Data Science II Final Project Analysis

Camille Okonkwo

Contents

Background **3**

Data **3**
Data Preparation . . . 3

Exploratory analysis and data visualization **6**
Descriptive Statistics of Training Data . . . 6
Continuous Variable Visualization . . . 6
Descriptive Table of Discrete Variables . . . 8

Pre-Processing **10**

Model training **12**
Logistic Regression . . . 12
Penalized Logistic Regression . . . 18
KNN - how to tune? . . . 20
PLS . . . 22
MARS . . . 24
GAM . . . 26
LDA . . . 34
QDA . . . 36
Naive Bayes (NB) . . . 38
CART . . . 165
Conditional Inference Trees (CIT) . . . 168
Random Forest . . . 172
AdaBoost . . . 174
Support Vector Machine: linear . . . 176
SVML: e1071 . . . 178
SVML: Radial Sigma . . . 180
SVML: radial cost . . . 182

Results **184**
Model Comparison: Cross Validation Performance . . . 184
Scaled Model Performance . . . 198
Test Data Performance . . . 200

```r
library(tidymodels)
library(splines)
library(caret)
library(glmnet)
library(table1)
library(kableExtra)
library(summarytools)
library(corrplot)
library(cowplot)

library(vip)
library(pROC)
library(glmnet)
library(tidymodels)
library(mlbench)
library(pROC)
library(pdp)
library(vip)
library(AppliedPredictiveModeling)

library(rpart)
library(rpart.plot)
```

Background

A research study aims to identify key factors that predict the severity of COVID-19 illness. This study collects demographic information, clinical variables, and disease severity among participants infected with COVID-19 between 2021 and 2023. The goal is to develop a robust prediction model that can accurately predict COVID-19 severity and understand how predictors impact the risk of severe infection.

Data

The training data in "severity_training.RData" includes data from 800 participants.

The test data in "severity_test.RData" includes data from another set of 200 participants.

Here is a description of each variable:

- ID (`id`): Participant ID
- Age (`age`): Age
- Gender (`gender`): 1 = Male, 0 = Female
- Race/ethnicity (`race`): 1 = White, 2 = Asian, 3 = Black, 4 = Hispanic
- Smoking (`smoking`): Smoking status; 0 = Never smoked, 1 = Former smoker, 2 = Current smoker
- Height (`height`): Height (in centimeters)
- Weight (`weight`): Weight (in kilograms)
- BMI (`bmi`): Body Mass Index; BMI = weight (in kilograms) / height (in meters) squared
- Hypertension (`hypertension`): 0 = No, 1 = Yes
- Diabetes (`diabetes`): 0 = No, 1 = Yes
- Systolic blood pressure (`SBP`): Systolic blood pressure (in mm/Hg)
- LDL cholesterol (`LDL`): LDL (low-density lipoprotein) cholesterol (in mg/dL)
- Vaccination status at the time of infection (`vaccine`): 0 = Not vaccinated, 1 = Vaccinated
- Depression score (`depression`): Higher scores indicate higher risk for depression
- Severity of COVID-19 infection (`severity`): **Response variable**; 0 = Not severe, 1 = Severe

Data Preparation

```r
# loading training data
load("data/severity_training.RData")

# making discrete variables factors
training_data = training_data |>
  select(-id) |>
  mutate_at(vars(age, height, weight, bmi, SBP, LDL, depression), as.numeric) |>
 mutate(
    gender = factor(gender,
                    levels = c(0, 1),
                    labels = c("Female", "Male")) |>
      relevel(ref = "Female"),
    race = factor(race,
                  levels = c(1, 2, 3, 4),
                  labels = c("White", "Asian", "Black", "Hispanic")) |>
      relevel(ref = "White"),
    smoking = factor(smoking,
                     levels = c(0, 1, 2),
                     labels = c("Never_smoked", "Former_smoker", "Current_smoker")) |>
      relevel(ref = "Never_smoked"),
    hypertension = factor(hypertension,
                          levels = c(0, 1),
```

```
                           labels = c("No", "Yes")) |>
      relevel(ref = "No"),
    diabetes = factor(diabetes,
                       levels = c(0, 1),
                       labels = c("No", "Yes")) |>
      relevel(ref = "No"),
    vaccine = factor(vaccine,
                      levels = c(0, 1),
                      labels = c("Not_vaccinated", "Vaccinated")) |>
      relevel(ref = "Not_vaccinated"),
    severity = factor(severity,
                       levels = c(0, 1),
                       labels = c("Not_severe", "Severe")) |>
      relevel(ref = "Not_severe")
  ) |>
  janitor::clean_names()

# checking levels
levels(training_data$race)
levels(training_data$smoking)
levels(training_data$hypertension)
levels(training_data$diabetes)
levels(training_data$vaccine)
levels(training_data$severity)

# matrix of predictors & vector of response for data set exploration
x.train = model.matrix(severity ~ ., training_data)[, -1]
y.train = training_data$severity

# loading testing data
load("data/severity_test.RData")

# making discrete variables factors
test_data = test_data |>
  select(-id) |>
  mutate_at(vars(age, height, weight, bmi, SBP, LDL, depression), as.numeric) |>
 mutate(
    gender = factor(gender,
                     levels = c(0, 1),
                     labels = c("Female", "Male")) |>
      relevel(ref = "Female"),
    race = factor(race,
                   levels = c(1, 2, 3, 4),
                   labels = c("White", "Asian", "Black", "Hispanic")) |>
      relevel(ref = "White"),
    smoking = factor(smoking,
                      levels = c(0, 1, 2),
                      labels = c("Never_smoked", "Former_smoker", "Current_smoker")) |>
      relevel(ref = "Never_smoked"),
    hypertension = factor(hypertension,
                           levels = c(0, 1),
                           labels = c("No", "Yes")) |>
      relevel(ref = "No"),
```

```r
    diabetes = factor(diabetes,
                      levels = c(0, 1),
                      labels = c("No", "Yes")) |>
      relevel(ref = "No"),
    vaccine = factor(vaccine,
                     levels = c(0, 1),
                     labels = c("Not_vaccinated", "Vaccinated")) |>
      relevel(ref = "Not_vaccinated"),
    severity = factor(severity,
                      levels = c(0, 1),
                      labels = c("Not_severe", "Severe")) |>
      relevel(ref = "Not_severe")
  ) |>
  janitor::clean_names()

# matrix of predictors and vector of response
x.test = model.matrix(severity ~., test_data)[, -1]
y.test = test_data$severity
```

Exploratory analysis and data visualization

Descriptive Statistics of Training Data

```
descriptive_table = table1(~ age + gender + race + smoking + height + weight + bmi + hypertension + dial
                            data = training_data,
                            overall = "Total",
                            caption = "Descriptive Characteristics of Participants, Stratified by Severi

ds = t1kable(descriptive_table)
ds
```

Continuous Variable Visualization

```
theme1 <- trellis.par.get()
theme1$plot.symbol$col <- rgb(.2, .4, .2, .5)
theme1$plot.symbol$pch <- 2
theme1$plot.line$col <- rgb(.8, .1, .1, 1)
theme1$plot.line$lwd <- 2
theme1$strip.background$col <- rgb(.0, .2, .6, .2)
trellis.par.set(theme1)

featurePlot(
  x.train[, -c(2, 3, 4, 5, 6, 7, 11, 12, 15)],
  y.train,
  scales = list(x = list(relation = "free"),
                y = list(relation = "free")),
  plot = "box")
```

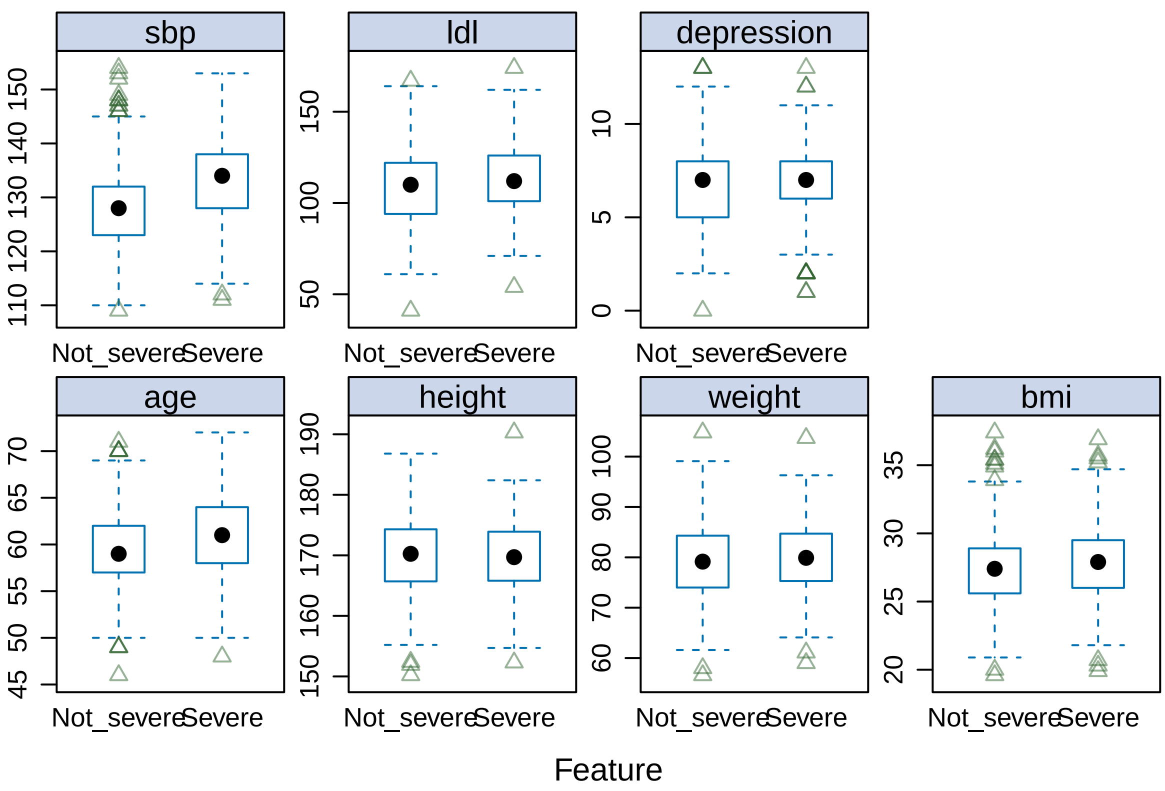


Table 1: Descriptive Characteristics of Participants, Stratified by Severity of COVID-19 Infection

	Not_severe	Severe	Total
	(N=514)	(N=286)	(N=800)
age			
Mean (SD)	59.5 (4.29)	61.0 (4.12)	60.0 (4.30)
Median [Min, Max]	59.0 [46.0, 71.0]	61.0 [48.0, 72.0]	60.0 [46.0, 72.0]
gender			
Female	255 (49.6%)	155 (54.2%)	410 (51.3%)
Male	259 (50.4%)	131 (45.8%)	390 (48.8%)
race			
White	328 (63.8%)	193 (67.5%)	521 (65.1%)
Asian	34 (6.6%)	16 (5.6%)	50 (6.3%)
Black	103 (20.0%)	46 (16.1%)	149 (18.6%)
Hispanic	49 (9.5%)	31 (10.8%)	80 (10.0%)
smoking			
Never_smoked	304 (59.1%)	163 (57.0%)	467 (58.4%)
Former_smoker	157 (30.5%)	91 (31.8%)	248 (31.0%)
Current_smoker	53 (10.3%)	32 (11.2%)	85 (10.6%)
height			
Mean (SD)	170 (6.24)	170 (5.83)	170 (6.09)
Median [Min, Max]	170 [150, 187]	170 [152, 190]	170 [150, 190]
weight			
Mean (SD)	79.0 (7.33)	80.1 (7.09)	79.4 (7.26)
Median [Min, Max]	79.2 [56.6, 105]	79.9 [59.0, 104]	79.3 [56.6, 105]
bmi			
Mean (SD)	27.4 (2.70)	27.9 (2.78)	27.5 (2.74)
Median [Min, Max]	27.4 [19.6, 37.4]	27.9 [19.9, 36.9]	27.6 [19.6, 37.4]
hypertension			
No	332 (64.6%)	100 (35.0%)	432 (54.0%)
Yes	182 (35.4%)	186 (65.0%)	368 (46.0%)
diabetes			
No	437 (85.0%)	242 (84.6%)	679 (84.9%)
Yes	77 (15.0%)	44 (15.4%)	121 (15.1%)
sbp			
Mean (SD)	128 (7.58)	133 (7.62)	130 (7.97)
Median [Min, Max]	128 [109, 154]	134 [111, 153]	130 [109, 154]
ldl			
Mean (SD)	108 (20.5)	113 (18.8)	110 (20.1)
Median [Min, Max]	110 [41.0, 167]	112 [54.0, 174]	111 [41.0, 174]
vaccine			
Not_vaccinated	96 (18.7%)	240 (83.9%)	336 (42.0%)
Vaccinated	418 (81.3%)	46 (16.1%)	464 (58.0%)
depression			
Mean (SD)	6.91 (2.13)	6.90 (2.09)	6.91 (2.12)
Median [Min, Max]	7.00 [0, 13.0]	7.00 [1.00, 13.0]	7.00 [0, 13.0]

Table 2: Descriptive Characteristics of Participants, Stratified by Severity of COVID-19 Infection

	Not_severe	Severe	Total
	(N=514)	(N=286)	(N=800)
gender			
Female	255 (49.6%)	155 (54.2%)	410 (51.3%)
Male	259 (50.4%)	131 (45.8%)	390 (48.8%)
race			
White	328 (63.8%)	193 (67.5%)	521 (65.1%)
Asian	34 (6.6%)	16 (5.6%)	50 (6.3%)
Black	103 (20.0%)	46 (16.1%)	149 (18.6%)
Hispanic	49 (9.5%)	31 (10.8%)	80 (10.0%)
smoking			
Never_smoked	304 (59.1%)	163 (57.0%)	467 (58.4%)
Former_smoker	157 (30.5%)	91 (31.8%)	248 (31.0%)
Current_smoker	53 (10.3%)	32 (11.2%)	85 (10.6%)
hypertension			
No	332 (64.6%)	100 (35.0%)	432 (54.0%)
Yes	182 (35.4%)	186 (65.0%)	368 (46.0%)
diabetes			
No	437 (85.0%)	242 (84.6%)	679 (84.9%)
Yes	77 (15.0%)	44 (15.4%)	121 (15.1%)
vaccine			
Not_vaccinated	96 (18.7%)	240 (83.9%)	336 (42.0%)
Vaccinated	418 (81.3%)	46 (16.1%)	464 (58.0%)

The mean and median ages for both `Severity` groups (Not Severe and Severe) are close, indicating a relatively balanced distribution of age across severity levels. `Height`, `Weight`, and `BMI` have similar mean and median values, suggesting comparable distributions of these variables between the two `severity` groups. The Systolic Blood Pressure (`SBP`) and LDL cholesterol (`LDL`) variables show slightly higher mean values in the Severe group compared to the Not Severe group, indicating potential differences in these clinical measures between `severity` levels.

Descriptive Table of Discrete Variables

```
descriptive_table2 = table1(~ gender + race + smoking + hypertension + diabetes + vaccine | severity,
                            data = training_data,
                            overall = "Total",
                            caption = "Descriptive Characteristics of Participants, Stratified by Severi

ds_bin = t1kable(descriptive_table2)
ds_bin
```

The distribution of `gender` is relatively balanced in both `severity` groups, with slightly more females in the Not Severe group and slightly more males in the Severe group. The majority of participants in both `severity` groups are White, followed by Black, Asian, and Hispanic participants. The distribution across `race` appears to be consistent between severity levels. The majority of participants in both `severity` groups are non-smokers (Never smoked category), followed by former smokers and current smokers. The distribution of `smoking` status is similar between `severity` levels.The prevalence of `hypertension` and `diabetes` is noticeably higher in the Severe group compared to the Not Severe group, indicating a potential association between these conditions and COVID-19 `severity`. A significant proportion of participants in the Severe group are not vaccinated, while the majority in the Not Severe group are vaccinated. This suggests a potential protective effect of vaccination against severe COVID-19 infection. The mean and median `depression` scores are similar between `severity` groups, indicating comparable levels of depression risk or severity across severity levels.

