Classification-Practice-1—Test-data—diabetes.R

user

2022-05-05

library(readr)

## Warning: package 'readr' was built under R version 4.1.3

testss <- read\_csv("diabetes.csv")

## Rows: 768 Columns: 9  
## -- Column specification --------------------------------------------------------  
## Delimiter: ","  
## dbl (9): Pregnancies, Glucose, BloodPressure, SkinThickness, Insulin, BMI, D...  
##   
## i Use `spec()` to retrieve the full column specification for this data.  
## i Specify the column types or set `show\_col\_types = FALSE` to quiet this message.

names(testss)

## [1] "Pregnancies" "Glucose"   
## [3] "BloodPressure" "SkinThickness"   
## [5] "Insulin" "BMI"   
## [7] "DiabetesPedigreeFunction" "Age"   
## [9] "Outcome"

head(testss)

## # A tibble: 6 x 9  
## Pregnancies Glucose BloodPressure SkinThickness Insulin BMI DiabetesPedigre~  
## <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 6 148 72 35 0 33.6 0.627  
## 2 1 85 66 29 0 26.6 0.351  
## 3 8 183 64 0 0 23.3 0.672  
## 4 1 89 66 23 94 28.1 0.167  
## 5 0 137 40 35 168 43.1 2.29   
## 6 5 116 74 0 0 25.6 0.201  
## # ... with 2 more variables: Age <dbl>, Outcome <dbl>

tail(testss)

## # A tibble: 6 x 9  
## Pregnancies Glucose BloodPressure SkinThickness Insulin BMI DiabetesPedigre~  
## <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 9 89 62 0 0 22.5 0.142  
## 2 10 101 76 48 180 32.9 0.171  
## 3 2 122 70 27 0 36.8 0.34   
## 4 5 121 72 23 112 26.2 0.245  
## 5 1 126 60 0 0 30.1 0.349  
## 6 1 93 70 31 0 30.4 0.315  
## # ... with 2 more variables: Age <dbl>, Outcome <dbl>

dim(testss)

## [1] 768 9

library(caTools)

## Warning: package 'caTools' was built under R version 4.1.3

library(dplyr)

## Warning: package 'dplyr' was built under R version 4.1.3

##   
## Attaching package: 'dplyr'  
##   
## The following objects are masked from 'package:stats':  
##   
## filter, lag  
##   
## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

library(ggplot2)   
library(caret)

## Warning: package 'caret' was built under R version 4.1.3

## Loading required package: lattice

## Warning: package 'lattice' was built under R version 4.1.3

library(class)

## Warning: package 'class' was built under R version 4.1.3

library(corrplot)

## Warning: package 'corrplot' was built under R version 4.1.2

## corrplot 0.92 loaded

summary(testss)

## Pregnancies Glucose BloodPressure SkinThickness   
## Min. : 0.000 Min. : 0.0 Min. : 0.00 Min. : 0.00   
## 1st Qu.: 1.000 1st Qu.: 99.0 1st Qu.: 62.00 1st Qu.: 0.00   
## Median : 3.000 Median :117.0 Median : 72.00 Median :23.00   
## Mean : 3.845 Mean :120.9 Mean : 69.11 Mean :20.54   
## 3rd Qu.: 6.000 3rd Qu.:140.2 3rd Qu.: 80.00 3rd Qu.:32.00   
## Max. :17.000 Max. :199.0 Max. :122.00 Max. :99.00   
## Insulin BMI DiabetesPedigreeFunction Age   
## Min. : 0.0 Min. : 0.00 Min. :0.0780 Min. :21.00   
## 1st Qu.: 0.0 1st Qu.:27.30 1st Qu.:0.2437 1st Qu.:24.00   
## Median : 30.5 Median :32.00 Median :0.3725 Median :29.00   
## Mean : 79.8 Mean :31.99 Mean :0.4719 Mean :33.24   
## 3rd Qu.:127.2 3rd Qu.:36.60 3rd Qu.:0.6262 3rd Qu.:41.00   
## Max. :846.0 Max. :67.10 Max. :2.4200 Max. :81.00   
## Outcome   
## Min. :0.000   
## 1st Qu.:0.000   
## Median :0.000   
## Mean :0.349   
## 3rd Qu.:1.000   
## Max. :1.000

str(testss)

## spec\_tbl\_df [768 x 9] (S3: spec\_tbl\_df/tbl\_df/tbl/data.frame)  
## $ Pregnancies : num [1:768] 6 1 8 1 0 5 3 10 2 8 ...  
## $ Glucose : num [1:768] 148 85 183 89 137 116 78 115 197 125 ...  
## $ BloodPressure : num [1:768] 72 66 64 66 40 74 50 0 70 96 ...  
## $ SkinThickness : num [1:768] 35 29 0 23 35 0 32 0 45 0 ...  
## $ Insulin : num [1:768] 0 0 0 94 168 0 88 0 543 0 ...  
## $ BMI : num [1:768] 33.6 26.6 23.3 28.1 43.1 25.6 31 35.3 30.5 0 ...  
## $ DiabetesPedigreeFunction: num [1:768] 0.627 0.351 0.672 0.167 2.288 ...  
## $ Age : num [1:768] 50 31 32 21 33 30 26 29 53 54 ...  
## $ Outcome : num [1:768] 1 0 1 0 1 0 1 0 1 1 ...  
## - attr(\*, "spec")=  
## .. cols(  
## .. Pregnancies = col\_double(),  
## .. Glucose = col\_double(),  
## .. BloodPressure = col\_double(),  
## .. SkinThickness = col\_double(),  
## .. Insulin = col\_double(),  
## .. BMI = col\_double(),  
## .. DiabetesPedigreeFunction = col\_double(),  
## .. Age = col\_double(),  
## .. Outcome = col\_double()  
## .. )  
## - attr(\*, "problems")=<externalptr>

standard.features = scale(testss[,1:8])  
  
data = cbind(standard.features,testss[9])  
  
head(data)

## Pregnancies Glucose BloodPressure SkinThickness Insulin BMI  
## 1 0.6395305 0.8477713 0.1495433 0.9066791 -0.6924393 0.2038799  
## 2 -0.8443348 -1.1226647 -0.1604412 0.5305558 -0.6924393 -0.6839762  
## 3 1.2330766 1.9424580 -0.2637694 -1.2873733 -0.6924393 -1.1025370  
## 4 -0.8443348 -0.9975577 -0.1604412 0.1544326 0.1232213 -0.4937213  
## 5 -1.1411079 0.5037269 -1.5037073 0.9066791 0.7653372 1.4088275  
## 6 0.3427574 -0.1530851 0.2528715 -1.2873733 -0.6924393 -0.8108128  
## DiabetesPedigreeFunction Age Outcome  
## 1 0.4681869 1.42506672 1  
## 2 -0.3648230 -0.19054773 0  
## 3 0.6040037 -0.10551539 1  
## 4 -0.9201630 -1.04087112 0  
## 5 5.4813370 -0.02048305 1  
## 6 -0.8175458 -0.27558007 0

summary(data)

