248 249 250 251 252 253  
## 0 0.000000000 0.002551020 0.002551020 0.000000000 0.002551020 0.000000000  
## 1 0.005102041 0.000000000 0.000000000 0.002551020 0.000000000 0.002551020  
##   
## 254 256 258 259 260 261  
## 0 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.000000000 0.005102041 0.005102041  
##   
## 262 263 264 265 266 267  
## 0 0.000000000 0.002551020 0.000000000 0.002551020 0.000000000 0.000000000  
## 1 0.005102041 0.000000000 0.002551020 0.000000000 0.012755102 0.005102041  
##   
## 268 269 270 271 272 273  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.010204082 0.002551020 0.002551020  
##   
## 274 275 276 277 278 279  
## 0 0.000000000 0.000000000 0.005102041 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.000000000 0.002551020 0.002551020 0.002551020  
##   
## 280 281 282 283 284 285  
## 0 0.000000000 0.000000000 0.000000000 0.002551020 0.000000000 0.000000000  
## 1 0.002551020 0.002551020 0.002551020 0.000000000 0.007653061 0.002551020  
##   
## 286 287 288 289 290 291  
## 0 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.002551020 0.005102041 0.002551020 0.002551020 0.002551020 0.002551020  
##   
## 292 293 294 295 296 297  
## 0 0.000000000 0.000000000 0.002551020 0.002551020 0.002551020 0.002551020  
## 1 0.002551020 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000  
##   
## 298 299 300 301 302 303  
## 0 0.002551020 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000  
## 1 0.000000000 0.002551020 0.002551020 0.002551020 0.005102041 0.002551020  
##   
## 304  
## 0 0.000000000  
## 1 0.002551020

boxplot(Auto01$mpg02~Auto01$namenum)



#################

سوال3 تقریبا 75 درصد داده ها را برای آموزشی و25 درصد را برای آزمایشی در نظر میگیریم.داده ها را برای یکسان شدن واحدها استاندارد می کنیم.(بدون استفاده از داده های آزمایشی)

یک،دو و پنج الگوریتم را انجام میدهیم مقدار آن هرگز نباید خیلی بزرگ و یا خیلی کوچک باشد.k روی متغیر پاسخ با

هرچه خطا کمتر باشد بهتر است اما اگر دلیل بیش برازشی باشد باز باید بررسی شود و کا بهینه پیدا شود.

میس ها از تقسیم عناصر غیرقطر به قطر اصلی بدست می آید.

مثلا کا برابر 1 میانگین خطاهایش صفر است که هم بدلیل بسیار کوچک بودن کا و هم بدلیل بیش برازشی این اتفاق افتاده است.

برای کا2 خطایمان بیشتر شده است چه در اموزشی چه در ازمایشی که دلیل آن می تواند بیش برازشی کمتر باشد.

در کا5 خطای آموزشی و آزمایشی هر دو زیاد شده که میتوان نتیجه گرفت تازه به حالت بهینه و نرمالتر نزدیک میشوند.

با کراس ولیدیشن مقدار آنرا پیدا میکنیم

Mink5=

و با یک استاندارد ارور بیشتر و کمتر حساب میکنیم.

در حالت بهینه هم خطایمان واقعیست و هم دچار بیش برازشی نشدیم و هم اندازه کا بسیار زیاد نیست که همه نقاط در آن جا بگیرد.

#Q3

#Delete useless variables  
Autonew<-Auto01[,-c(1,5,7,8,9,11)]  
#294 trains 98 tests  
set.seed(123)  
dim(Autonew)

## [1] 392 5

perm <- sample(x=nrow(Autonew))  
set1 <- Autonew[which(perm <= 294),]  
set2 <- Autonew[which(perm>294),]  
#Need to scale all variables to have same SD  
#Function to Scaling x1 using mean and SD from set2  
scale.1 <- function(x1,x2){  
 for(col in 1:ncol(x1)){  
 a <- mean(x2[,col])  
 b <- sd(x2[,col])  
 x1[,col] <- (x1[,col]-a)/b  
 }  
 x1  
}  
#Creating training and test X matrices, then scaling them.  
x.1.unscaled <- as.matrix(set1[,-5])  
x.1 <- scale.1(x.1.unscaled, x.1.unscaled)  
x.2.unscaled <- as.matrix(set2[,-5])  
x.2 <- scale.1(x.2.unscaled, x.1.unscaled)  
summary(x.1)