Pre-Processing

Based on the descriptive statistics of the training data, scaling the training data has potential benefits for most of the classificaiton algorithms I plan to use. I will scale the data foe the benefits of standardizing the features, model stability, and ensuring that each feature contributes meaningfully to the model training process.

```r
# Preprocess the training data by centering and scaling numerical features
t_train = preProcess(training_data,
                     method = c("center", "scale"))
t_train
```

```
## Created from 800 samples and 14 variables
##
## Pre-processing:
##   - centered (7)
##   - ignored (7)
##   - scaled (7)
```

```r
# Apply the preprocessing transformation to the training data to obtain scaled data
scaled_training = predict(t_train, newdata = training_data)

head(scaled_training)
```

```
##          age gender  race       smoking      height     weight        bmi
## 1 -0.2402656 Female White Former_smoker  0.04926394 -0.6503925 -0.6351185
## 2 -1.4037793   Male White Former_smoker  0.13130214 -0.5126157 -0.5620324
## 3 -1.1710766   Male Black Former_smoker  0.44304730  1.3887038  0.8996903
## 4 -0.2402656 Female White  Never_smoked  0.27897090 -0.6641702 -0.8178339
## 6  0.9232481   Male White  Never_smoked -0.19685066  1.1682610  1.1920349
## 9  1.6213564 Female White  Never_smoked -0.24607358 -0.4023943 -0.1966017
##   diabetes hypertension        sbp        ldl        vaccine depression
## 1       No           No -1.2354661 -0.7605421     Vaccinated -0.9009419
## 2      Yes          Yes  0.3953052 -1.1594496 Not_vaccinated -2.3169606
## 3       No           No -0.8591342  1.4334492     Vaccinated -0.9009419
## 4       No           No -1.1100221  0.7852245     Vaccinated -1.3729481
## 6       No          Yes  0.2698613 -0.5610883     Vaccinated  0.9870830
## 9       No          Yes  1.0225250 -0.6608152 Not_vaccinated  0.5150768
##     severity
## 1 Not_severe
## 2     Severe
## 3 Not_severe
## 4 Not_severe
## 6 Not_severe
## 9     Severe
```

```r
# Create the design matrix for training with scaled features, excluding the intercept column
x.train.scaled = model.matrix(severity ~ ., scaled_training)[, -1]

# Extract the scaled target variable (severity) from the scaled training data
y.train.scaled = scaled_training$severity

# Preprocess the test data using the same transformation applied to the training data
t_test = preProcess(test_data,
                    method = c("center", "scale"))
t_test
```

```
## Created from 200 samples and 14 variables
##
## Pre-processing:
##   - centered (7)
##   - ignored (7)
##   - scaled (7)
```

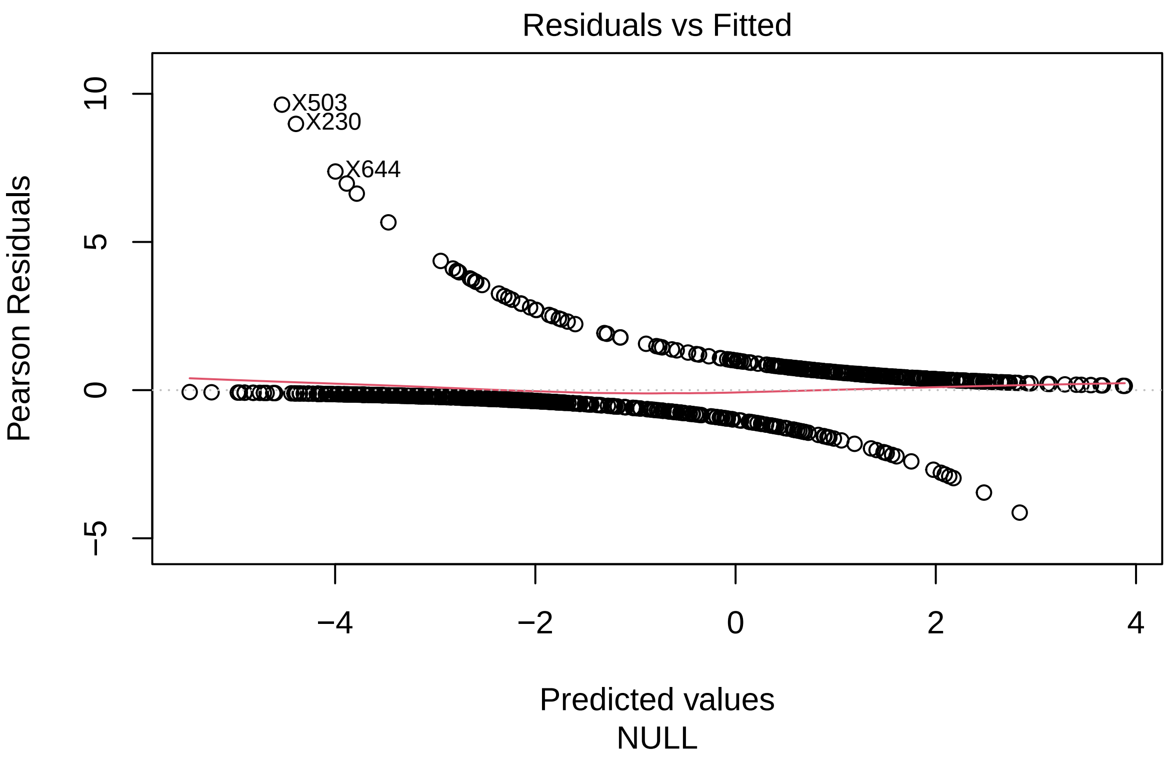
```r
# Apply the preprocessing transformation to the test data to obtain scaled data
scaled_testing = predict(t_test, newdata = test_data)

# Create the design matrix for testing with scaled features, excluding the intercept column
x.test.scaled = model.matrix(severity ~ ., scaled_testing)[, -1]

# Extract the scaled target variable (severity) from the scaled testing data
y.test.scaled = scaled_training$severity
```

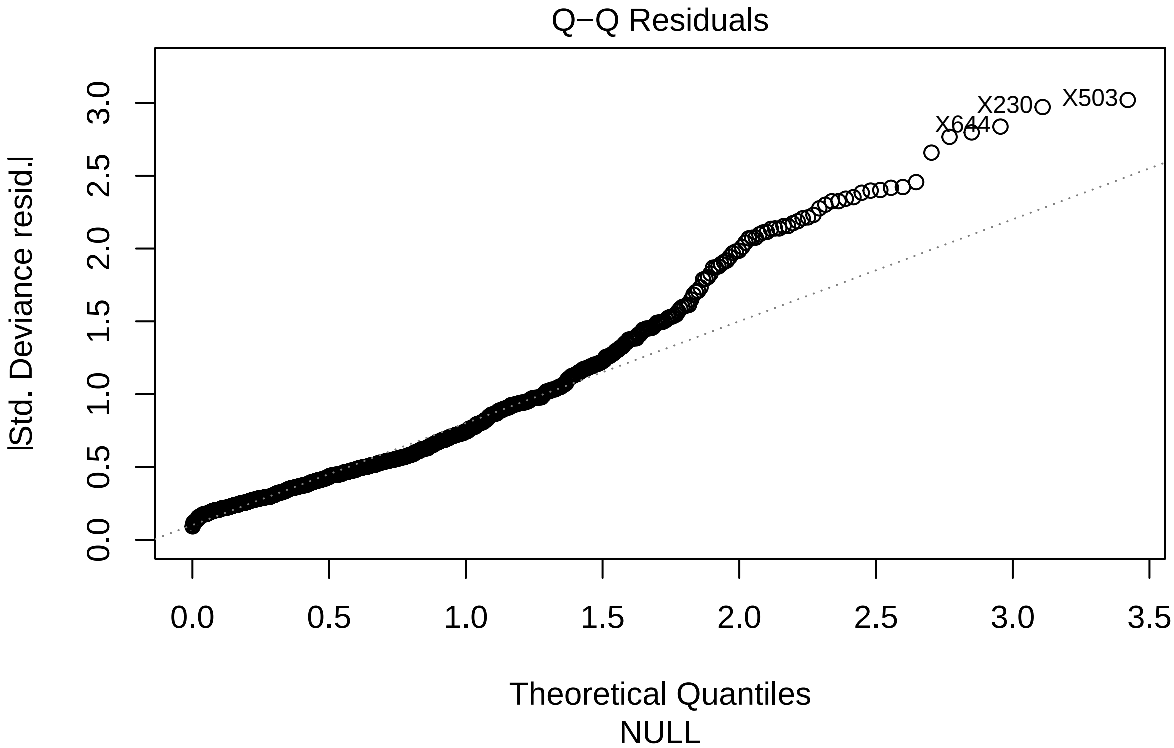
I will compare model performance between scaled and un-scaled data to see if there any benefits from scaling.

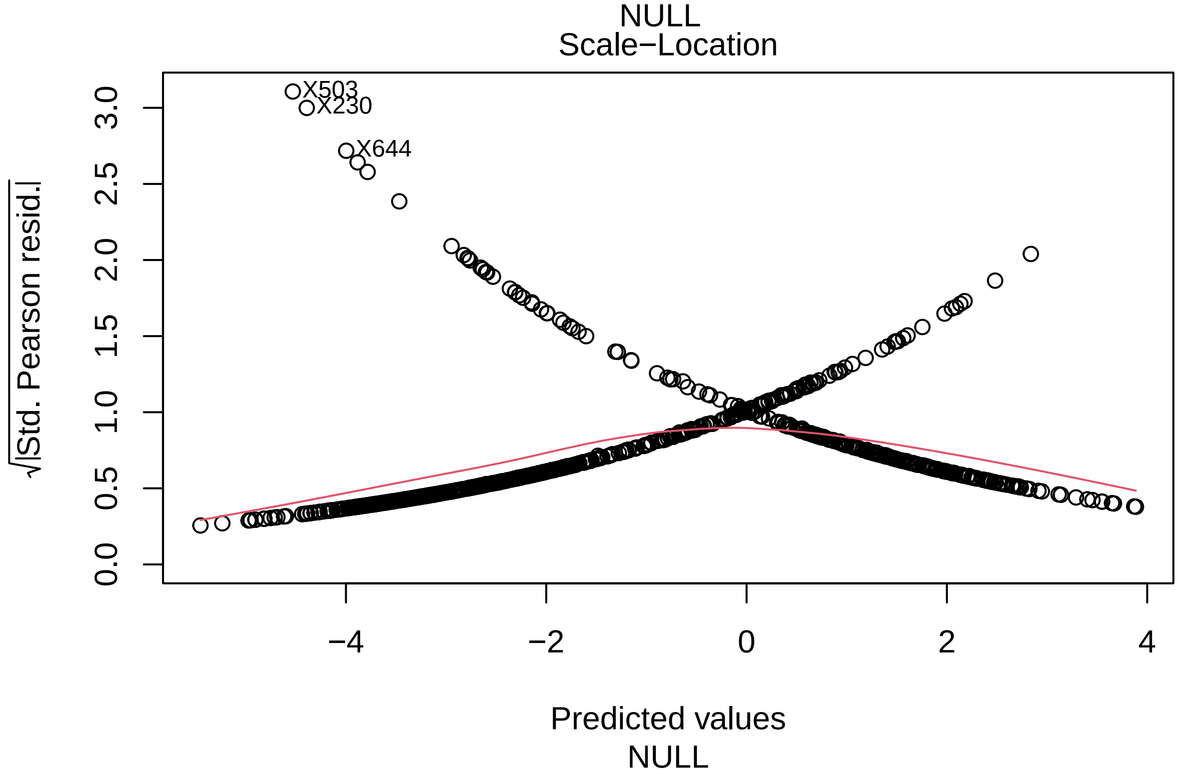
Model training

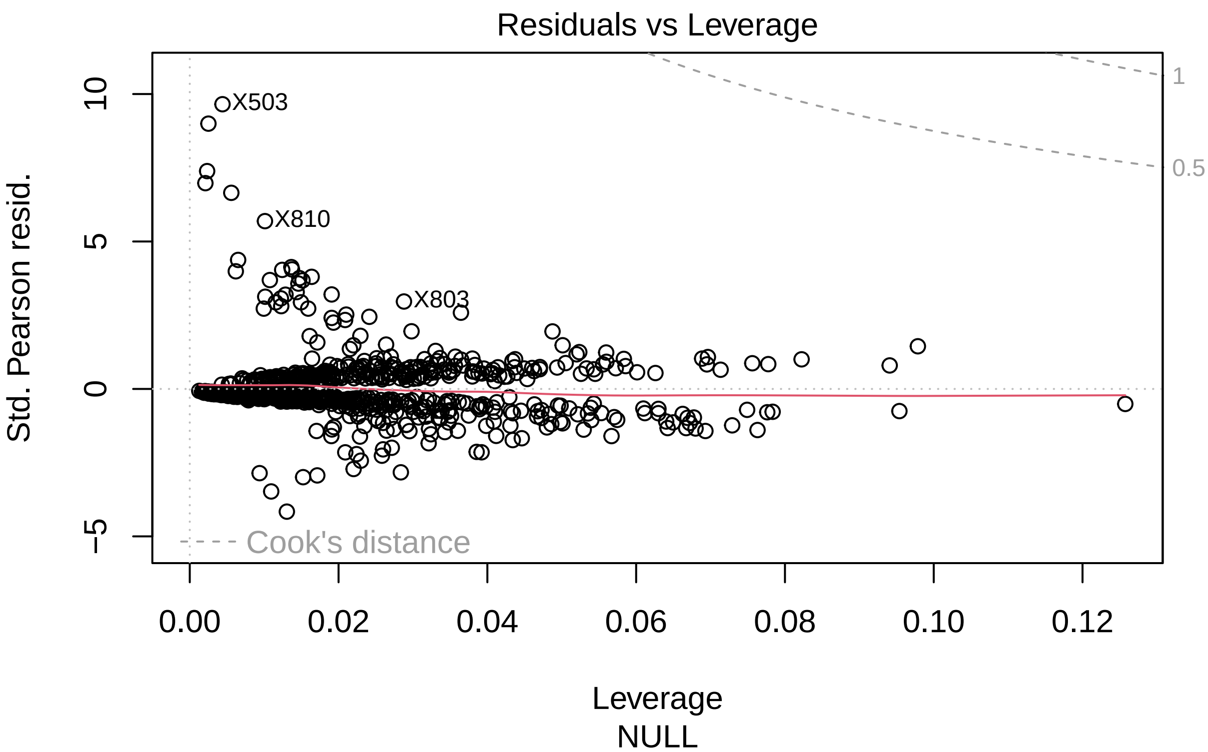
Logistic Regression

```r
# setting a 10-fold cross-validation
ctrl = trainControl(method = "cv", number = 10,
                    summaryFunction = twoClassSummary,
                    classProbs = TRUE)
set.seed(2)

# logistic regression
model.glm = train(x = x.train,
                  y = y.train,
                  method = "glm",
                  metric = "ROC",
                  trControl = ctrl)

plot(model.glm$finalModel)
```




Q−Q Residuals
|Std. Deviance resid.|
Theoretical Quantiles
NULL
X503
X230
X644
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