## Pregnancies Glucose BloodPressure SkinThickness   
## Min. :-1.1411 Min. :-3.7812 Min. :-3.5703 Min. :-1.2874   
## 1st Qu.:-0.8443 1st Qu.:-0.6848 1st Qu.:-0.3671 1st Qu.:-1.2874   
## Median :-0.2508 Median :-0.1218 Median : 0.1495 Median : 0.1544   
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000 Mean : 0.0000   
## 3rd Qu.: 0.6395 3rd Qu.: 0.6054 3rd Qu.: 0.5629 3rd Qu.: 0.7186   
## Max. : 3.9040 Max. : 2.4429 Max. : 2.7327 Max. : 4.9187   
## Insulin BMI DiabetesPedigreeFunction  
## Min. :-0.6924 Min. :-4.057829 Min. :-1.1888   
## 1st Qu.:-0.6924 1st Qu.:-0.595191 1st Qu.:-0.6885   
## Median :-0.4278 Median : 0.000941 Median :-0.2999   
## Mean : 0.0000 Mean : 0.000000 Mean : 0.0000   
## 3rd Qu.: 0.4117 3rd Qu.: 0.584390 3rd Qu.: 0.4659   
## Max. : 6.6485 Max. : 4.452906 Max. : 5.8797   
## Age Outcome   
## Min. :-1.0409 Min. :0.000   
## 1st Qu.:-0.7858 1st Qu.:0.000   
## Median :-0.3606 Median :0.000   
## Mean : 0.0000 Mean :0.349   
## 3rd Qu.: 0.6598 3rd Qu.:1.000   
## Max. : 4.0611 Max. :1.000

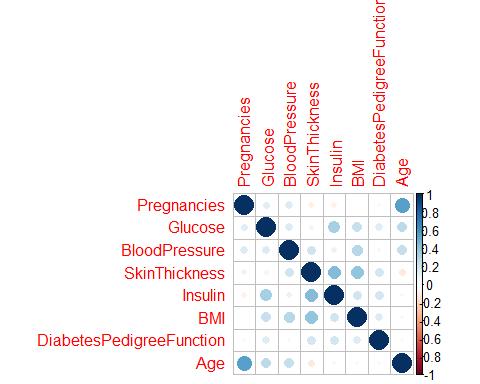
dim(data)

## [1] 768 9

anyNA(data)

## [1] FALSE

corrplot(cor(data[,-9]))



set.seed(550)  
  
sample = sample.split(data$Outcome, SplitRatio = 0.70)  
  
train = subset(data, sample==TRUE)  
dim(train)