## cylinders displacement horsepower acceleration   
## Min. :-1.48338 Min. :-1.2519 Min. :-1.5485 Min. :-2.62726   
## 1st Qu.:-0.90574 1st Qu.:-0.8734 1st Qu.:-0.7291 1st Qu.:-0.69587   
## Median :-0.03929 Median :-0.4192 Median :-0.2938 Median :-0.04622   
## Mean : 0.00000 Mean : 0.0000 Mean : 0.0000 Mean : 0.00000   
## 3rd Qu.: 1.40479 3rd Qu.: 0.9623 3rd Qu.: 0.6407 3rd Qu.: 0.53319   
## Max. : 1.40479 Max. : 2.4101 Max. : 3.1628 Max. : 3.27225

summary(x.2)

## cylinders displacement horsepower acceleration   
## Min. :-1.4834 Min. :-1.2330 Min. :-1.5485 Min. :-2.45168   
## 1st Qu.:-0.9057 1st Qu.:-0.9681 1st Qu.:-0.8059 1st Qu.:-0.37105   
## Median :-0.9057 Median :-0.6274 Median :-0.4219 Median : 0.00645   
## Mean :-0.2220 Mean :-0.2230 Mean :-0.2055 Mean : 0.08385   
## 3rd Qu.: 0.2495 3rd Qu.: 0.2999 3rd Qu.:-0.0378 3rd Qu.: 0.61220   
## Max. : 1.4048 Max. : 2.4101 Max. : 3.0347 Max. : 2.35923

#First with k=1  
library(FNN)

## Warning: package 'FNN' was built under R version 4.2.2

knnfit.1.1 <- knn(train=x.1, test=x.1, cl=set1[,5], k=1)  
#Create Confusion Matrix and misclass rate  
table(knnfit.1.1, set1[,5], dnn=c("Predicted","Observed"))

## Observed  
## Predicted 0 1  
## 0 154 0  
## 1 0 140

(misclass.knn1.1 <-   
 mean(ifelse(knnfit.1.1 == set1[,5], yes=0, no=1)))

## [1] 0

#Fit the 1-NN function using set 1 to train and set2 to test  
#(compute test error)  
knnfit.1.2 <- knn(train=x.1, test=x.2, cl=set1[,5], k=1)  
table(knnfit.1.2, set2[,5], dnn=c("Predicted","Observed"))

## Observed  
## Predicted 0 1  
## 0 38 4  
## 1 4 52

(misclass.knn1.2 <-   
 mean(ifelse(knnfit.1.2 == set2[,5], yes=0, no=1)))

## [1] 0.08163265

#Examine with k=2  
knnfit.1.1 <- knn(train=x.1, test=x.1, cl=set1[,5], k=2)  
table(knnfit.1.1, set1[,5], dnn=c("Predicted","Observed"))

## Observed  
## Predicted 0 1  
## 0 154 19  
## 1 0 121

(misclass.knn1.1 <-   
 mean(ifelse(knnfit.1.1 == set1[,5], yes=0, no=1)))

## [1] 0.06462585

#Fit the 1-NN function using set 1 to train and set2 to test  
#(compute test error)  
knnfit.1.2 <- knn(train=x.1, test=x.2, cl=set1[,5], k=2)  
table(knnfit.1.2, set2[,5], dnn=c("Predicted","Observed"))

## Observed  
## Predicted 0 1  
## 0 38 5  
## 1 4 51

(misclass.knn1.2 <-   
 mean(ifelse(knnfit.1.2 == set2[,5], yes=0, no=1)))

## [1] 0.09183673

#Examine with k=5  
knnfit.1.1 <- knn(train=x.1, test=x.1, cl=set1[,5], k=5)  
table(knnfit.1.1, set1[,5], dnn=c("Predicted","Observed"))

## Observed  
## Predicted 0 1  
## 0 139 8  
## 1 15 132

(misclass.knn1.1 <-   
 mean(ifelse(knnfit.1.1 == set1[,5], yes=0, no=1)))

## [1] 0.07823129

#Fit the 1-NN function using set 1 to train and set2 to test  
#(compute test error)  
knnfit.1.2 <- knn(train=x.1, test=x.2, cl=set1[,5], k=5)  
table(knnfit.1.2, set2[,5], dnn=c("Predicted","Observed"))

## Observed  
## Predicted 0 1  
## 0 37 4  
## 1 5 52

(misclass.knn1.2 <-   
 mean(ifelse(knnfit.1.2 == set2[,5], yes=0, no=1)))