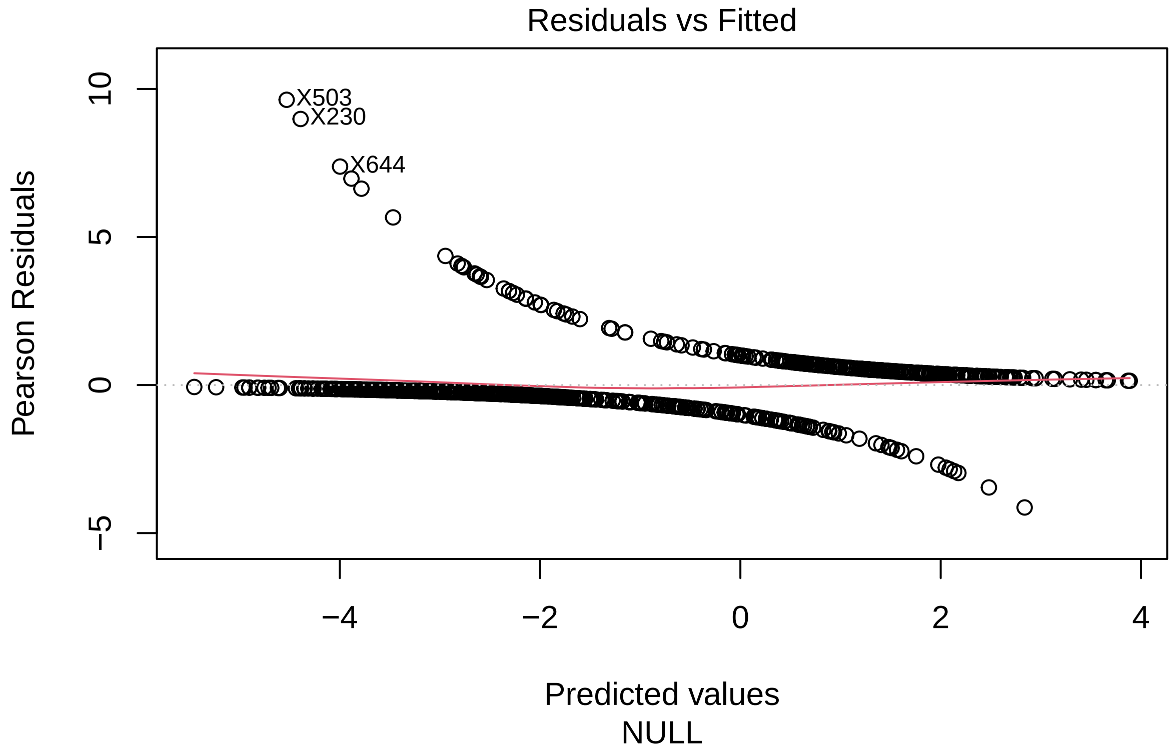

Scale−Location
√|Std. Pearson resid.|
Predicted values
NULL
X503
X230
X644
−4
−2
0
2
4
0.0
0.5
1.0
1.5
2.0
2.5
3.0

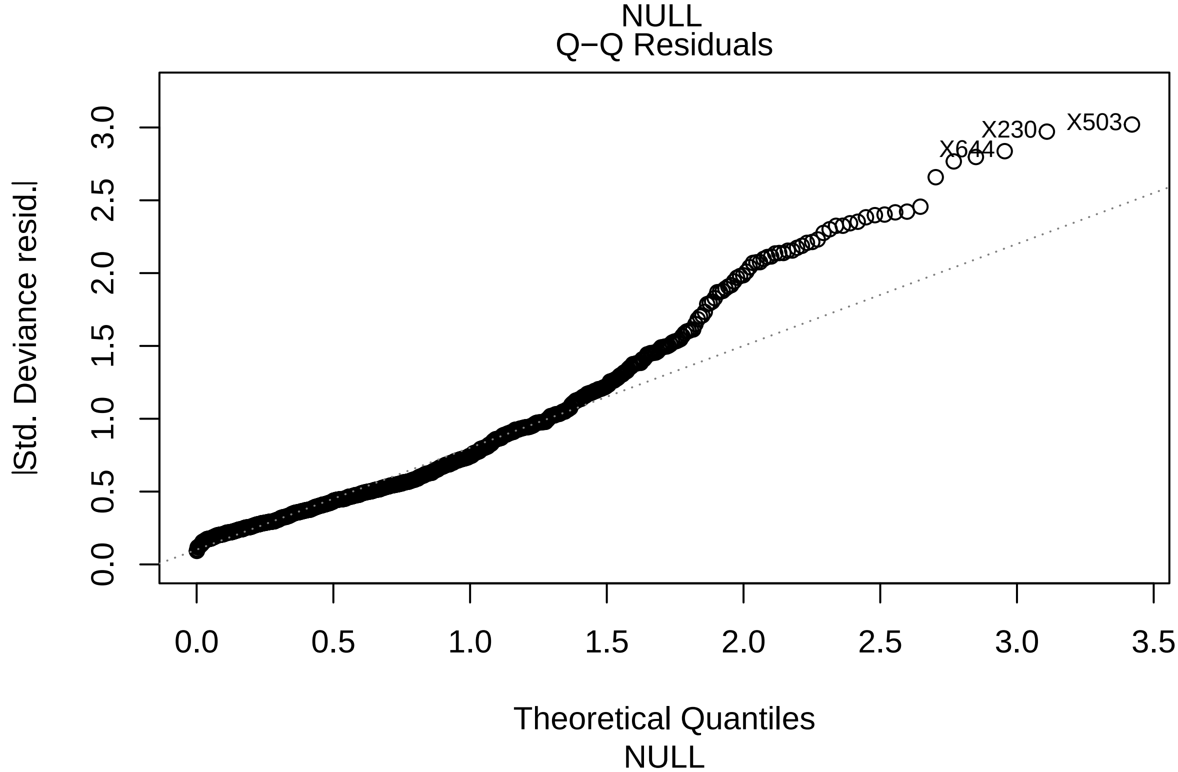


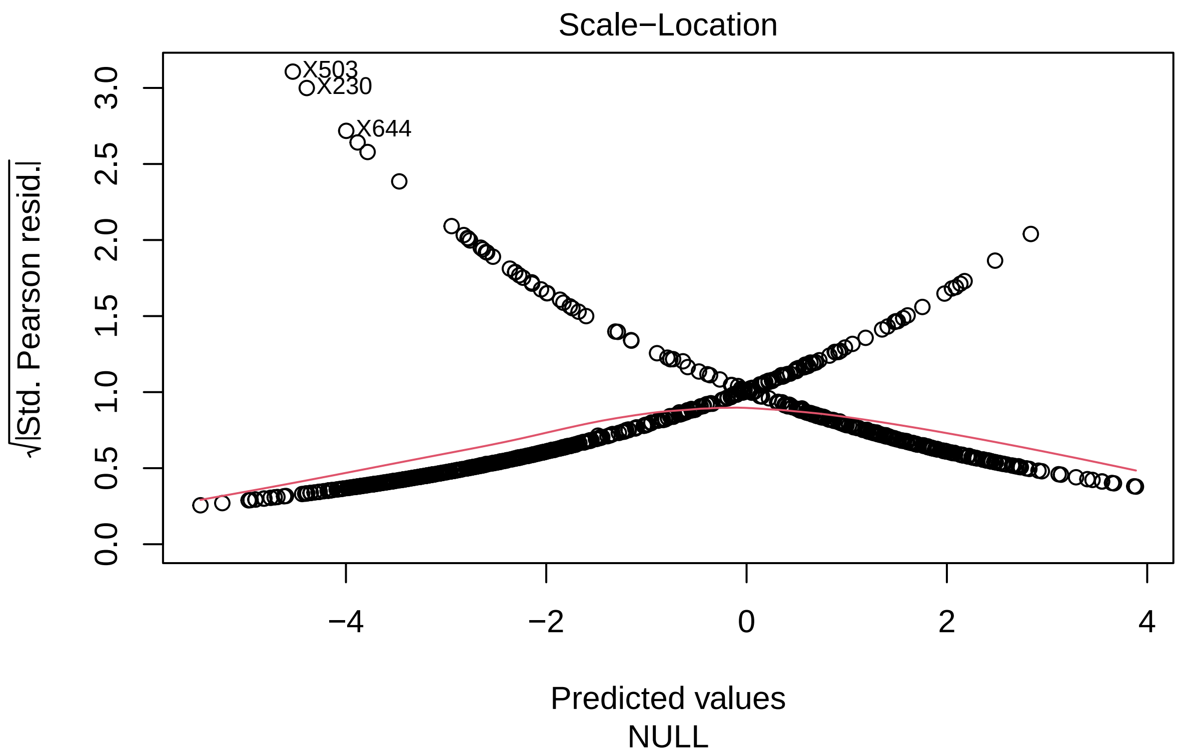

```r
coef(model.glm$finalModel)
```

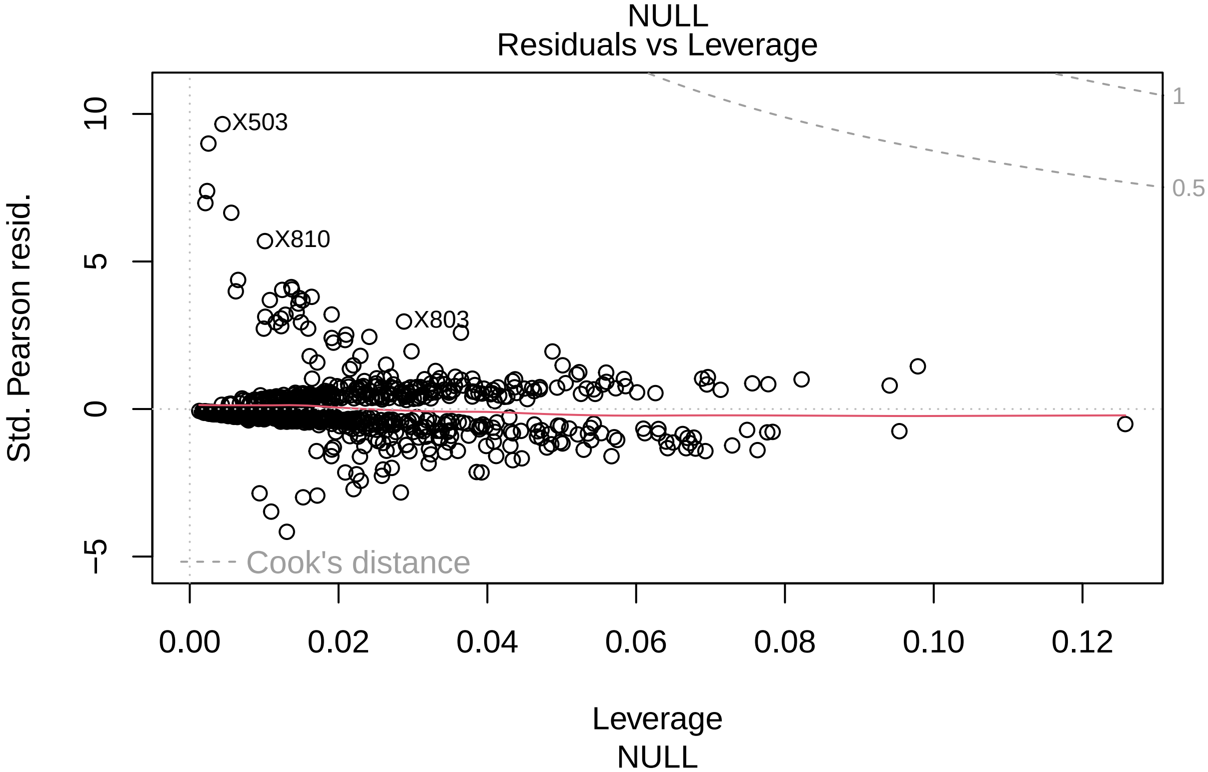
```
##           (Intercept)                   age             genderMale
##          -36.14267644            0.06479499            -0.40913157
##             raceAsian             raceBlack           raceHispanic
##           -0.20261995            0.01737165            -0.17462048
##  smokingFormer_smoker smokingCurrent_smoker                 height
##            0.02496598            0.49239971             0.11171808
##                weight                   bmi            diabetesYes
##           -0.13337473            0.53758507             0.25302775
##       hypertensionYes                   sbp                    ldl
##            0.38092720            0.07081051             0.01002248
##      vaccineVaccinated            depression
##           -3.61798671           -0.03796927
```

```r
set.seed(2)
# logistic regression scaled
scaled.model.glm = train(x = x.train.scaled,
                   y = y.train.scaled,
                   method = "glm",
                   metric = "ROC",
                   trControl = ctrl)

plot(scaled.model.glm$finalModel)
```


Residuals vs Fitted
Pearson Residuals
10
5
0
−5
X503
X230
X644
−4
−2
0
2
4
Predicted values
NULL


Q−Q Residuals
|Std. Deviance resid.|
0.0
0.5
1.0
1.5
2.0
2.5
3.0
X503
X230
X644
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Theoretical Quantiles
NULL






```r
coef(scaled.model.glm$finalModel)
```

```
##           (Intercept)                   age            genderMale
##            0.98782691            0.27844531           -0.40913157
##             raceAsian             raceBlack          raceHispanic
##           -0.20261995            0.01737165           -0.17462048
##  smokingFormer_smoker smokingCurrent_smoker                height
```

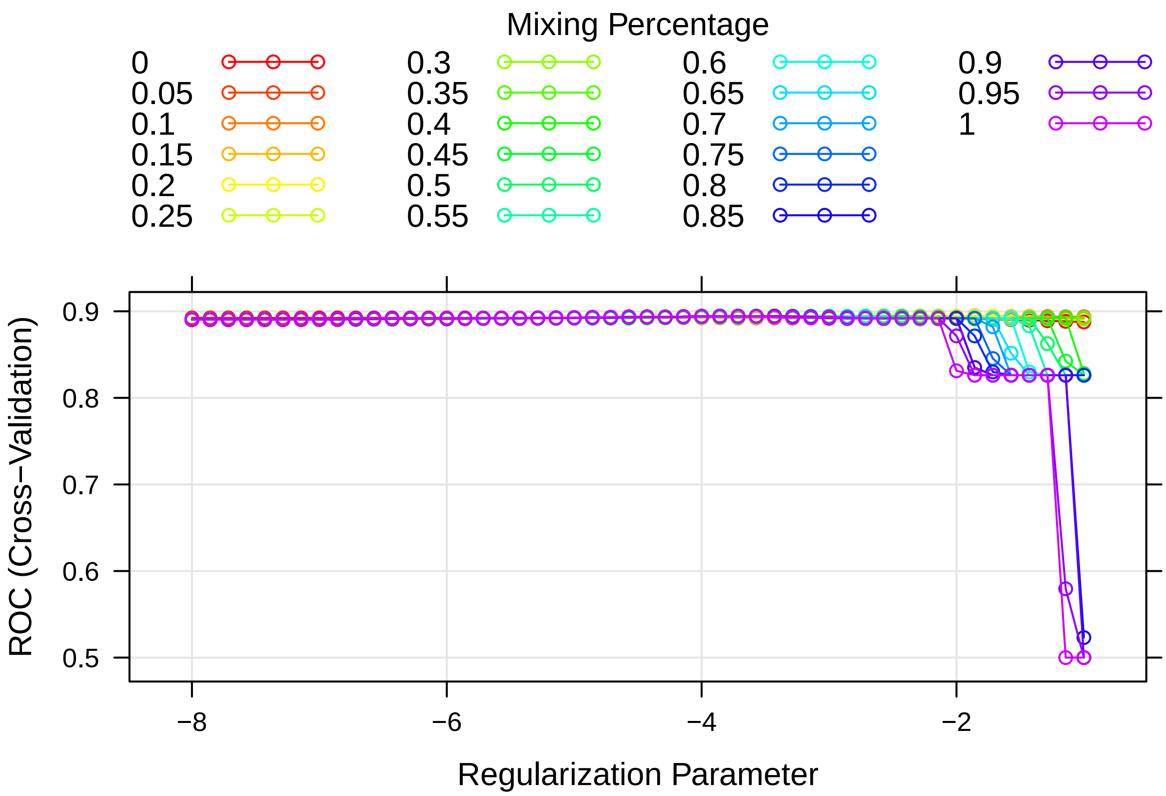
```
##          0.02496598          0.49239971          0.68089063
##              weight                 bmi         diabetesYes
##         -0.96804941          1.47110001          0.25302775
##     hypertensionYes                 sbp                 ldl
##          0.38092720          0.56447926          0.20099852
##   vaccineVaccinated          depression
##         -3.61798671         -0.08044231
```

Penalized Logistic Regression

```
# penalized logistic regression - elastic net
glmnGrid = expand.grid(.alpha = seq(0, 1, length = 21),
                       .lambda = exp(seq(-8, -1, length = 50)))
set.seed(2)
model.glmn = train(x = x.train,
                   y = y.train,
                   method = "glmnet",
                   tuneGrid = glmnGrid,
                   metric = "ROC",
                   trControl = ctrl)
model.glmn$bestTune
```

```
##     alpha   lambda
## 144   0.1 0.156118
```

```
myCol = rainbow(25)
myPar = list(superpose.symbol = list(col = myCol),
superpose.line = list(col = myCol))
plot(model.glmn, par.settings = myPar, xTrans = function(x) log(x))
```