## [1] 538 9

train

## Pregnancies Glucose BloodPressure SkinThickness Insulin  
## 2 -0.84433482 -1.122664745 -0.16044119 0.53055581 -0.692439325  
## 3 1.23307662 1.942458024 -0.26376935 -1.28737326 -0.692439325  
## 4 -0.84433482 -0.997557693 -0.16044119 0.15443255 0.123221344  
## 6 0.34275743 -0.153085094 0.25287146 -1.28737326 -0.692439325  
## 8 1.82662274 -0.184361857 -3.57027057 -1.28737326 -0.692439325  
## 10 1.23307662 0.128405773 1.38948126 -1.28737326 -0.692439325  
## 11 0.04598437 -0.340745671 1.18282493 -1.28737326 -0.692439325  
## 13 1.82662274 0.566280454 0.56285595 -1.28737326 -0.692439325  
## 14 -0.84433482 2.130118601 -0.47042568 0.15443255 6.648506692  
## 15 0.34275743 1.410753054 0.14954330 -0.09631628 0.826077877  
## 16 0.93630355 -0.653513301 -3.57027057 -1.28737326 -0.692439325  
## 18 0.93630355 -0.434575960 0.25287146 -1.28737326 -0.692439325  
## 20 -0.84433482 -0.184361857 0.04621514 0.59324302 0.140575826  
## 21 -0.25078869 0.159682536 0.97616860 1.28280232 1.346712347  
## 22 1.23307662 -0.684790064 0.76951228 -1.28737326 -0.692439325  
## 25 2.12339580 0.691387506 1.28615309 0.78130464 0.574437884  
## 28 -0.84433482 -0.747343590 -0.16044119 -0.34706512 0.522374437  
## 30 0.34275743 -0.121808331 1.18282493 -1.28737326 -0.692439325  
## 33 -0.25078869 -1.028834456 -0.57375384 -0.59781396 -0.223868302  
## 34 0.63953049 -0.903727404 1.18282493 -1.28737326 -0.692439325  
## 35 1.82662274 0.034575484 0.45952779 0.65593023 -0.692439325  
## 36 0.04598437 -0.559683012 -0.47042568 0.78130464 0.973590977  
## 37 2.12339580 0.535003691 0.35619962 -1.28737326 -0.692439325  
## 38 1.52984968 -0.590959775 0.35619962 1.03205348 -0.692439325  
## 40 0.04598437 -0.309468908 0.14954330 1.65892557 1.103749594  
## 43 0.93630355 -0.465852723 1.18282493 -0.15900349 -0.692439325  
## 44 1.52984968 1.567136868 2.11277840 0.21711976 1.390098552  
## 46 -1.14110788 1.848627735 -0.16044119 1.15742790 -0.692439325  
## 48 -0.54756176 -1.560539426 0.04621514 0.40518139 -0.692439325  
## 49 0.93630355 -0.559683012 -0.16044119 0.71861743 -0.692439325  
## 50 0.93630355 -0.497129486 -3.57027057 -1.28737326 -0.692439325  
## 51 -0.84433482 -0.559683012 0.56285595 -0.59781396 0.019094450  
## 52 -0.84433482 -0.622236538 -0.98706650 -0.34706512 -0.380058643  
## 53 0.34275743 -1.028834456 -0.16044119 0.02905813 -0.492862778  
## 55 0.93630355 0.910324846 -0.16044119 1.34548953 2.275177150  
## 56 -0.84433482 -1.497985900 -0.98706650 -0.66050117 -0.692439325  
## 58 -1.14110788 -0.653513301 0.97616860 2.47385929 0.262057202  
## 59 -1.14110788 0.785217795 0.66618411 -1.28737326 -0.692439325  
## 60 -1.14110788 -0.497129486 -0.26376935 1.28280232 0.539728919  
## 61 -0.54756176 -1.153941508 -3.57027057 -1.28737326 -0.692439325  
## 62 1.23307662 0.378619876 0.14954330 -1.28737326 -0.692439325  
## 64 -0.54756176 0.628833980 -0.57375384 0.84399185 0.418247543  
## 65 0.93630355 -0.215638620 -0.16044119 -1.28737326 -0.692439325  
## 67 -1.14110788 -0.372022434 0.97616860 0.59324302 -0.692439325  
## 68 -0.54756176 -0.372022434 1.18282493 -1.28737326 -0.692439325  
## 69 -0.84433482 -0.809897115 -0.16044119 -0.47243954 -0.362704161  
## 71 -0.54756176 -0.653513301 -0.16044119 -0.03362908 0.088512379  
## 72 0.34275743 0.566280454 -0.26376935 0.90667906 0.522374437  
## 73 2.71694193 0.159682536 1.07949677 -1.28737326 -0.692439325  
## 74 0.04598437 0.253512825 0.87284044 -0.03362908 1.650415787  
## 75 -0.84433482 -1.310325323 0.30453554 0.59324302 -0.692439325  
## 76 -0.84433482 -3.781189595 -1.09039466 -0.03362908 -0.692439325  
## 77 0.93630355 -1.842030293 0.45952779 -1.28737326 -0.692439325  
## 78 0.34275743 -0.809897115 0.14954330 0.78130464 -0.692439325  
## 80 -0.54756176 -0.278192145 -0.16044119 0.09174534 -0.692439325  
## 81 -0.25078869 -0.246915382 -1.29705098 -0.47243954 -0.692439325  
## 84 -1.14110788 -0.622236538 -0.21210527 0.46786860 -0.692439325  
## 85 0.34275743 0.503726928 2.00945023 -1.28737326 -0.692439325  
## 87 2.71694193 -0.465852723 0.14954330 2.09773604 -0.692439325  
## 88 -0.54756176 -0.653513301 -0.05711303 0.27980697 -0.076355203  
## 89 3.31048805 0.472450165 0.04621514 0.71861743 0.262057202  
## 90 -0.84433482 -0.434575960 -0.05711303 -0.09631628 -0.692439325  
## 91 -0.84433482 -1.279048560 -0.72874609 -1.28737326 -0.692439325  
## 92 0.04598437 0.065852247 0.56285595 -0.34706512 0.834755118  
## 93 0.93630355 -1.247771797 0.45952779 1.22011511 -0.275931749  
## 94 0.04598437 0.409896639 0.14954330 -1.28737326 -0.692439325  
## 95 -0.54756176 0.660110743 0.66618411 -0.15900349 -0.137095891  
## 96 0.63953049 0.722664269 0.14954330 0.40518139 1.285971658  
## 97 -0.54756176 -0.903727404 -0.36709752 0.46786860 -0.692439325  
## 98 -0.84433482 -1.560539426 -1.09039466 -0.15900349 -0.032968997  
## 101 -0.84433482 1.316922765 0.14954330 -1.28737326 -0.692439325  
## 103 -1.14110788 0.128405773 1.38948126 -1.28737326 -0.692439325  
## 104 -0.84433482 -1.247771797 0.14954330 -0.15900349 -0.345349679  
## 106 -0.84433482 0.159682536 -0.67708201 0.53055581 0.626501331  
## 107 -0.84433482 -0.778620353 2.73274738 -1.28737326 -0.692439325  
## 108 0.04598437 0.722664269 -0.57375384 0.46786860 0.522374437  
## 109 -0.25078869 -1.185218271 -0.57375384 0.65593023 -0.536248984  
## 111 -0.25078869 1.567136868 0.14954330 0.78130464 0.478988231  
## 112 1.23307662 1.066708661 -0.36709752 0.34249418 3.602795047  
## 113 -0.84433482 -0.997557693 0.35619962 0.84399185 -0.371381402  
## 114 0.04598437 -1.404155611 -0.36709752 -1.28737326 -0.692439325  
## 115 0.93630355 1.223092476 -0.78041017 0.71861743 0.826077877  
## 116 0.04598437 0.785217795 1.18282493 -1.28737326 -0.692439325  
## 117 0.34275743 0.097129010 0.25287146 -1.28737326 -0.692439325  
## 118 0.34275743 -1.341602086 -1.09039466 -1.28737326 -0.692439325  
## 119 0.04598437 -0.747343590 -0.47042568 0.15443255 -0.692439325  
## 120 0.04598437 -0.684790064 0.35619962 -0.34706512 -0.249900026  
## 121 -1.14110788 1.285646002 0.35619962 2.22311046 0.175284791  
## 122 0.63953049 -0.309468908 -0.26376935 1.15742790 -0.692439325  
## 123 -0.54756176 -0.434575960 0.25287146 0.59324302 0.175284791  
## 124 0.34275743 0.347343113 0.56285595 -1.28737326 -0.692439325  
## 126 -0.84433482 -1.028834456 -2.02034813 1.34548953 0.166607550  
## 127 -0.25078869 -0.027978042 0.04621514 0.59324302 0.478988231  
## 128 -0.84433482 -0.090531568 -0.57375384 0.96936627 0.123221344  
## 130 -1.14110788 -0.497129486 0.76951228 -1.28737326 -0.692439325  
## 133 -0.25078869 1.535860105 -0.26376935 1.03205348 1.259939935  
## 134 1.23307662 -1.153941508 0.25287146 0.65593023 -0.692439325  
## 135 -0.54756176 -0.778620353 -0.05711303 -0.47243954 -0.267254508  
## 137 -1.14110788 -0.653513301 0.04621514 0.34249418 -0.258577267  
## 138 -1.14110788 -0.872450641 -0.47042568 0.27980697 0.105866861  
## 139 -1.14110788 0.253512825 0.56285595 -1.28737326 -0.692439325  
## 140 0.34275743 -0.497129486 0.14954330 0.53055581 2.127664050  
## 142 0.34275743 -0.465852723 0.66618411 0.59324302 -0.692439325  
## 143 -0.54756176 -0.403299197 -0.88373833 0.34249418 -0.145773132  
## 144 1.82662274 -0.403299197 -0.16044119 -1.28737326 -0.692439325  
## 146 -1.14110788 -0.590959775 0.30453554 0.15443255 -0.692439325  
## 147 1.52984968 -1.998414107 0.56285595 1.03205348 -0.692439325  
## 148 -0.54756176 -0.465852723 -0.26376935 0.90667906 0.340152373  
## 149 0.34275743 0.816494558 0.45952779 -1.28737326 -0.692439325  
## 150 -0.54756176 -0.966280930 0.04621514 -0.22169070 -0.692439325  
## 151 -0.84433482 0.472450165 0.25287146 1.84698720 1.077717871  
## 152 0.04598437 -0.215638620 -0.21210527 -1.28737326 -0.692439325  
## 154 -0.84433482 1.004155135 0.66618411 1.34548953 3.516022635  
## 155 1.23307662 2.098841838 0.45952779 -1.28737326 -0.692439325  
## 156 0.93630355 0.972878372 0.97616860 1.47086395 -0.692439325  
## 157 -0.54756176 -0.684790064 -0.88373833 -0.34706512 0.123221344  
## 158 -0.84433482 -0.372022434 -0.67708201 0.02905813 0.478988231  
## 160 3.90403418 1.316922765 0.14954330 1.28280232 0.296766167  
## 161 0.04598437 0.941601609 1.07949677 1.09474069 -0.692439325  
## 162 0.93630355 -0.590959775 0.25287146 1.22011511 0.218670996  
## 163 -1.14110788 -0.215638620 0.56285595 0.84399185 1.780574404  
## 165 -1.14110788 0.316066351 0.97616860 -1.28737326 -0.692439325  
## 166 0.63953049 -0.528406249 0.25287146 -0.15900349 0.661210295  
## 169 0.04598437 -0.340745671 -0.16044119 -1.28737326 -0.692439325  
## 170 -0.25078869 -0.309468908 1.07949677 -0.53512675 -0.015614515  
## 171 0.63953049 -0.590959775 0.66618411 -1.28737326 -0.692439325  
## 173 -0.54756176 -1.060111219 -3.57027057 0.15443255 -0.692439325  
## 174 -0.84433482 -1.310325323 -0.47042568 1.34548953 -0.275931749  
## 175 -0.54756176 -1.435432374 -0.26376935 0.21711976 -0.215191061  
## 178 -1.14110788 0.253512825 2.11277840 1.59623836 0.435602025  
## 180 0.34275743 0.284789588 0.66618411 -1.28737326 -0.692439325  
## 181 0.63953049 -1.060111219 0.56285595 -1.28737326 -0.692439325  
## 182 -1.14110788 -0.059254805 -0.26376935 -0.15900349 0.105866861  
## 183 -0.84433482 -3.781189595 0.25287146 -0.03362908 -0.492862778  
## 184 0.34275743 -1.497985900 -0.47042568 -1.28737326 -0.692439325  
## 187 1.23307662 1.879904498 -0.05711303 0.96936627 3.602795047  
## 189 1.23307662 -0.372022434 0.35619962 1.15742790 0.296766167  
## 192 1.52984968 0.065852247 0.04621514 1.47086395 0.123221344  
## 193 0.93630355 1.191815713 -0.16044119 -1.28737326 -0.692439325  
## 195 1.23307662 -1.122664745 -0.72874609 -0.03362908 -0.692439325  
## 197 -0.84433482 -0.497129486 -0.57375384 -1.28737326 -0.692439325  
## 198 -0.25078869 -0.434575960 -0.36709752 -0.47243954 -0.275931749  
## 199 0.04598437 -0.372022434 -0.26376935 1.47086395 0.166607550  
## 201 -1.14110788 -0.246915382 0.56285595 -0.28437791 -0.692439325  
## 202 -0.84433482 0.535003691 0.66618411 -1.28737326 -0.692439325  
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## 568 0.0009413653 -1.167651413 1.08493736 0  
## 571 0.0643596597 -0.609293327 0.48971099 0  
## 572 -1.1913225687 -0.615329631 -1.04087112 0  
## 573 -0.3161501065 -0.126389037 -0.95583878 0  
## 575 -0.2400481533 1.267997101 -0.87080644 0  
## 576 0.4448694258 -0.579111809 -0.70074177 0  
## 577 -1.0137513445 1.029563108 0.14958163 0  
## 579 -0.6332415783 -0.684747123 0.23461397 0  
## 580 0.3434001549 0.311242976 2.44545479 1  
## 581 1.2819909114 -0.304459994 -1.04087112 1  
## 584 0.8507465098 -0.850745472 0.74480800 0  
## 585 -0.4176193775 0.649275979 1.59513140 1  
## 587 0.3687674726 -1.034852733 0.65977566 1  
## 589 0.1658289306 2.058752876 1.59513140 1  
## 590 -1.3815774518 -0.391986397 -0.70074177 0  
## 591 1.8781228784 1.367596111 0.99990502 1  
## 592 0.9395321219 -0.896017750 -0.78577411 0  
## 594 -0.4429866952 3.703645615 -0.70074177 0  
## 595 0.2038799073 0.788110962 0.06454929 0  
## 596 0.0009413653 0.634185220 -0.95583878 1  
## 599 0.6097569912 -1.158596957 0.40467865 1  
## 600 -1.1279042743 -0.195806529 -0.61570943 0  