## [1] 0.09183673

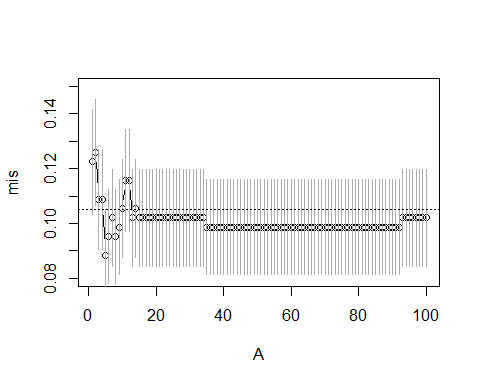
#Now we tune using cv.knn(), which does Leave-one-out (n-fold) CV  
kmax <- 100  
A <- matrix(c(1:kmax), nrow=kmax)  
runknn <- function(x){  
 knncv.fit <- knn.cv(train=x.1, cl=set1[,5], k=x)  
 # Fitted values are for deleted data from CV  
 mean(ifelse(knncv.fit == set1[,5], yes=0, no=1))  
}  
mis <- apply(X=A, MARGIN=1, FUN=runknn)  
mis

## [1] 0.12244898 0.12585034 0.10884354 0.10884354 0.08843537 0.09523810  
## [7] 0.10204082 0.09523810 0.09863946 0.10544218 0.11564626 0.11564626  
## [13] 0.10204082 0.10544218 0.10204082 0.10204082 0.10204082 0.10204082  
## [19] 0.10204082 0.10204082 0.10204082 0.10204082 0.10204082 0.10204082  
## [25] 0.10204082 0.10204082 0.10204082 0.10204082 0.10204082 0.10204082  
## [31] 0.10204082 0.10204082 0.10204082 0.10204082 0.09863946 0.09863946  
## [37] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [43] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [49] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [55] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [61] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [67] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [73] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [79] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [85] 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946 0.09863946  
## [91] 0.09863946 0.09863946 0.10204082 0.10204082 0.10204082 0.10204082  
## [97] 0.10204082 0.10204082 0.10204082 0.10204082

mis.se <- sqrt(mis\*(1-mis)/nrow(set1)) #SE of misclass rates  
mis.se

## [1] 0.01911790 0.01934401 0.01816371 0.01816371 0.01655896 0.01711981  
## [7] 0.01765394 0.01711981 0.01739005 0.01791174 0.01865113 0.01865113  
## [13] 0.01765394 0.01791174 0.01765394 0.01765394 0.01765394 0.01765394  
## [19] 0.01765394 0.01765394 0.01765394 0.01765394 0.01765394 0.01765394  
## [25] 0.01765394 0.01765394 0.01765394 0.01765394 0.01765394 0.01765394  
## [31] 0.01765394 0.01765394 0.01765394 0.01765394 0.01739005 0.01739005  
## [37] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [43] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [49] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [55] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [61] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [67] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [73] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [79] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [85] 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005 0.01739005  
## [91] 0.01739005 0.01739005 0.01765394 0.01765394 0.01765394 0.01765394  
## [97] 0.01765394 0.01765394 0.01765394 0.01765394

#Now plot results # Plot like the CV plots, with 1SE bars and a horizontal line # at 1SE above minimum.  
plot(x=A, y=mis, type="b", ylim=c(.08,.15))   
for(ii in c(1:kmax)){  
 lines(x=c(A[ii],A[ii]), y=c(mis[ii]-mis.se[ii], mis[ii]+mis.se[ii]), col=colors()[220])  
}  
abline(h=min(mis + mis.se), lty="dotted")



#k for Minimum CV error  
mink = which.min(mis)  
mink

## [1] 5

## [1] 12  
#Trying the value of k with the lowest validation error on test data set.  
knnfitmin.2 <- knn(train=x.1, test=x.2, cl=set1[,5], k=mink)  
table(knnfitmin.2, set2[,5], dnn=c("Predicted","Observed"))

## Observed  
## Predicted 0 1  
## 0 37 4  
## 1 5 52

(misclass.2.knnmin <- mean(ifelse(knnfitmin.2 == set2[,5], yes=0, no=1)))

## [1] 0.09183673

#1 SE of minimum validation error  
serule = max(which(mis<mis[mink]+mis.se[mink]))  
knnfitse.2 <- knn(train=x.1, test=x.2, cl=set1[,5], k=serule)  
table(knnfitse.2, set2[,5], dnn=c("Predicted","Observed"))

## Observed  
## Predicted 0 1  
## 0 35 2  
## 1 7 54

(misclass.2.knnse <- mean(ifelse(knnfitse.2 == set2[,5], yes=0, no=1)))

## [1] 0.09183673