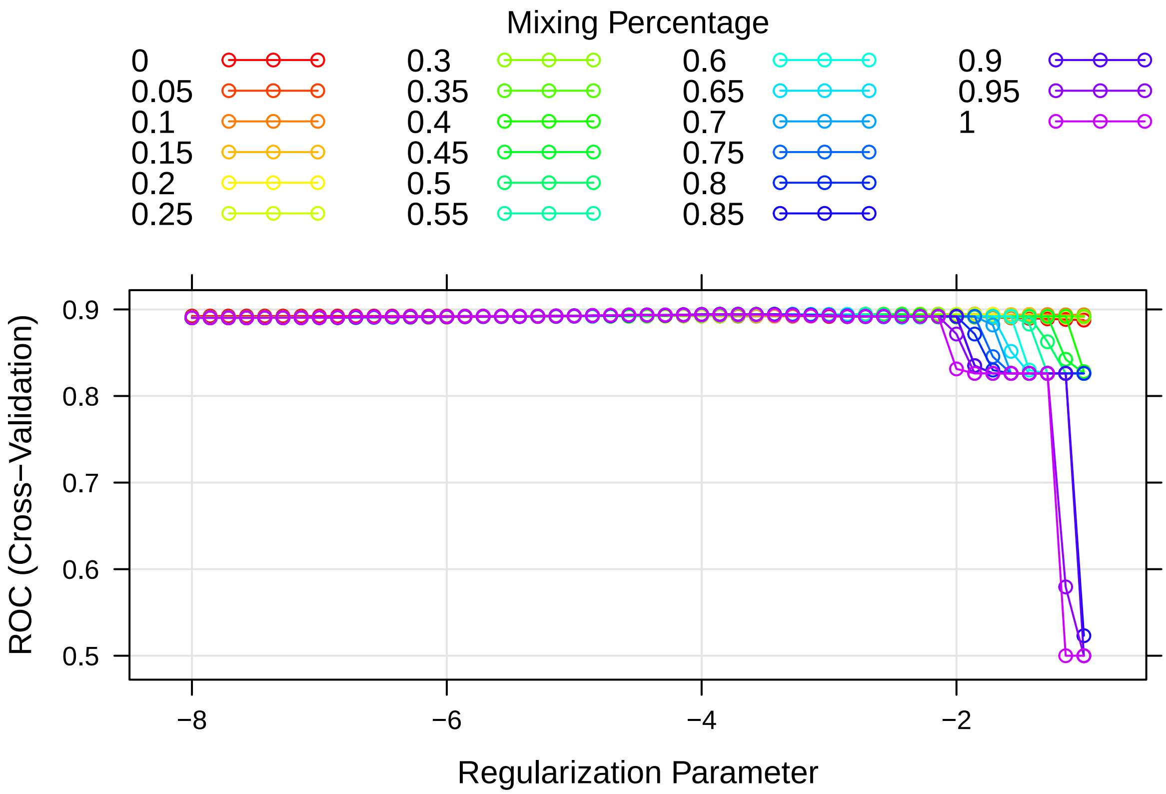



```
# penalized logistic regression - scaled
set.seed(2)
scaled.model.glmn = train(x = x.train.scaled,
                   y = y.train.scaled,
                   method = "glmnet",
                   tuneGrid = glmnGrid,
                   metric = "ROC",
                   trControl = ctrl)
```

```
scaled.model.glmn$bestTune
```

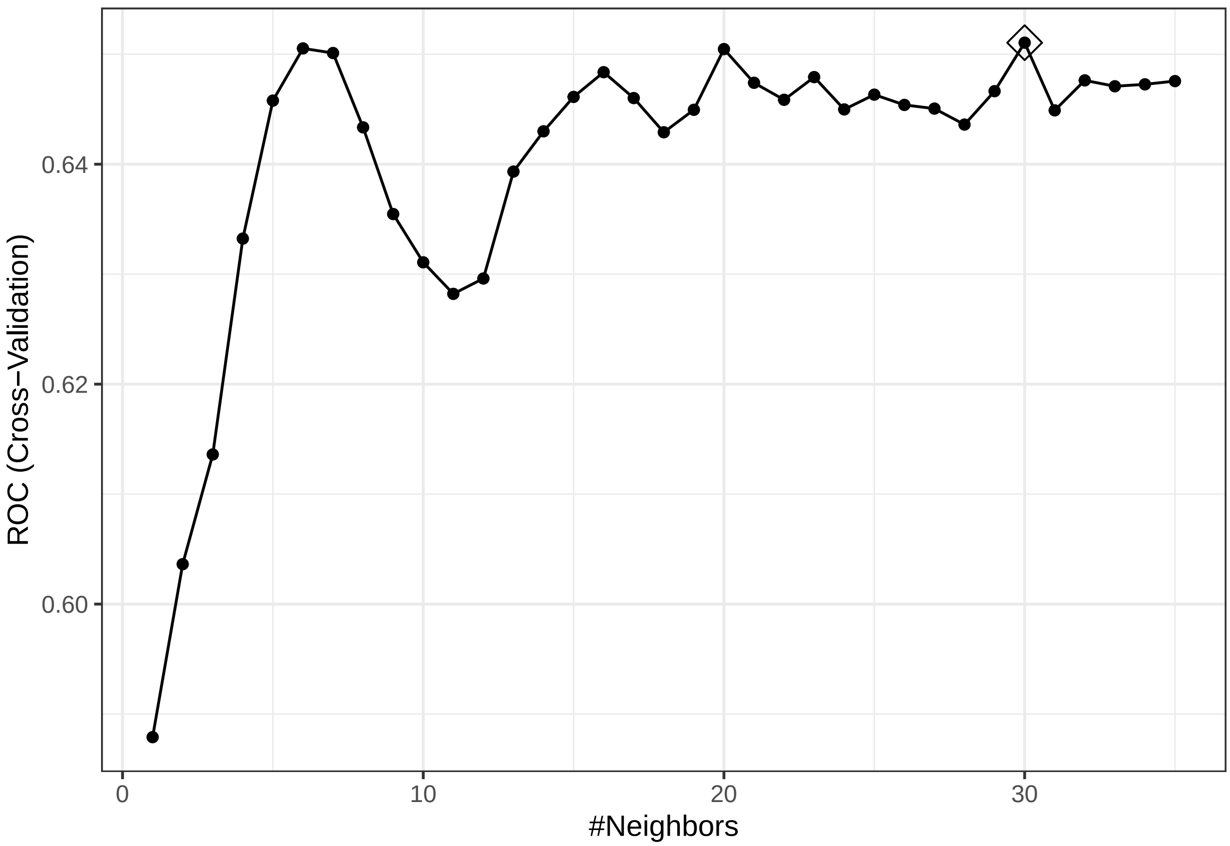
```
##     alpha   lambda
## 144   0.1 0.156118
```

```
myCol = rainbow(25)
myPar = list(superpose.symbol = list(col = myCol),
superpose.line = list(col = myCol))
plot(scaled.model.glmn, par.settings = myPar, xTrans = function(x) log(x))
```



KNN - how to tune?

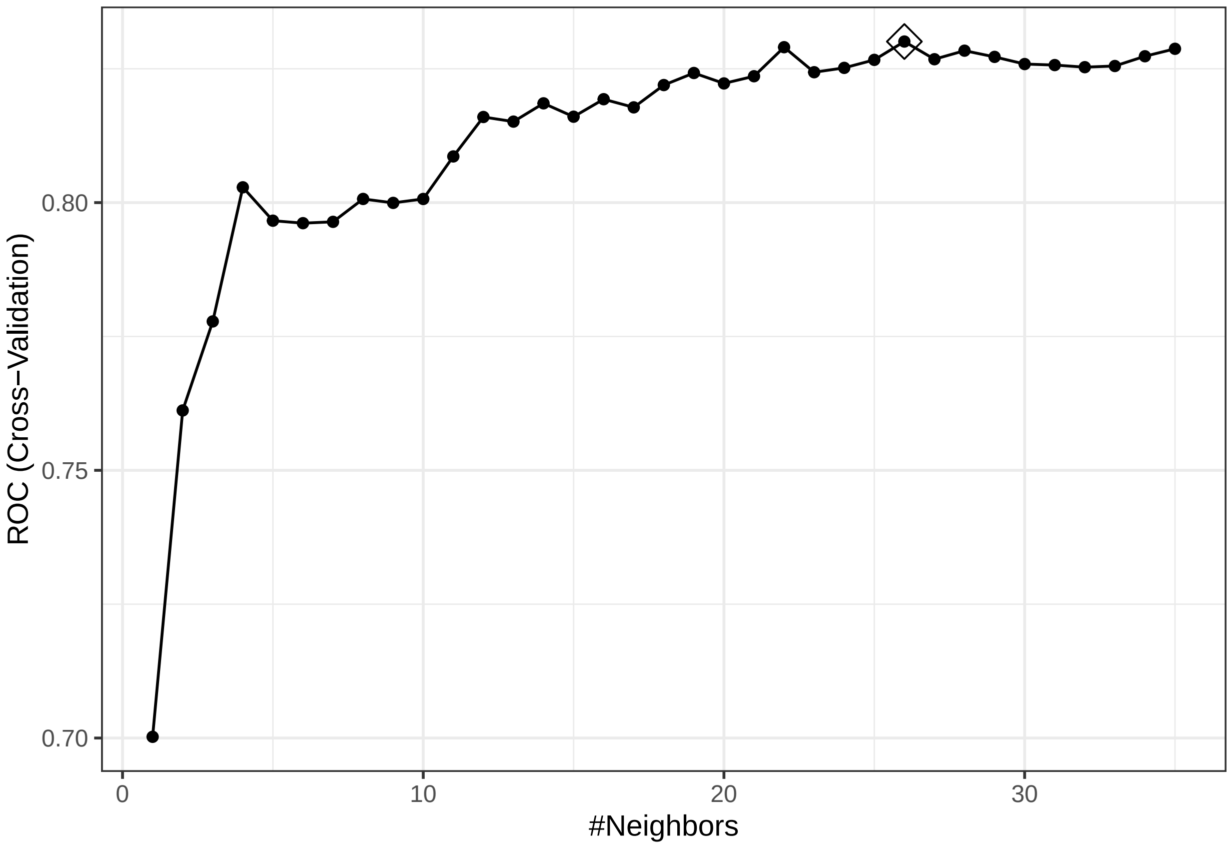
```
# KNN
set.seed(2)
model.knn = train(x.train, y.train,
                  method = "knn",
                  trControl = ctrl,
                  tuneGrid = expand.grid(k = seq(from = 1, to = 35, by = 1)))

ggplot(model.knn, highlight = TRUE) + theme_bw()
```




```
model.knn$finalModel
```

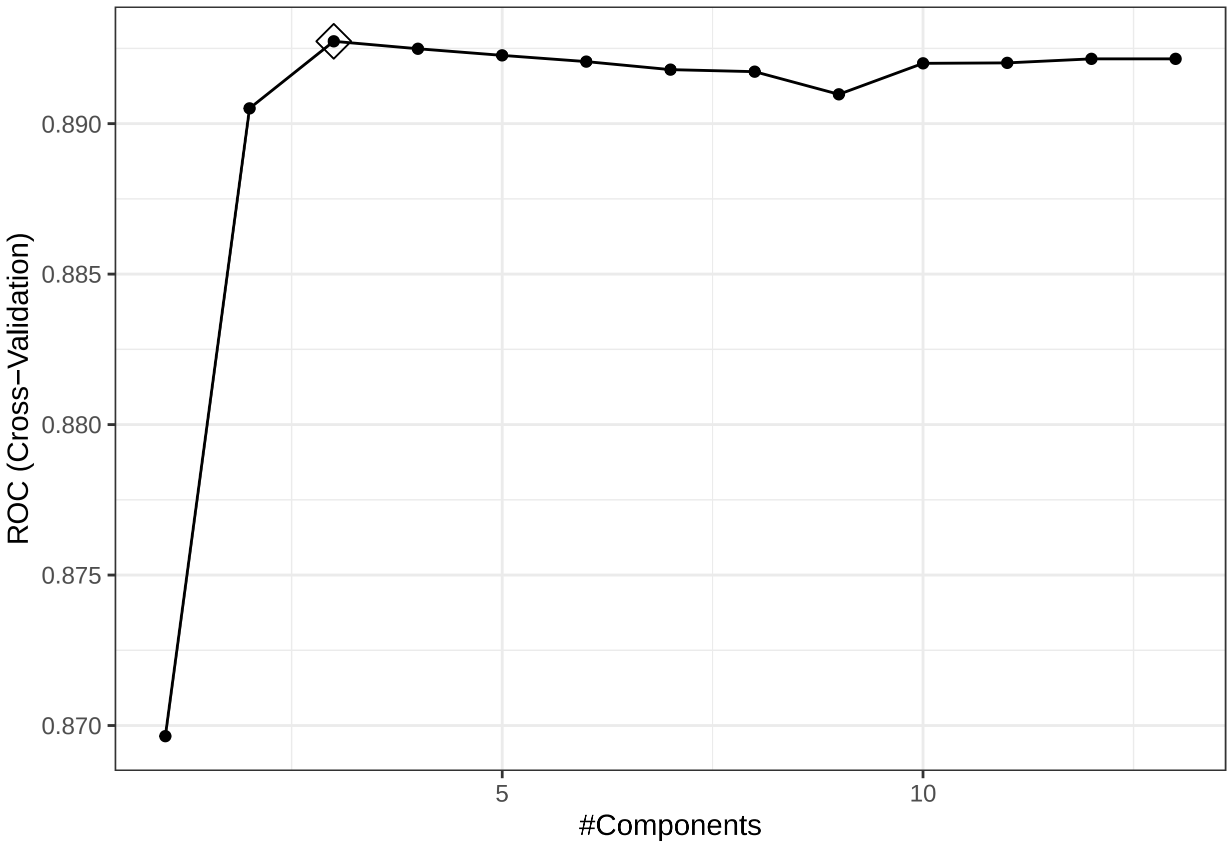
```
## 30-nearest neighbor model
## Training set outcome distribution:
##
## Not_severe     Severe
##        514        286
```

```
# KNN scaled
set.seed(2)
scaled.model.knn = train(x.train.scaled, y.train.scaled,
                  method = "knn",
                  trControl = ctrl,
                  tuneGrid = expand.grid(k = seq(from = 1, to = 35, by = 1)))

ggplot(scaled.model.knn, highlight = TRUE) + theme_bw()
```