## 601 -0.6205579194 -0.216933592 -0.78577411 0  
## 602 -1.0518023211 -0.850745472 -0.44564475 0  
## 603 -0.5317723073 -1.122379136 -0.27558007 0  
## 604 0.4068184492 0.664366738 1.76519608 1  
## 605 -0.4556703541 -0.784346132 0.23461397 1  
## 606 0.4829204025 0.127135715 -1.04087112 0  
## 607 1.0156340751 2.372640665 -0.95583878 1  
## 608 -1.5845159938 0.030554857 -0.70074177 0  
## 611 -0.1385788823 -0.542893987 -0.78577411 0  
## 612 0.1150942952 0.365569709 0.23461397 1  
## 613 0.7873282154 0.951091160 0.57474333 1  
## 614 0.0643596597 1.225742975 -0.61570943 0  
## 615 0.5209713791 0.256916243 1.42506672 1  
## 616 -0.7854454848 -0.799436892 -0.53067709 0  
## 618 -1.5084140405 -0.648529301 -0.87080644 0  
## 619 -0.4810376718 2.445076308 1.42506672 1  
## 620 0.0516760008 -0.998634911 -0.78577411 1  
## 621 0.8126955331 -0.681728971 -0.44564475 0  
## 622 -0.9883840268 3.700627463 -0.44564475 0  
## 624 1.4595621356 -0.376895638 -1.04087112 0  
## 625 -0.1512625412 -0.947326330 -1.04087112 0  
## 627 -0.9249657324 -0.802455043 -1.04087112 0  
## 628 0.0516760008 -0.238060654 -1.04087112 0  
## 630 -0.9249657324 -0.977507849 -1.04087112 0  
## 631 -0.5825069428 0.785092811 0.06454929 1  
## 633 -0.7347108493 -0.388968245 -0.87080644 0  
## 634 -0.5698232840 -1.077106858 -0.95583878 0  
## 635 -0.7727618259 -0.920162964 -0.19054773 0  
## 636 -0.1005279057 -0.020753724 0.40467865 1  
## 637 -0.4049357186 -0.962417090 1.25500204 0  
## 638 -0.0497932702 0.534586210 -0.87080644 0  
## 639 1.1297870050 1.204615913 -0.10551539 1  
## 640 -1.5845159938 -0.974489697 -0.44564475 0  
## 641 -0.3415174243 0.673421194 -0.53067709 0  
## 642 0.2926655194 -0.509694317 -0.78577411 0  
## 643 -0.3161501065 -0.886963294 1.42506672 1  
## 645 -0.5571396251 0.779056507 -0.53067709 0  
## 648 0.7365935799 -0.050935242 -0.95583878 1  
## 650 -0.7093435316 -1.022780126 -0.87080644 0  
## 654 -0.6586088961 -0.050935242 -0.53067709 0  
## 658 0.8761138275 2.082898091 0.65977566 0  
## 659 0.8887974864 -0.850745472 1.51009906 0  
## 660 0.2799818605 2.475257826 -0.53067709 1  
## 661 -0.5444559662 -0.874890687 1.76519608 0  
## 666 0.3560838137 -0.769255373 -0.78577411 0  
## 667 0.0643596597 -0.714928641 3.12571351 1  
## 668 -0.5698232840 -0.998634911 0.57474333 1  
## 670 -0.1385788823 -0.929217420 0.99990502 0  
## 671 0.2038799073 0.480259477 1.34003438 0  
## 672 -0.8361801203 0.238807332 -1.04087112 0  
## 674 3.2099070601 1.231779279 -0.95583878 0  
## 675 0.4575530847 0.347460798 2.95564883 0  
## 676 -0.1385788823 -0.434240522 -0.19054773 1  
## 677 -0.9122820735 -0.730019400 1.68016374 1  
## 679 0.5082877202 -1.040889037 -0.70074177 1  
## 680 -0.9883840268 0.428950897 -0.87080644 0  
## 681 -0.9883840268 -0.422167915 -0.95583878 0  
## 682 2.2332653269 -0.325587057 -0.61570943 1  
## 684 0.0389923419 0.193535055 -0.53067709 1  
## 686 0.1531452718 0.359533405 -0.70074177 0  
## 688 -0.4683540130 -0.877908839 -0.36061241 0  
## 690 1.7893372663 -0.413113459 1.08493736 1  
## 691 -0.9376493913 1.159343636 0.06454929 0  
## 692 1.3073582292 -0.648529301 0.91487268 1  
## 695 -1.0771696389 -0.847727321 -0.70074177 0  
## 696 -0.2019971767 -1.037870885 0.82984034 1  
## 700 1.5863987244 1.304214923 -0.61570943 0  
## 703 0.3814511315 1.307233074 1.59513140 1  
## 708 0.3053491782 -0.892999598 -0.95583878 0  
## 709 0.1024106363 -0.977507849 0.99990502 1  
## 712 -0.3034664476 -0.099225671 0.57474333 0  
## 713 1.1678379816 -0.093189367 0.40467865 1  
## 714 -0.7093435316 -0.361804879 -1.04087112 0  
## 716 0.2419308839 1.068799081 0.06454929 1  
## 717 0.2292472250 1.503412942 -0.19054773 1  
## 718 -1.1279042743 0.371606012 1.93526076 0  
## 719 0.4448694258 -0.171661314 -0.78577411 0  
## 720 0.4575530847 -0.283332931 1.59513140 1  
## 721 -0.3415174243 -0.467440192 0.06454929 0  
## 722 0.7746445565 -0.551948443 -1.04087112 0  
## 723 -0.3415174243 -0.370859334 0.74480800 1  
## 724 0.9014811453 -0.666638212 0.74480800 0  
## 725 0.1024106363 -0.624384086 0.99990502 0  
## 728 0.0516760008 -0.117334582 -0.95583878 0  
## 729 -1.1532715921 -0.440276826 -0.95583878 0  
## 730 -0.2400481533 -0.998634911 -0.95583878 0  
## 731 -0.4556703541 -0.449331281 0.06454929 1  
## 732 -0.4556703541 -0.642492997 -0.95583878 1  
## 733 1.5863987244 0.525531755 -0.78577411 1  
## 735 -1.1025369566 0.265970699 1.68016374 0  
## 736 0.4321857670 -0.567039202 -0.44564475 0  
## 737 -0.5825069428 0.130153867 -1.04087112 0  
## 739 0.5843896734 -0.056971545 -1.04087112 0  
## 740 0.9522157807 -0.539875836 0.74480800 1  
## 741 1.3073582292 0.945054857 1.25500204 1  
## 744 0.0897269774 0.791129114 0.99990502 1  
## 745 1.0917360283 2.119115912 0.48971099 0  
## 746 -0.2527318121 0.048663768 1.08493736 0  
## 748 1.8147045841 1.883700071 -0.10551539 0  
## 749 0.5590223557 -0.192788377 0.23461397 1  
## 750 -0.9757003679 -0.886963294 1.42506672 1  
## 751 -0.1005279057 2.143261127 -0.95583878 1  
## 752 0.8887974864 -0.636456694 -0.44564475 0  
## 755 0.0516760008 -0.087153064 0.99990502 1  
## 756 0.5717060146 1.765992150 0.31964631 1  
## 757 0.0009413653 -0.244096958 0.48971099 0  
## 758 0.5463386968 -0.645511149 1.59513140 1  
## 759 0.6985426033 -0.829618410 -0.61570943 0  
## 760 0.4448694258 -0.585148113 2.78558415 1  
## 762 1.5229804300 -0.207879136 0.82984034 1  
## 765 0.6097569912 -0.398022700 -0.53067709 0  
## 766 -0.7347108493 -0.684747123 -0.27558007 0  
## 767 -0.2400481533 -0.370859334 1.16996970 1  
## 768 -0.2019971767 -0.473476496 -0.87080644 0