0.80
0.75
0.70
ROC (Cross−Validation)
0
10
20
30
#Neighbors

PLS

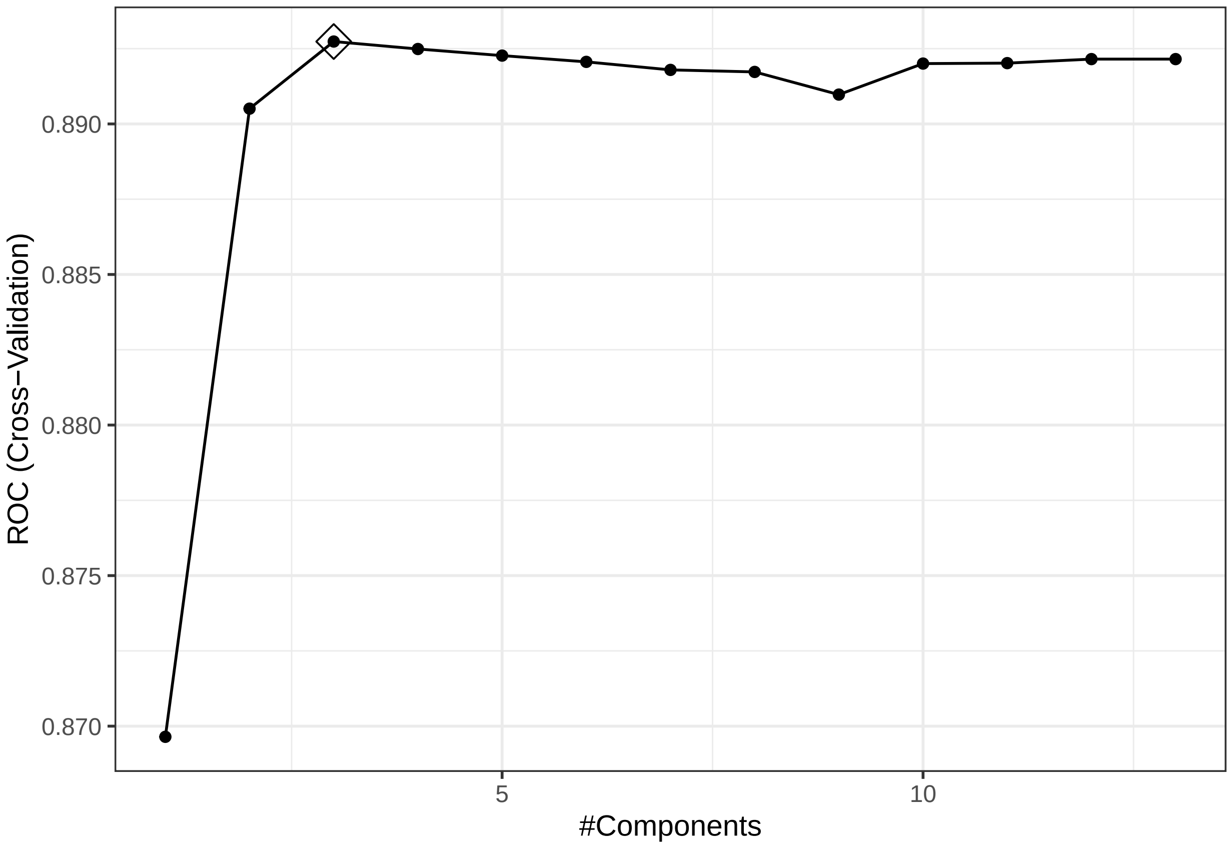
```
set.seed(2)
# pls
model.pls = train(x.train, y.train,
                  method = "pls",
                  tuneGrid = data.frame(ncomp = 1:13),
                  trControl = ctrl,
                  preProcess = c("center", "scale"))

ggplot(model.pls, highlight = TRUE) + theme_bw()
```




```
model.pls$bestTune
```

```
##   ncomp
## 3     3
```

```
set.seed(2)

# pls scaled
scaled.model.pls = train(x.train.scaled, y.train.scaled,
                  method = "pls",
                  tuneGrid = data.frame(ncomp = 1:13),
                  trControl = ctrl,
                  preProcess = c("center", "scale"))

ggplot(scaled.model.pls, highlight = TRUE) + theme_bw()
```

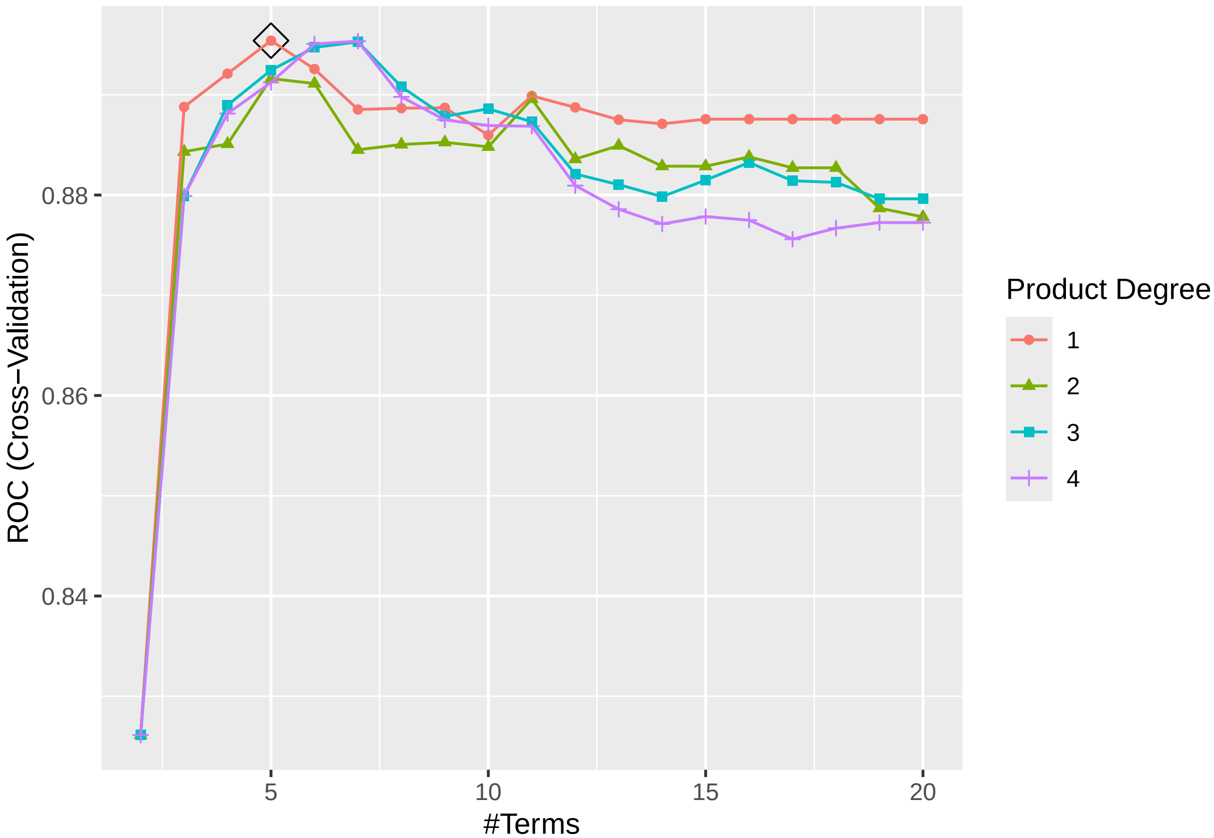



```
model.pls$bestTune
```

```
##   ncomp
## 3     3
```

MARS

```
# MARS
set.seed(2)
model.mars = train(x = x.train,
                   y = y.train,
                   method = "earth",
                   tuneGrid = expand.grid(degree = 1:4,
                                          nprune = 2:20),
                   metric = "ROC",
                   trControl = ctrl)

ggplot(model.mars, highlight = TRUE)
```




```
model.mars$bestTune
```

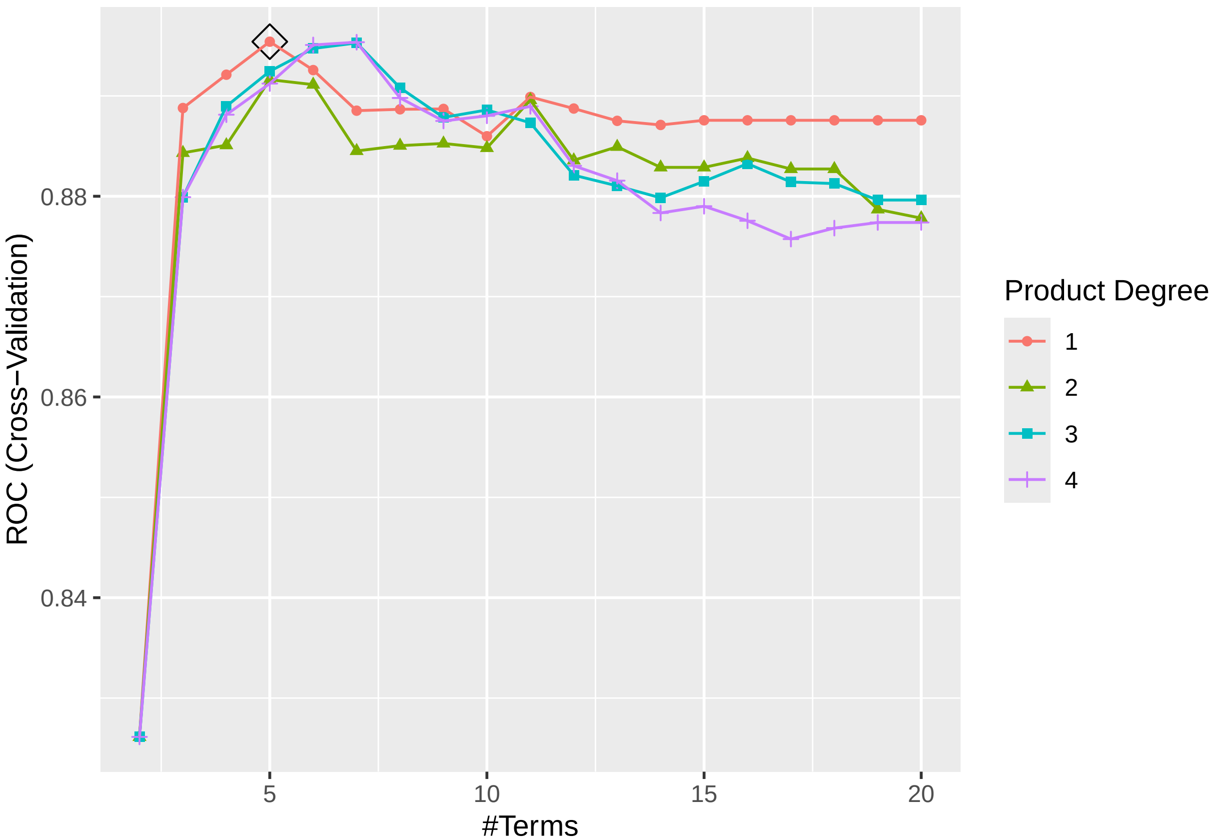
```
##   nprune degree
## 4      5      1
```

```
coef(model.mars$finalModel)
```

```
##       (Intercept) vaccineVaccinated        h(sbp-139)        h(139-sbp)
##        1.98341761       -3.50798169       -0.01515556       -0.13557595
##         h(bmi-27)
##        0.24293455
```

```
# MARS scaled
set.seed(2)
scaled.model.mars = train(x = x.train.scaled,
```

```
                     y = y.train.scaled,
                     method = "earth",
                     tuneGrid = expand.grid(degree = 1:4,
                                            nprune = 2:20),
                     metric = "ROC",
                     trControl = ctrl)

ggplot(scaled.model.mars, highlight = TRUE)
```




```
scaled.model.mars$bestTune
```

```
##   nprune degree
## 4      5      1
```

```
coef(scaled.model.mars$finalModel)
```

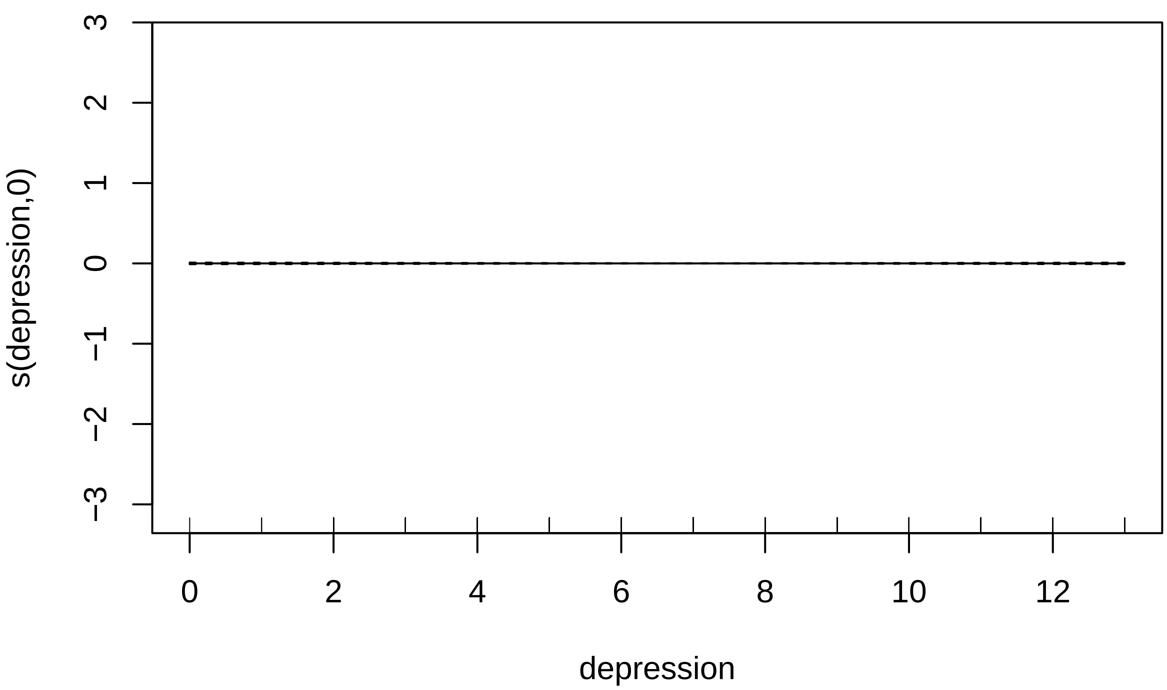
```
##        (Intercept) vaccineVaccinated    h(sbp-1.14797)    h(1.14797-sbp)
##          1.9834176        -3.5079817        -0.1208154        -1.0807692
## h(bmi- -0.196602)
##          0.6647897
```