test = subset(data, sample==FALSE)  
dim(test)

## [1] 230 9

test

## Pregnancies Glucose BloodPressure SkinThickness Insulin  
## 1 0.63953049 0.847771321 0.14954330 0.90667906 -0.69243932  
## 5 -1.14110788 0.503726928 -1.50370731 0.90667906 0.76533719  
## 7 -0.25078869 -1.341602086 -0.98706650 0.71861743 0.07115790  
## 9 -0.54756176 2.380332705 0.04621514 1.53355115 4.01930262  
## 12 1.82662274 1.473306579 0.25287146 -1.28737326 -0.69243932  
## 17 -1.14110788 -0.090531568 0.76951228 1.65892557 1.30332614  
## 19 -0.84433482 -0.559683012 -2.02034813 1.09474069 0.02777169  
## 23 0.93630355 2.349055942 1.07949677 -1.28737326 -0.69243932  
## 24 1.52984968 -0.059254805 0.56285595 0.90667906 -0.69243932  
## 26 1.82662274 0.128405773 0.04621514 0.34249418 0.30544341  
## 27 0.93630355 0.816494558 0.35619962 -1.28737326 -0.69243932  
## 29 2.71694193 0.753941032 0.66618411 -0.09631628 0.26205720  
## 31 0.34275743 -0.372022434 0.30453554 0.34249418 -0.69243932  
## 32 -0.25078869 1.160538950 0.35619962 0.96936627 1.43348476  
## 39 -0.54756176 -0.966280930 -0.05711303 1.34548953 -0.69243932  
## 41 -0.25078869 1.848627735 -0.26376935 0.27980697 -0.08503244  
## 42 0.93630355 0.378619876 0.76951228 -1.28737326 -0.69243932  
## 45 0.93630355 1.191815713 -0.26376935 -1.28737326 -0.69243932  
## 47 -0.84433482 0.785217795 -0.67708201 -1.28737326 -0.69243932  
## 54 1.23307662 1.723520683 1.07949677 0.84399185 1.91073302  
## 57 0.93630355 2.067565075 -0.05711303 1.15742790 1.94544199  
## 63 0.34275743 -2.405012026 -0.36709752 -1.28737326 -0.69243932  
## 66 0.34275743 -0.684790064 0.25287146 0.40518139 -0.69243932  
## 70 0.04598437 0.785217795 0.82117636 0.40518139 0.17528479  
## 79 -1.14110788 0.316066351 -3.57027057 -1.28737326 -0.69243932  
## 82 -0.54756176 -1.466709137 -3.57027057 -1.28737326 -0.69243932  
## 83 0.93630355 -1.185218271 0.45952779 0.34249418 -0.07635520  
## 86 -0.54756176 -0.340745671 0.25287146 0.53055581 0.39221582  
## 99 0.63953049 -0.872450641 -0.98706650 0.59324302 -0.13709589  
## 100 -0.84433482 0.034575484 1.07949677 1.90967441 1.21655373  
## 102 -0.84433482 0.941601609 -0.47042568 -1.28737326 -0.69243932  
## 105 -0.54756176 -1.122664745 -0.21210527 -1.28737326 -0.69243932  
## 110 -1.14110788 -0.809897115 0.82117636 0.27980697 -0.38005864  
## 125 -1.14110788 -0.246915382 0.35619962 -1.28737326 -0.69243932  
## 129 -0.84433482 -0.121808331 0.97616860 0.21711976 0.56576064  
## 131 0.04598437 1.629690394 0.04621514 -0.40975233 0.76533719  
## 132 1.52984968 0.034575484 -0.67708201 -1.28737326 -0.69243932  
## 136 -0.54756176 0.128405773 -0.47042568 -0.03362908 0.52237444  
## 141 -0.25078869 0.222236062 0.45952779 -1.28737326 -0.69243932  
## 145 0.04598437 1.035431898 -0.36709752 0.65593023 1.77189716  
## 153 1.52984968 1.097985424 0.87284044 0.46786860 0.65253305  
## 159 -0.54756176 -1.028834456 0.25287146 -0.09631628 -0.23254554  
## 164 -0.54756176 -0.653513301 -0.26376935 0.15443255 -0.69243932  
## 167 -0.25078869 0.847771321 -0.16044119 0.27980697 -0.69243932  
## 168 0.04598437 -0.027978042 -0.05711303 -1.28737326 -0.69243932  
## 172 0.63953049 0.409896639 0.04621514 0.15443255 0.43560203  
## 176 1.23307662 1.817350972 0.14954330 1.34548953 0.43560203  
## 177 0.63953049 -1.122664745 0.45952779 -1.28737326 -0.69243932  
## 179 0.34275743 0.691387506 0.45952779 -1.28737326 -0.69243932  
## 185 0.04598437 0.628833980 0.25287146 -1.28737326 -0.69243932  
## 186 0.93630355 2.286502416 -0.05711303 0.46786860 -0.69243932  
## 188 -0.84433482 0.222236062 1.49280942 1.28280232 -0.18915934  
## 190 0.34275743 0.566280454 0.56285595 0.90667906 0.69591926  
## 191 -0.25078869 -0.309468908 -0.36709752 -1.28737326 -0.69243932  
## 194 2.12339580 0.441173402 -3.57027057 -1.28737326 -0.69243932  
## 196 0.34275743 1.160538950 0.76951228 1.28280232 1.12978132  
## 200 0.04598437 0.847771321 -0.47042568 0.40518139 2.06692336  
## 206 0.34275743 -0.309468908 0.14954330 0.46786860 -0.69243932  
## 209 -0.84433482 -0.778620353 -0.26376935 0.40518139 0.06248066  
## 220 0.34275743 -0.278192145 -0.16044119 -1.28737326 -0.69243932  
## 226 -0.84433482 -1.060111219 0.45952779 0.40518139 -0.41476761  
## 231 0.04598437 0.660110743 0.87284044 -1.28737326 -0.69243932  
## 232 0.63953049 0.409896639 0.56285595 1.03205348 2.51813990  
## 234 0.04598437 0.034575484 -0.05711303 -1.28737326 -0.69243932  
## 236 0.04598437 1.567136868 0.14954330 -1.28737326 -0.69243932  
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## 248 -1.14110788 1.379476291 1.07949677 0.78130464 5.20808466  
## 249 1.52984968 0.097129010 0.04621514 0.78130464 2.79581162  
## 250 -0.84433482 -0.309468908 0.87284044 -0.09631628 -0.69243932  
## 251 1.52984968 -0.465852723 -0.88373833 -1.28737326 -0.69243932  
## 254 -1.14110788 -1.091387982 -0.05711303 0.71861743 -0.69243932  
## 255 2.42016887 -0.903727404 -0.36709752 -0.84856280 1.54628889  
## 268 -0.54756176 0.222236062 -0.26376935 1.34548953 -0.69243932  
## 269 -1.14110788 -0.590959775 -0.88373833 -1.28737326 -0.69243932  
## 271 1.82662274 -0.622236538 0.87284044 1.03205348 -0.69243932  
## 278 -1.14110788 -0.528406249 -0.26376935 0.15443255 0.31412065  
## 293 -0.54756176 0.222236062 0.45952779 1.03205348 0.88681857  
## 298 -1.14110788 0.159682536 0.76951228 0.53055581 1.17316752  
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## 305 -0.25078869 0.910324846 0.35619962 -1.28737326 -0.69243932  
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## 327 -0.84433482 0.034575484 -0.26376935 0.71861743 0.66121030  
## 328 1.82662274 1.817350972 0.04621514 -1.28737326 -0.69243932  
## 334 2.42016887 -0.465852723 0.56285595 -1.28737326 -0.69243932  
## 335 -0.84433482 -0.809897115 -0.47042568 -0.15900349 -0.18915934  
## 336 -1.14110788 1.379476291 0.35619962 1.40817674 1.52025717  
## 339 1.52984968 0.972878372 0.45952779 0.84399185 0.79136891  
## 341 -0.84433482 0.284789588 0.04621514 -0.47243954 0.21867100  
## 346 1.23307662 0.159682536 0.97616860 0.96936627 0.24470272  
## 351 0.04598437 -0.903727404 0.56285595 -1.28737326 -0.69243932  
## 353 -0.25078869 -1.873307056 0.66618411 0.46786860 -0.69243932  
## 355 -0.25078869 -0.966280930 0.45952779 -1.28737326 -0.69243932  
## 359 2.42016887 -1.028834456 0.25287146 1.22011511 -0.22386830  
## 366 0.34275743 -0.684790064 -0.78041017 0.46786860 0.02777169  
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## 373 -1.14110788 -1.153941508 -0.26376935 0.09174534 -0.11974141  
## 374 -0.54756176 -0.497129486 -0.57375384 1.22011511 0.12322134  
## 377 -1.14110788 -0.716066827 0.66618411 -0.34706512 0.03644893  
## 379 0.04598437 1.097985424 0.30453554 -1.28737326 -0.69243932  
## 381 -0.84433482 -0.434575960 0.14954330 0.59324302 0.01909445  
## 382 -1.14110788 -0.497129486 -0.05711303 0.09174534 -0.69243932  
## 384 -0.84433482 -0.966280930 -0.36709752 -0.15900349 -0.18048210  
## 387 0.34275743 -0.153085094 0.25287146 0.53055581 -0.69243932  
## 392 0.34275743 1.410753054 0.35619962 -1.28737326 -0.69243932  
## 394 0.04598437 -0.153085094 0.14954330 -0.53512675 0.06248066  
## 396 -0.54756176 0.190959299 -0.57375384 0.21711976 1.69380199  
## 397 -0.25078869 -0.778620353 -0.67708201 0.84399185 0.30544341  
## 401 0.04598437 -0.809897115 -0.26376935 -1.28737326 -0.69243932  
## 403 0.34275743 0.472450165 0.76951228 1.28280232 0.07115790  
## 404 1.52984968 -1.529262663 0.45952779 0.27980697 -0.69243932  
## 407 0.04598437 -0.184361857 0.14954330 -1.28737326 -0.69243932  
## 412 -0.84433482 -0.278192145 0.14954330 0.59324302 0.83475512  
## 415 -1.14110788 0.535003691 -0.47042568 0.90667906 0.75665995  
## 416 -0.25078869 1.629690394 0.76951228 0.78130464 3.42057298  
## 443 0.04598437 -0.121808331 -0.26376935 0.40518139 0.34882961  
## 444 1.23307662 -0.403299197 0.04621514 -1.28737326 -0.69243932  
## 446 -1.14110788 1.848627735 0.45952779 2.66192092 -0.57095795  
## 449 -1.14110788 -0.528406249 -0.26376935 1.03205348 -0.13709589  
## 456 3.01371499 1.692243920 -0.36709752 0.59324302 -0.69243932  
## 462 -0.84433482 -1.560539426 -0.36709752 -1.28737326 -0.69243932  
## 464 0.34275743 -1.028834456 0.45952779 0.59324302 -0.69243932  
## 465 1.82662274 -0.184361857 1.49280942 -1.28737326 -0.69243932  
## 467 -1.14110788 -1.466709137 -0.88373833 -0.66050117 -0.38005864  
## 468 -1.14110788 -0.747343590 -0.26376935 0.96936627 0.17528479  
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## 474 0.93630355 0.472450165 1.07949677 -1.28737326 -0.69243932  
## 479 1.23307662 0.159682536 0.25287146 1.09474069 -0.04164624  
## 480 0.04598437 0.347343113 0.87284044 0.65593023 -0.69243932  
## 483 0.04598437 -1.122664745 -0.57375384 0.09174534 -0.26725451  
## 486 -1.14110788 0.441173402 -0.05711303 1.34548953 1.47687096  
## 487 -0.84433482 0.566280454 -0.36709752 1.28280232 3.47263643  
## 488 -1.14110788 1.629690394 0.45952779 0.71861743 1.60702958  
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## 694 0.93630355 0.253512825 -0.05711303 1.78429999 0.39221582  
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## BMI DiabetesPedigreeFunction Age Outcome  
## 1 0.2038799073 0.4681868702 1.42506672 1  
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## 9 -0.1893135178 -0.9473263304 1.68016374 1  
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## 19 1.4341948179 -0.8718725351 -0.02048305 0  
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## 45 -0.5825069428 -0.5368576838 0.57474333 0  
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## 141 -1.3815774518 -0.6153296309 1.85022842 0  
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## 582 -0.8869147558 -0.8024550434 -0.53067709 0  
## 583 -0.6966598727 -0.6424929972 2.44545479 0  
## 586 -1.2040062276 -0.1656250107 -0.95583878 0  
## 588 -0.9757003679 -0.6726745154 -0.36061241 0  
## 593 0.3053491782 -0.2108972879 0.91487268 1  
## 597 1.6878679954 -0.8386728651 1.08493736 0  
## 598 -0.5317723073 0.2629525469 -1.04087112 0  
## 609 1.2058889582 -0.6092933273 -0.53067709 0  
## 610 -1.0137513445 -1.0076893667 -0.87080644 0  
## 617 -0.4176193775 -0.9503444823 -0.27558007 0  
## 623 1.1171033461 2.9853254829 0.99990502 0  
## 626 0.7239099210 -0.3316233604 -0.36061241 0  
## 629 0.3307164960 -0.9895804558 0.99990502 0  
## 632 0.3180328371 -0.7058741853 -0.78577411 0  
## 644 -0.5064049896 0.4168782894 -0.19054773 0  
## 646 0.9395321219 -1.0197619740 -0.27558007 0  
## 647 -1.0898532977 -0.0750804563 -0.02048305 1  
## 649 -0.4683540130 -0.6394748454 0.74480800 1  
## 651 -0.8615474380 -0.7179467926 -0.87080644 0  
## 652 0.2292472250 -0.0177355718 -0.53067709 0  
## 653 0.2672982016 -0.6123114791 -0.44564475 0  
## 655 0.2799818605 -0.9956167595 -0.95583878 0  
## 656 0.8507465098 -0.6998378817 -0.70074177 1  
## 657 -1.2927918397 -0.9563807859 -0.95583878 0  
## 662 1.3834601824 2.7831093114 -0.95583878 1  
## 663 0.7112262622 -0.9261992677 0.82984034 1  
## 664 0.7492772388 0.4983683884 0.57474333 1  
## 665 0.2165635661 -0.6847471226 0.57474333 1  
## 669 0.2546145428 -0.1263890371 0.82984034 0  
## 673 0.4448694258 -0.5640210501 1.16996970 0  
## 678 0.4195021081 -0.6304203900 -0.70074177 0  
## 683 1.5990823832 -0.3195507532 -0.95583878 0  
## 685 -4.0578294739 0.5074228438 3.04068117 0  
## 687 -1.1279042743 -0.4764946475 -0.95583878 0  
## 689 -1.0010676856 1.0748353848 -0.87080644 0  
## 693 0.9014811453 1.2498881900 -0.87080644 0  
## 694 0.8253791920 -0.0992256708 0.82984034 1  
## 697 -0.2654154710 -0.6153296309 -0.19054773 1  
## 698 -0.8869147558 -0.6606019081 -0.95583878 0  
## 699 0.3180328371 0.3806604676 -0.44564475 0  
## 701 0.4956040613 0.0335730090 -0.61570943 0  
## 702 -0.5571396251 0.2810614578 1.34003438 1  
## 704 0.8253791920 -0.5066761656 0.65977566 0  
## 705 -0.4556703541 -1.0680524030 -0.53067709 0  
## 706 0.9902667574 -0.8899814460 -0.44564475 0  
## 707 -4.0578294739 -0.6364566936 -0.27558007 1  
## 710 0.7619608977 0.6100400055 -0.87080644 1  
## 711 -0.1005279057 -0.5338395320 -0.78577411 0  
## 715 -0.3161501065 -1.0589979476 -0.10551539 0  
## 726 0.9395321219 -0.7119104890 0.40467865 0  
## 727 0.5209713791 0.0728089826 -0.70074177 0  
## 734 -0.3795684009 -0.1384616443 -0.95583878 0  
## 738 0.0009413653 0.3866967713 0.74480800 0  
## 742 -0.1512625412 -0.2169335915 -0.61570943 0  
## 743 -0.4429866952 -0.7632190698 -0.95583878 0  
## 747 2.1952143503 -0.3436959677 -0.53067709 1  
## 753 -0.7600781670 -0.7511464625 -0.70074177 0  
## 754 1.4341948179 -0.7541646144 -0.61570943 1  
## 761 -0.4556703541 0.8877099723 -0.95583878 0  
## 763 -1.2040062276 -0.9956167595 -0.02048305 0  
## 764 0.1150942952 -0.9080903569 2.53048713 0