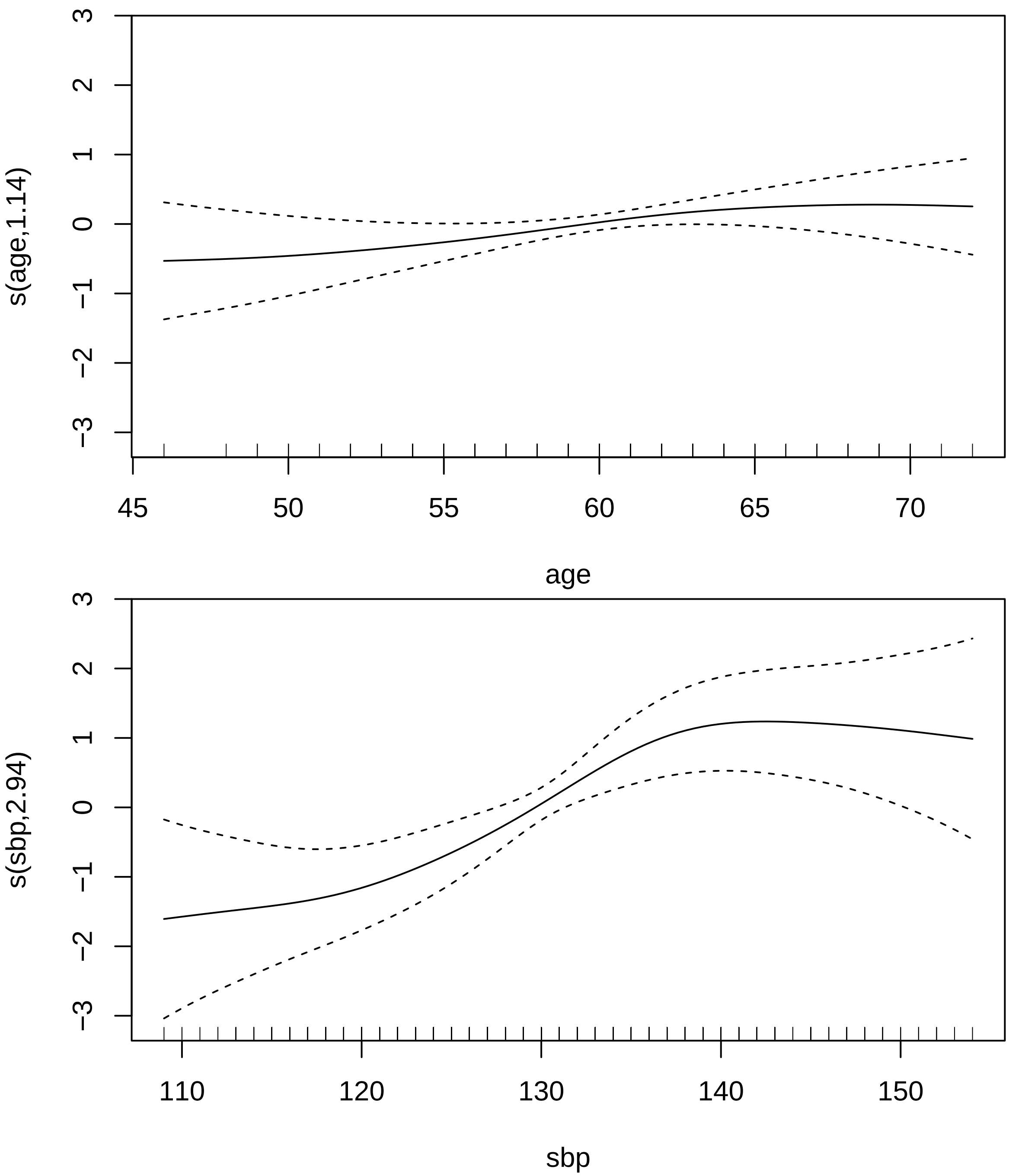
GAM

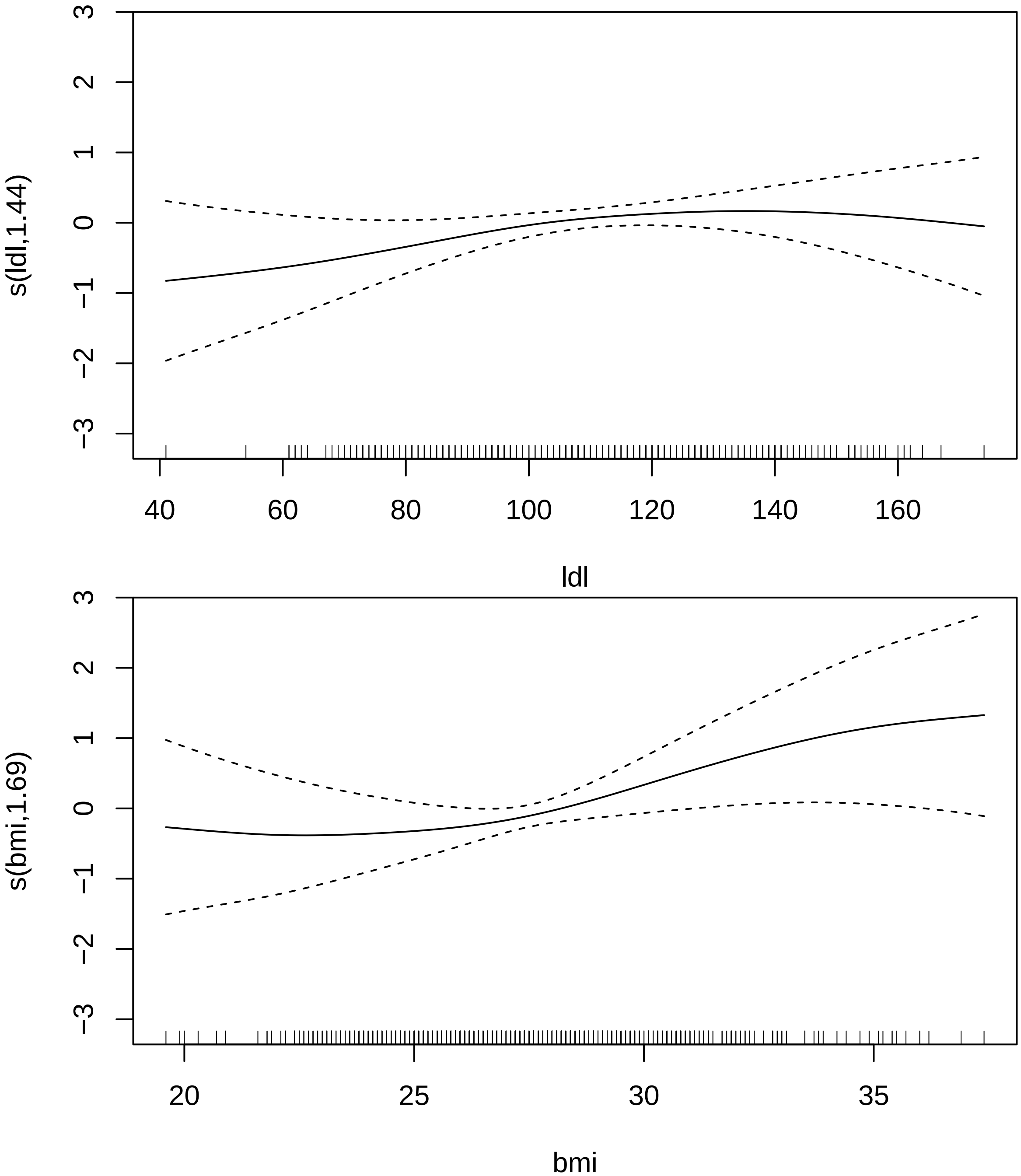
```r
set.seed(2)

model.gam = train(x = x.train,
                  y = y.train,
                   method = "gam",
                   metric = "ROC",
                   trControl = ctrl)

model.gam$finalModel
```

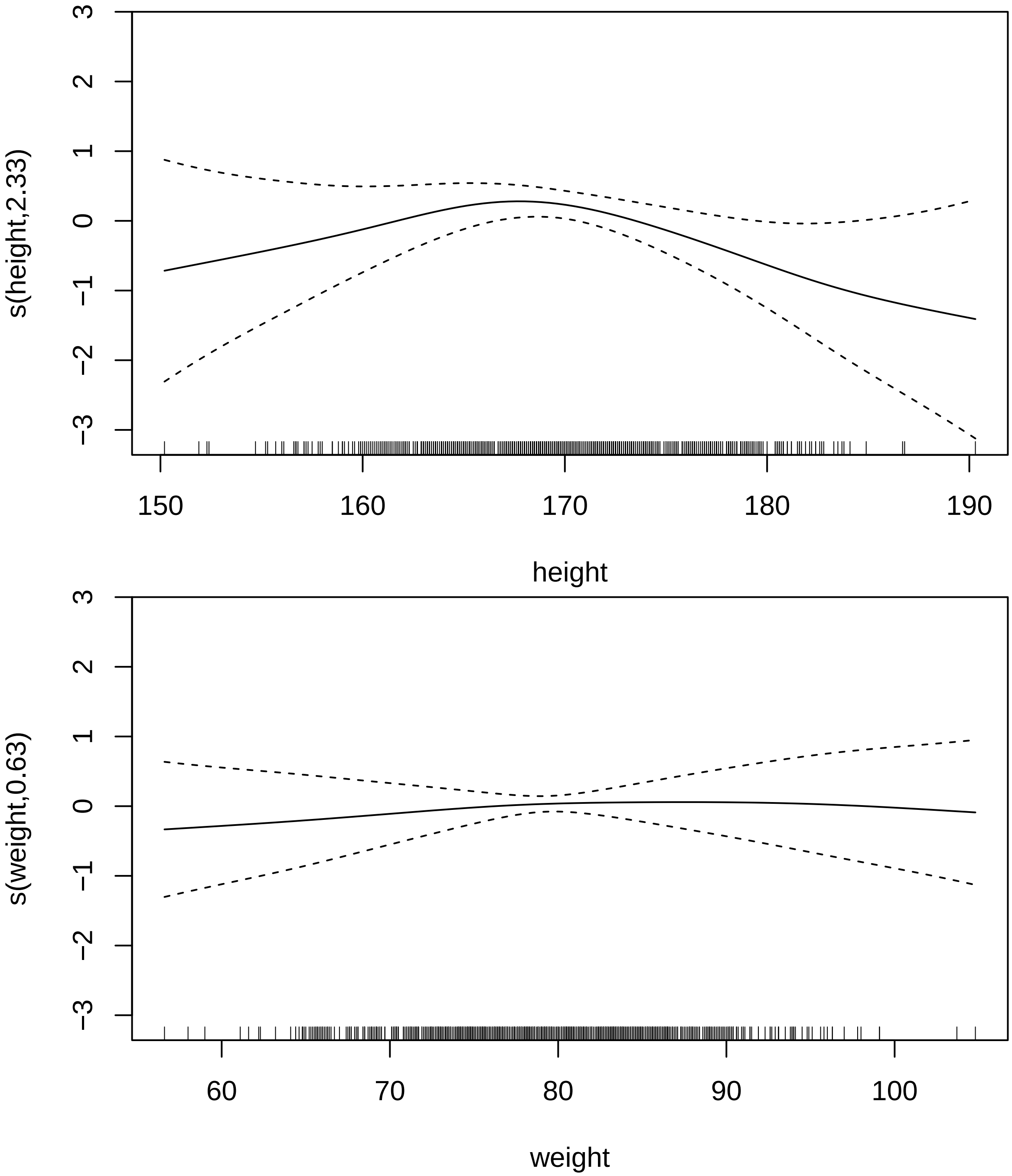
```
##
## Family: binomial
## Link function: logit
##
## Formula:
## .outcome ~ genderMale + raceAsian + raceBlack + raceHispanic +
##     smokingFormer_smoker + smokingCurrent_smoker + diabetesYes +
##     hypertensionYes + vaccineVaccinated + s(depression) + s(age) +
##     s(sbp) + s(ldl) + s(bmi) + s(height) + s(weight)
##
## Estimated degrees of freedom:
## 0.0003 1.1386 2.9397 1.4411 1.6912 2.3301 0.6288
##  total = 20.17
##
## UBRE score: -0.2327168
```

```r
plot(model.gam$finalModel)
```




s(age,1.14)
3
2
1
0
−1
−2
−3
45
50
55
60
65
70
age
s(sbp,2.94)
3
2
1
0
−1
−2
−3
110
120
130
140
150
sbp


s(ldl,1.44)
3
2
1
0
−1
−2
−3
40
60
80
100
120
140
160
ldl
s(bmi,1.69)
3
2
1
0
−1
−2
−3
20
25
30
35
bmi




```r
coef(model.gam)
```

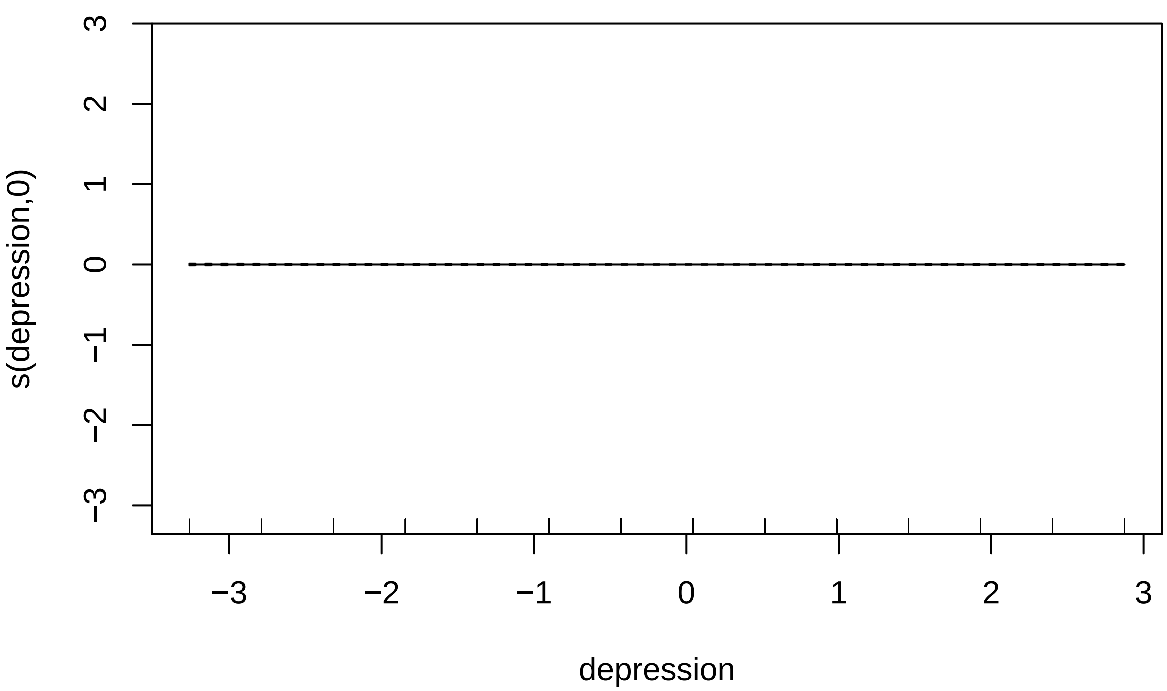
```
## NULL
```

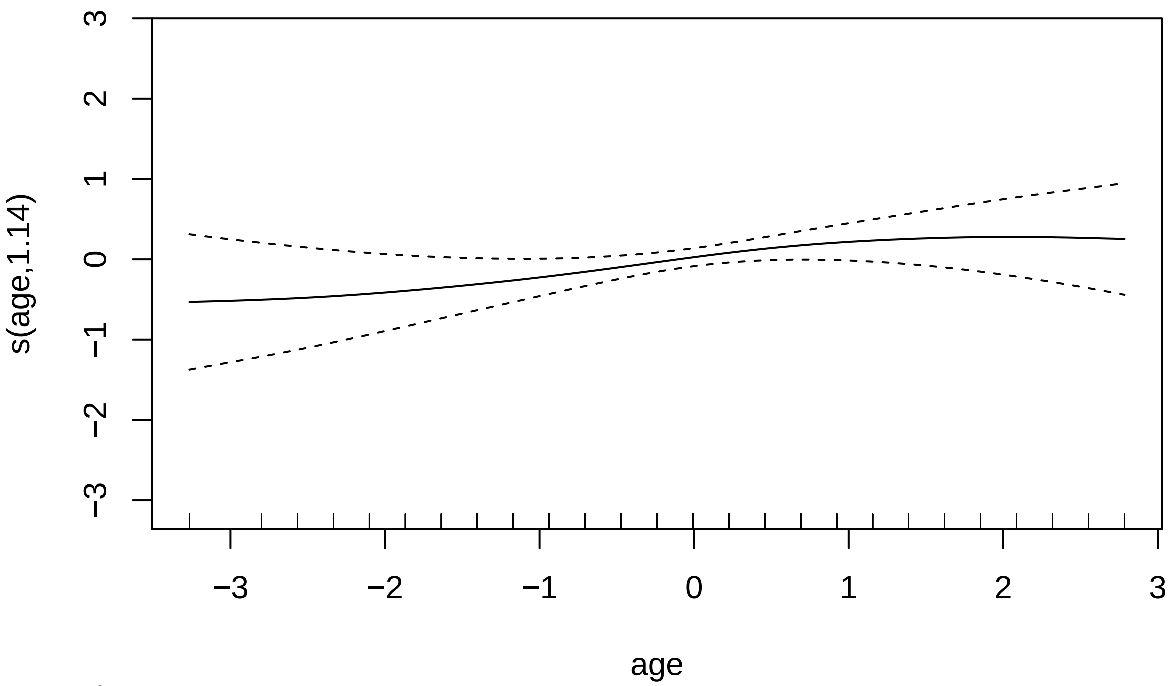
```r
# GAM scaled
set.seed(2)

scaled.model.gam = train(x = x.train.scaled,
                  y = y.train.scaled,
                   method = "gam",
                   metric = "ROC",
                   trControl = ctrl)
```