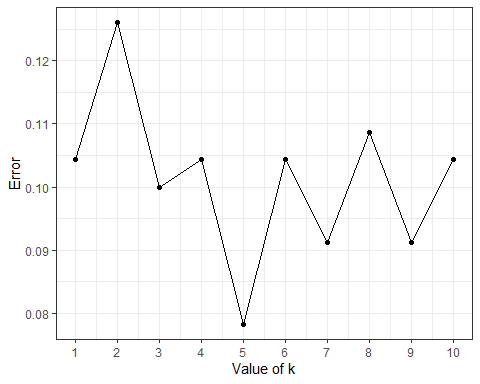
predicted.type = knn(train[1:9], test[1:9], train$Outcome, k=1)  
  
error = mean(predicted.type!=test$Outcome)  
  
confusionMatrix(predicted.type, as.factor(test$Outcome))

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction 0 1  
## 0 139 13  
## 1 11 67  
##   
## Accuracy : 0.8957   
## 95% CI : (0.8487, 0.932)  
## No Information Rate : 0.6522   
## P-Value [Acc > NIR] : <2e-16   
##   
## Kappa : 0.7687   
##   
## Mcnemar's Test P-Value : 0.8383   
##   
## Sensitivity : 0.9267   
## Specificity : 0.8375   
## Pos Pred Value : 0.9145   
## Neg Pred Value : 0.8590   
## Prevalence : 0.6522   
## Detection Rate : 0.6043   
## Detection Prevalence : 0.6609   
## Balanced Accuracy : 0.8821   
##   
## 'Positive' Class : 0   
##

#The above results reveal that our model achieved an accuracy of 89.57%.  
  
predicted.type = NULL  
error.rate = NULL  
  
for (i in 1:10){  
 predicted.type = knn(train[1:9], test[1:9], train$Outcome, k=i)  
 error.rate[i] = mean(predicted.type!=test$Outcome)  
}  
  
knn.error = as.data.frame(cbind(k=1:10, error.type=error.rate))  
knn.error

## k error.type  
## 1 1 0.10434783  
## 2 2 0.12608696  
## 3 3 0.10000000  
## 4 4 0.10434783  
## 5 5 0.07826087  
## 6 6 0.10434783  
## 7 7 0.09130435  
## 8 8 0.10869565  
## 9 9 0.09130435  
## 10 10 0.10434783

ggplot(knn.error, aes(k,error.type))+  
 geom\_point()+  
 geom\_line()+  
 scale\_x\_continuous(breaks = 1:10)+  
 theme\_bw()+  
 xlab("Value of k")+  
 ylab("Error")



#The above plot reveals that error is lowest when k=5  
  
predicted.type = knn(train[1:9], test[1:9], train$Outcome, k=5)  
  
error = mean(predicted.type!=test$Outcome)  
error

## [1] 0.07826087

confusionMatrix(predicted.type, as.factor(test$Outcome))

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction 0 1  
## 0 143 11  
## 1 7 69  
##   
## Accuracy : 0.9217   
## 95% CI : (0.8791, 0.953)  
## No Information Rate : 0.6522   
## P-Value [Acc > NIR] : <2e-16   
##   
## Kappa : 0.8255   
##   
## Mcnemar's Test P-Value : 0.4795   
##   
## Sensitivity : 0.9533   
## Specificity : 0.8625   
## Pos Pred Value : 0.9286   
## Neg Pred Value : 0.9079   
## Prevalence : 0.6522   
## Detection Rate : 0.6217   
## Detection Prevalence : 0.6696   
## Balanced Accuracy : 0.9079   
##   
## 'Positive' Class : 0   
##

#Above Model gave us an accuracy of 92.17 %.