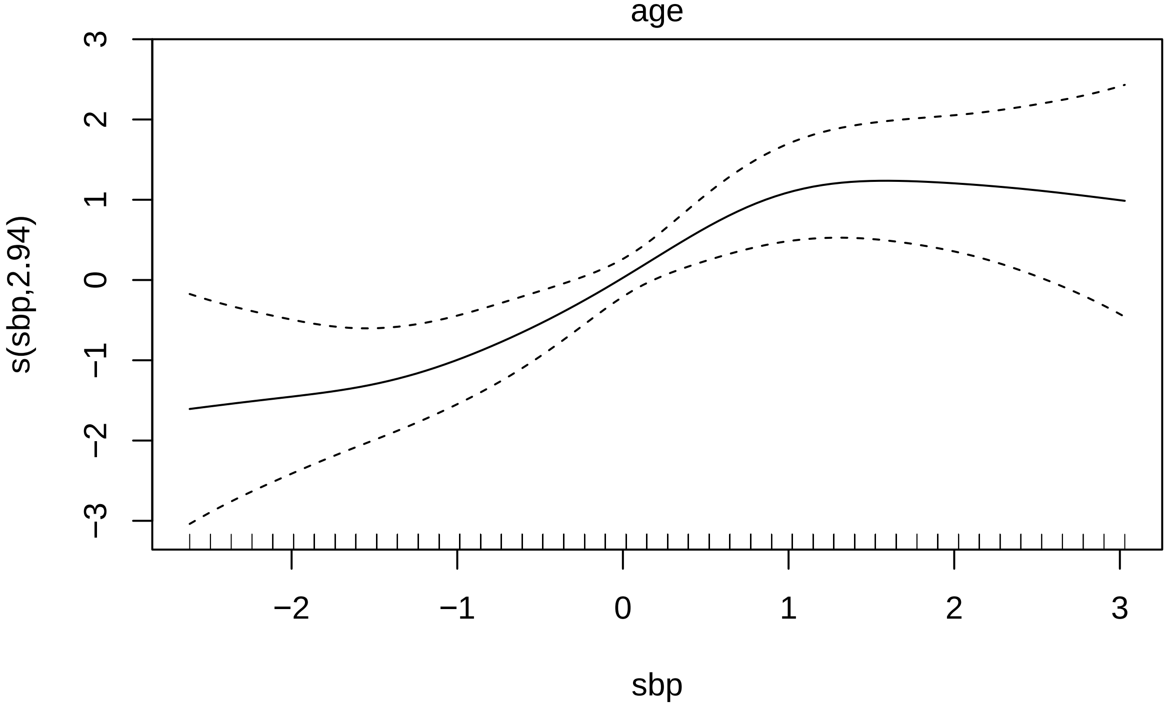
```r
scaled.model.gam$finalModel
```

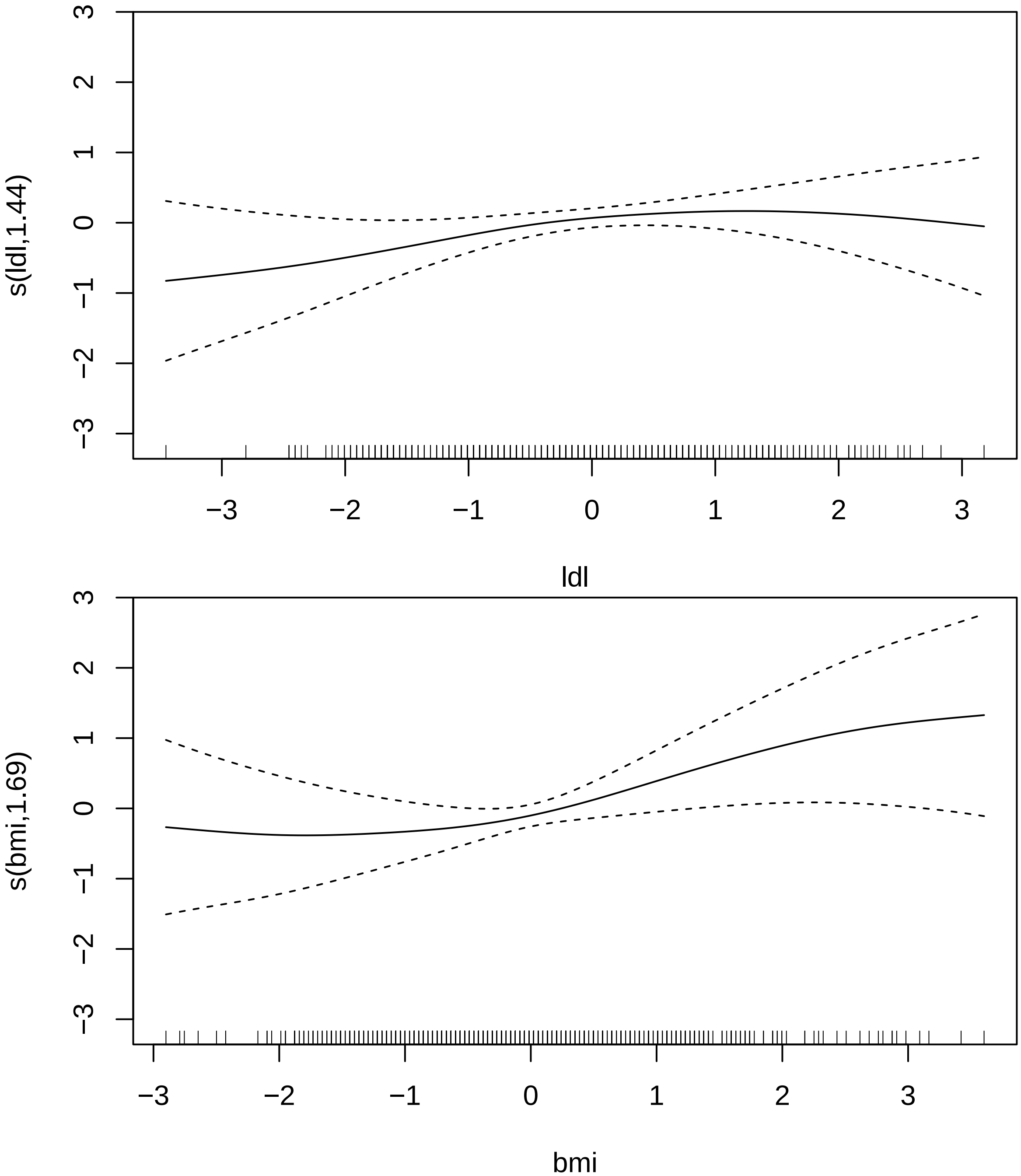
```
##
## Family: binomial
## Link function: logit
##
## Formula:
## .outcome ~ genderMale + raceAsian + raceBlack + raceHispanic +
##     smokingFormer_smoker + smokingCurrent_smoker + diabetesYes +
##     hypertensionYes + vaccineVaccinated + s(depression) + s(age) +
##     s(sbp) + s(ldl) + s(bmi) + s(height) + s(weight)
##
## Estimated degrees of freedom:
## 0.0003 1.1386 2.9397 1.4411 1.6912 2.3301 0.6288
##  total = 20.17
##
## UBRE score: -0.2327167
```

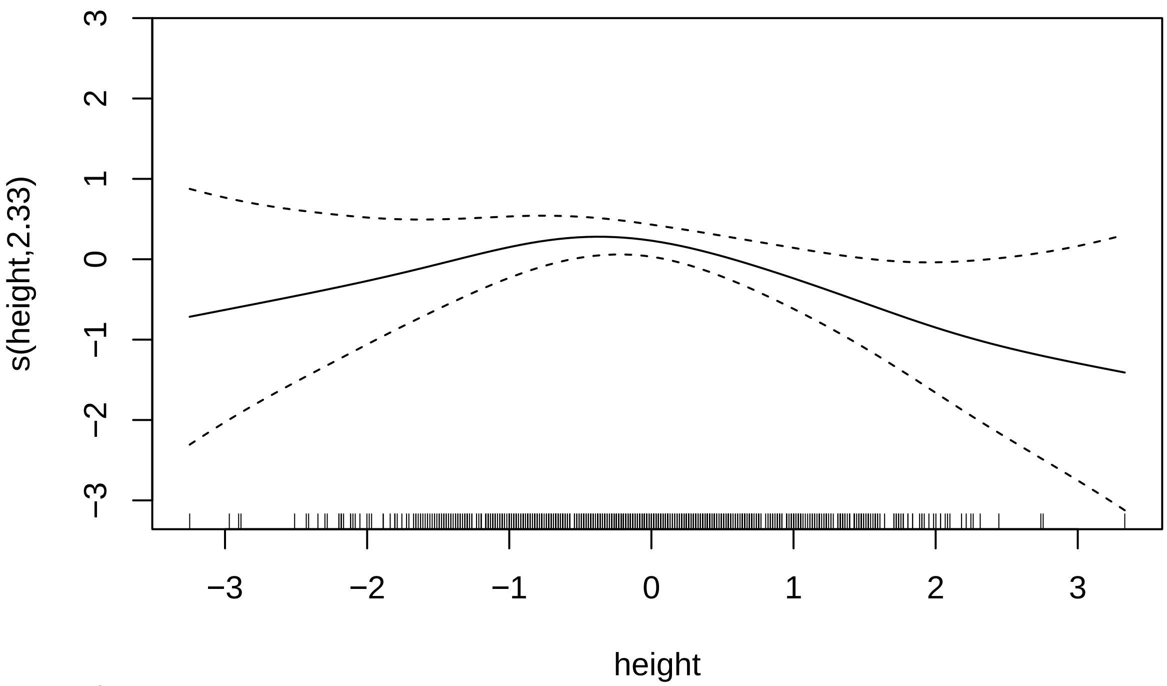
```r
plot(scaled.model.gam$finalModel)
```

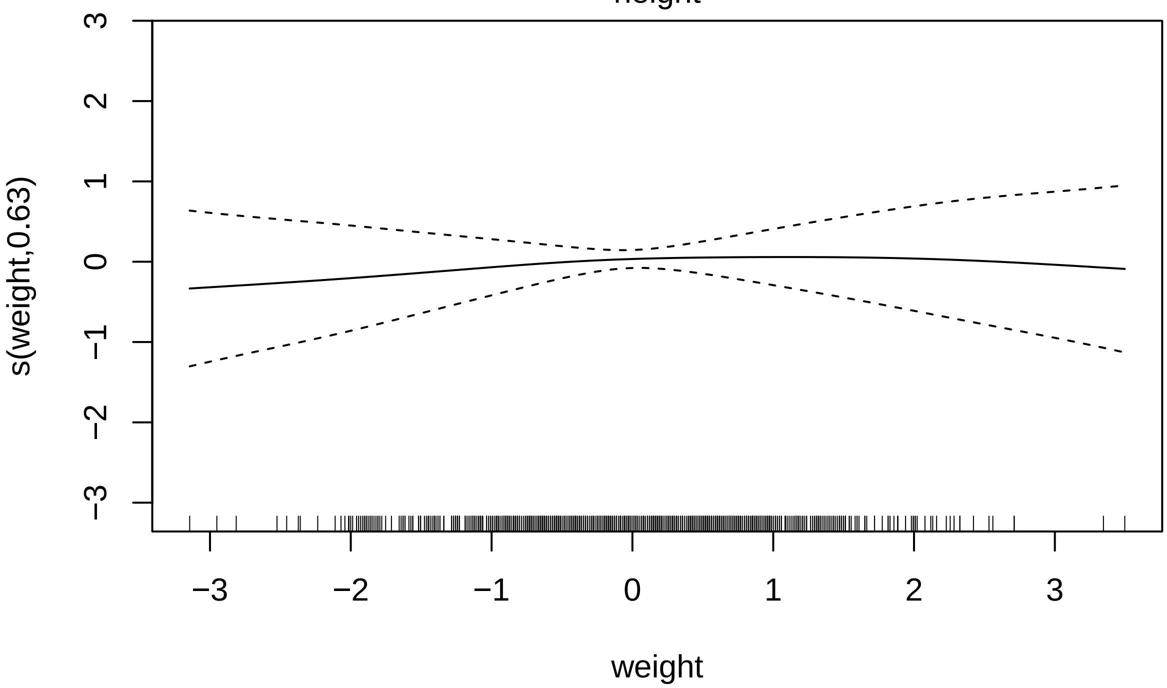



s(age,1.14)
3
2
1
0
−1
−2
−3
−3
−2
−1
0
1
2
3
age


s(sbp,2.94)
3
2
1
0
−1
−2
−3
−2
−1
0
1
2
3
sbp


s(ldl,1.44)
ldl
s(bmi,1.69)
bmi


s(height,2.33)
height


s(weight,0.63)
weight

LDA

```r
set.seed(2)
model.lda = train(x = x.train,
                  y = y.train,
                  method = "lda",
                  metric = "ROC",
                  trControl = ctrl)

model.lda$finalModel
```

```
## Call:
## lda(x, grouping = y)
##
## Prior probabilities of groups:
## Not_severe     Severe
##     0.6425     0.3575
##
## Group means:
##                 age genderMale  raceAsian raceBlack raceHispanic
## Not_severe 59.46887  0.5038911 0.06614786 0.2003891   0.09533074
## Severe     61.04545  0.4580420 0.05594406 0.1608392   0.10839161
##            smokingFormer_smoker smokingCurrent_smoker   height   weight
## Not_severe            0.3054475             0.1031128 170.1516 79.04125
## Severe                0.3181818             0.1118881 169.7269 80.10245
##                 bmi diabetesYes hypertensionYes      sbp      ldl
## Not_severe 27.35331   0.1498054       0.3540856 128.0272 108.4689
## Severe     27.86993   0.1538462       0.6503497 133.1224 113.4580
##            vaccineVaccinated depression
## Not_severe         0.8132296   6.912451
## Severe             0.1608392   6.902098
##
## Coefficients of linear discriminants:
##                                LD1
## age                    0.034385337
## genderMale            -0.236369596
## raceAsian             -0.126074229
## raceBlack              0.007697045
## raceHispanic          -0.114853112
## smokingFormer_smoker   0.027814955
## smokingCurrent_smoker  0.248324764
## height                 0.067561771
## weight                -0.077322293
## bmi                    0.301287096
## diabetesYes            0.144018177
## hypertensionYes        0.215120572
## sbp                    0.036100853
## ldl                    0.004588793
## vaccineVaccinated     -2.478676582
## depression            -0.010600382
```

```r
coef(model.lda)
```

```
## NULL
```

```r
# LDA scaled
set.seed(2)
scaled.model.lda = train(x = x.train.scaled,
                         y = y.train.scaled,
                         method = "lda",
                         metric = "ROC",
                         trControl = ctrl)

scaled.model.lda$finalModel
```

```
## Call:
## lda(x, grouping = y)
##
## Prior probabilities of groups:
## Not_severe     Severe
##     0.6425     0.3575
##
## Group means:
##                   age genderMale  raceAsian raceBlack raceHispanic
## Not_severe -0.1311579  0.5038911 0.06614786 0.2003891   0.09533074
## Severe      0.2357173  0.4580420 0.05594406 0.1608392   0.10839161
##            smokingFormer_smoker smokingCurrent_smoker      height      weight
## Not_severe            0.3054475             0.1031128  0.02490785 -0.05226974
## Severe                0.3181818             0.1118881 -0.04476446  0.09393932
##                    bmi diabetesYes hypertensionYes        sbp         ldl
## Not_severe -0.06749234   0.1498054       0.3540856 -0.2284977 -0.08893784
## Severe      0.12129743   0.1538462       0.6503497  0.4106568  0.15983934
##            vaccineVaccinated   depression
## Not_severe         0.8132296  0.001747066
## Severe             0.1608392 -0.003139832
##
## Coefficients of linear discriminants:
##                                LD1
## age                    0.147765068
## genderMale            -0.236369596
## raceAsian             -0.126074229
## raceBlack              0.007697045
## raceHispanic          -0.114853112
## smokingFormer_smoker   0.027814955
## smokingCurrent_smoker  0.248324764
## height                 0.411770187
## weight                -0.561214252
## bmi                    0.824471272
## diabetesYes            0.144018177
## hypertensionYes        0.215120572
## sbp                    0.287784736
## ldl                    0.092027205
## vaccineVaccinated     -2.478676582
## depression            -0.022458139
```

QDA

```r
set.seed(2)
model.qda = train(x = x.train,
                  y = y.train,
                  method = "qda",
                  metric = "ROC",
                  trControl = ctrl)
model.qda$finalModel
```

```
## Call:
## qda(x, grouping = y)
##
## Prior probabilities of groups:
## Not_severe     Severe
##     0.6425     0.3575
##
## Group means:
##                  age genderMale  raceAsian raceBlack raceHispanic
## Not_severe 59.46887  0.5038911 0.06614786 0.2003891   0.09533074
## Severe     61.04545  0.4580420 0.05594406 0.1608392   0.10839161
##            smokingFormer_smoker smokingCurrent_smoker   height   weight
## Not_severe            0.3054475             0.1031128 170.1516 79.04125
## Severe                0.3181818             0.1118881 169.7269 80.10245
##                  bmi diabetesYes hypertensionYes      sbp      ldl
## Not_severe 27.35331   0.1498054       0.3540856 128.0272 108.4689
## Severe     27.86993   0.1538462       0.6503497 133.1224 113.4580
##            vaccineVaccinated depression
## Not_severe         0.8132296   6.912451
## Severe             0.1608392   6.902098
```

```r
coef(model.qda)
```

```
## NULL
```

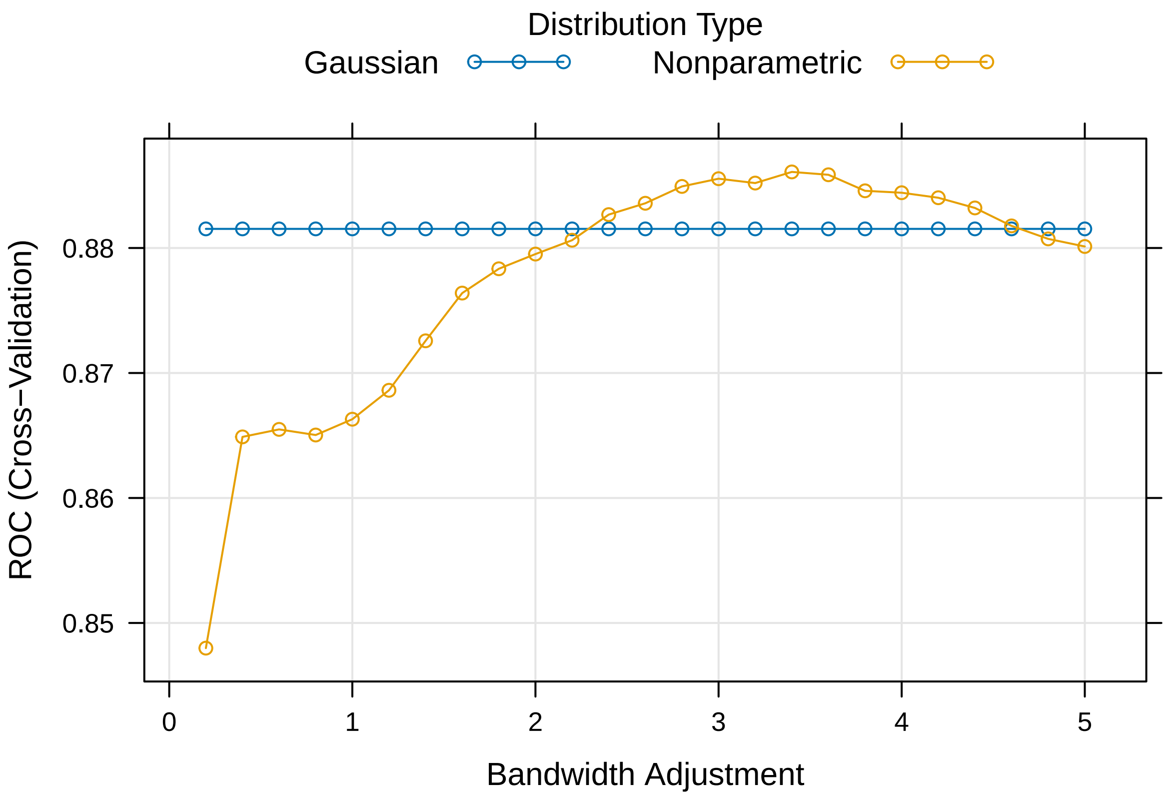
```r
# QDA scaled
set.seed(2)
scaled.model.qda = train(x = x.train.scaled,
                  y = y.train.scaled,
                  method = "qda",
                  metric = "ROC",
                  trControl = ctrl)
scaled.model.qda$finalModel
```

```
## Call:
## qda(x, grouping = y)
##
## Prior probabilities of groups:
## Not_severe     Severe
##     0.6425     0.3575
##
## Group means:
##                    age genderMale  raceAsian raceBlack raceHispanic
## Not_severe -0.1311579  0.5038911 0.06614786 0.2003891   0.09533074
## Severe      0.2357173  0.4580420 0.05594406 0.1608392   0.10839161
##            smokingFormer_smoker smokingCurrent_smoker      height      weight
```

```
## Not_severe            0.3054475             0.1031128  0.02490785 -0.05226974
## Severe                0.3181818             0.1118881 -0.04476446  0.09393932
##                    bmi diabetesYes hypertensionYes        sbp         ldl
## Not_severe -0.06749234   0.1498054       0.3540856 -0.2284977 -0.08893784
## Severe      0.12129743   0.1538462       0.6503497  0.4106568  0.15983934
##            vaccineVaccinated   depression
## Not_severe         0.8132296  0.001747066
## Severe             0.1608392 -0.003139832
```

Naive Bayes (NB)

```
nbGrid = expand.grid(usekernel = c(FALSE, TRUE),
                     fL = 1,
                     adjust = seq(.2, 5, by = .2))
set.seed(2)
model.nb = train(x = x.train,
                 y = y.train,
                 method = "nb",
                 tuneGrid = nbGrid,
                 metric = "ROC",
                 trControl = ctrl)
plot(model.nb)
```




```
model.nb$bestTune
```

```
##    fL usekernel adjust
## 42  1      TRUE    3.4
```

```
model.nb$finalModel
```

```
## $apriori
## grouping
## Not_severe     Severe
##     0.6425     0.3575
##
## $tables
## $tables$age
## $tables$age$Not_severe
##
```

```
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 3.276
##
##        x               y
##  Min.   :36.17   Min.   :3.240e-06
##  1st Qu.:47.34   1st Qu.:5.095e-04
##  Median :58.50   Median :8.818e-03
##  Mean   :58.50   Mean   :2.237e-02
##  3rd Qu.:69.66   3rd Qu.:4.340e-02
##  Max.   :80.83   Max.   :7.341e-02
##
## $tables$age$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 4.071
##
##        x               y
##  Min.   :35.79   Min.   :6.120e-06
##  1st Qu.:47.89   1st Qu.:4.830e-04
##  Median :60.00   Median :7.734e-03
##  Mean   :60.00   Mean   :2.063e-02
##  3rd Qu.:72.11   3rd Qu.:3.977e-02
##  Max.   :84.21   Max.   :6.887e-02
##
##
## $tables$genderMale
## $tables$genderMale$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.4394
##
##        x                 y
##  Min.   :-1.3183   Min.   :0.005056
##  1st Qu.:-0.4092   1st Qu.:0.065590
##  Median : 0.5000   Median :0.296017
##  Mean   : 0.5000   Mean   :0.274341
##  3rd Qu.: 1.4092   3rd Qu.:0.478500
##  Max.   : 2.3183   Max.   :0.501583
##
## $tables$genderMale$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.4928
##
##        x                 y
##  Min.   :-1.4783   Min.   :0.004163
```

```
##  1st Qu.:-0.4892   1st Qu.:0.054802
##  Median : 0.5000   Median :0.249263
##  Mean   : 0.5000   Mean   :0.252157
##  3rd Qu.: 1.4892   3rd Qu.:0.451335
##  Max.   : 2.4783   Max.   :0.503657
##
##
## $tables$raceAsian
## $tables$raceAsian$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.2184
##
##        x                  y
##  Min.   :-0.65534   Min.   :0.001356
##  1st Qu.:-0.07767   1st Qu.:0.058789
##  Median : 0.50000   Median :0.115559
##  Mean   : 0.50000   Mean   :0.431777
##  3rd Qu.: 1.07767   3rd Qu.:0.710201
##  Max.   : 1.65534   Max.   :1.704901
##
## $tables$raceAsian$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.2273
##
##        x                  y
##  Min.   :-0.68188   Min.   :0.001102
##  1st Qu.:-0.09094   1st Qu.:0.056832
##  Median : 0.50000   Median :0.096677
##  Mean   : 0.50000   Mean   :0.422084
##  3rd Qu.: 1.09094   3rd Qu.:0.707112
##  Max.   : 1.68188   Max.   :1.656538
##
##
## $tables$raceBlack
## $tables$raceBlack$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.3518
##
##        x                 y
##  Min.   :-1.0555   Min.   :0.002552
##  1st Qu.:-0.2777   1st Qu.:0.070360
##  Median : 0.5000   Median :0.244896
##  Mean   : 0.5000   Mean   :0.320704
##  3rd Qu.: 1.2777   3rd Qu.:0.517906
##  Max.   : 2.0555   Max.   :0.910590
```

```
##
## $tables$raceBlack$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3634
##
##        x                 y
##  Min.   :-1.090   Min.   :0.001981
##  1st Qu.:-0.295   1st Qu.:0.059468
##  Median : 0.500   Median :0.203735
##  Mean   : 0.500   Mean   :0.313730
##  3rd Qu.: 1.295   3rd Qu.:0.529073
##  Max.   : 2.090   Max.   :0.925319
##
##
## $tables$raceHispanic
## $tables$raceHispanic$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.2581
##
##        x                  y
##  Min.   :-0.7743   Min.   :0.001654
##  1st Qu.:-0.1372   1st Qu.:0.077879
##  Median : 0.5000   Median :0.143643
##  Mean   : 0.5000   Mean   :0.391457
##  3rd Qu.: 1.1372   3rd Qu.:0.651065
##  Max.   : 1.7743   Max.   :1.398214
##
## $tables$raceHispanic$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3075
##
##        x                  y
##  Min.   :-0.9224   Min.   :0.001579
##  1st Qu.:-0.2112   1st Qu.:0.062210
##  Median : 0.5000   Median :0.152821
##  Mean   : 0.5000   Mean   :0.350712
##  3rd Qu.: 1.2112   3rd Qu.:0.597910
##  Max.   : 1.9224   Max.   :1.157318
##
##
## $tables$smokingFormer_smoker
## $tables$smokingFormer_smoker$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
```

```
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.4048
##
##        x                 y
##  Min.   :-1.2145   Min.   :0.003377
##  1st Qu.:-0.3572   1st Qu.:0.067287
##  Median : 0.5000   Median :0.283394
##  Mean   : 0.5000   Mean   :0.290960
##  3rd Qu.: 1.3572   3rd Qu.:0.460554
##  Max.   : 2.2145   Max.   :0.699683
##
## $tables$smokingFormer_smoker$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.4607
##
##        x                y
##  Min.   :-1.382   Min.   :0.003094
##  1st Qu.:-0.441   1st Qu.:0.056076
##  Median : 0.500   Median :0.244153
##  Mean   : 0.500   Mean   :0.265065
##  3rd Qu.: 1.441   3rd Qu.:0.445425
##  Max.   : 2.382   Max.   :0.619975
##
##
## $tables$smokingCurrent_smoker
## $tables$smokingCurrent_smoker$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.2673
##
##        x                 y
##  Min.   :-0.8019   Min.   :0.001728
##  1st Qu.:-0.1509   1st Qu.:0.077124
##  Median : 0.5000   Median :0.151115
##  Mean   : 0.5000   Mean   :0.383183
##  3rd Qu.: 1.1509   3rd Qu.:0.637338
##  Max.   : 1.8019   Max.   :1.338499
##
## $tables$smokingCurrent_smoker$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3118
##
##        x                 y
##  Min.   :-0.9353   Min.   :0.001607
##  1st Qu.:-0.2177   1st Qu.:0.062239
##  Median : 0.5000   Median :0.157377
```

```
##  Mean   : 0.5000   Mean   :0.347555
##  3rd Qu.: 1.2177   3rd Qu.:0.592791
##  Max.   : 1.9353   Max.   :1.137104
##
##
## $tables$height
## $tables$height$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 5.478
##
##        x               y
##  Min.   :133.8   Min.   :2.960e-06
##  1st Qu.:151.1   1st Qu.:3.115e-04
##  Median :168.5   Median :5.361e-03
##  Mean   :168.5   Mean   :1.438e-02
##  3rd Qu.:185.9   3rd Qu.:2.806e-02
##  Max.   :203.2   Max.   :4.753e-02
##
## $tables$height$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 5.753
##
##        x               y
##  Min.   :135.0   Min.   :0.0000028
##  1st Qu.:153.2   1st Qu.:0.0002160
##  Median :171.3   Median :0.0041101
##  Mean   :171.3   Mean   :0.0137756
##  3rd Qu.:189.4   3rd Qu.:0.0262831
##  Max.   :207.6   Max.   :0.0488791
##
##
## $tables$weight
## $tables$weight$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 6.437
##
##        x                y
##  Min.   : 37.29   Min.   :1.610e-06
##  1st Qu.: 58.99   1st Qu.:1.611e-04
##  Median : 80.70   Median :3.327e-03
##  Mean   : 80.70   Mean   :1.151e-02
##  3rd Qu.:102.41   3rd Qu.:2.221e-02
##  Max.   :124.11   Max.   :4.050e-02
##
## $tables$weight$Severe
```

```
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 6.926
##
##        x                y
##  Min.   : 38.22   Min.   :2.520e-06
##  1st Qu.: 59.79   1st Qu.:2.040e-04
##  Median : 81.35   Median :3.727e-03
##  Mean   : 81.35   Mean   :1.158e-02
##  3rd Qu.:102.91   3rd Qu.:2.215e-02
##  Max.   :124.48   Max.   :4.044e-02
##
##
## $tables$bmi
## $tables$bmi$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 2.162
##
##        x               y
##  Min.   :13.11   Min.   :5.670e-06
##  1st Qu.:20.81   1st Qu.:6.282e-04
##  Median :28.50   Median :9.248e-03
##  Mean   :28.50   Mean   :3.246e-02
##  3rd Qu.:36.19   3rd Qu.:6.107e-02
##  Max.   :43.89   Max.   :1.176e-01
##
## $tables$bmi$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 2.579
##
##        x               y
##  Min.   :12.16   Min.   :1.011e-05
##  1st Qu.:20.28   1st Qu.:7.340e-04
##  Median :28.40   Median :1.048e-02
##  Mean   :28.40   Mean   :3.076e-02
##  3rd Qu.:36.52   3rd Qu.:5.791e-02
##  Max.   :44.64   Max.   :1.075e-01
##
##
## $tables$diabetesYes
## $tables$diabetesYes$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.3137
```

```
##
##        x                 y
##  Min.   :-0.9410   Min.   :0.002137
##  1st Qu.:-0.2205   1st Qu.:0.073069
##  Median : 0.5000   Median :0.198557
##  Mean   : 0.5000   Mean   :0.346180
##  3rd Qu.: 1.2205   3rd Qu.:0.570623
##  Max.   : 1.9410   Max.   :1.082367
##
## $tables$diabetesYes$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3568
##
##        x                 y
##  Min.   :-1.0705   Min.   :0.00193
##  1st Qu.:-0.2853   1st Qu.:0.06001
##  Median : 0.5000   Median :0.19888
##  Mean   : 0.5000   Mean   :0.31763
##  3rd Qu.: 1.2853   3rd Qu.:0.53567
##  Max.   : 2.0705   Max.   :0.94928
##
##
## $tables$hypertensionYes
## $tables$hypertensionYes$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.4203
##
##        x                 y
##  Min.   :-1.2610   Min.   :0.003773
##  1st Qu.:-0.3805   1st Qu.:0.066342
##  Median : 0.5000   Median :0.289537
##  Mean   : 0.5000   Mean   :0.283276
##  3rd Qu.: 1.3805   3rd Qu.:0.450622
##  Max.   : 2.2610   Max.   :0.635073
##
## $tables$hypertensionYes$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.4716
##
##        x                 y
##  Min.   :-1.4149   Min.   :0.003319
##  1st Qu.:-0.4574   1st Qu.:0.055554
##  Median : 0.5000   Median :0.246724
##  Mean   : 0.5000   Mean   :0.260511
##  3rd Qu.: 1.4574   3rd Qu.:0.441410
```

```
##  Max.   : 2.4149   Max.   :0.586568
##
##
## $tables$sbp
## $tables$sbp$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 5.897
##
##        x                y
##  Min.   : 91.31   Min.   :3.180e-06
##  1st Qu.:111.40   1st Qu.:3.285e-04
##  Median :131.50   Median :4.558e-03
##  Mean   :131.50   Mean   :1.243e-02
##  3rd Qu.:151.60   3rd Qu.:2.358e-02
##  Max.   :171.69   Max.   :4.231e-02
##
## $tables$sbp$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 7.184
##
##        x                y
##  Min.   : 89.45   Min.   :5.770e-06
##  1st Qu.:110.72   1st Qu.:3.990e-04
##  Median :132.00   Median :4.851e-03
##  Mean   :132.00   Mean   :1.174e-02
##  3rd Qu.:153.28   3rd Qu.:2.218e-02
##  Max.   :174.55   Max.   :3.895e-02
##
##
## $tables$ldl
## $tables$ldl$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 18.04
##
##        x                y
##  Min.   :-13.13   Min.   :5.520e-07
##  1st Qu.: 45.44   1st Qu.:7.124e-05
##  Median :104.00   Median :1.469e-03
##  Mean   :104.00   Mean   :4.265e-03
##  3rd Qu.:162.56   3rd Qu.:8.267e-03
##  Max.   :221.13   Max.   :1.447e-02
##
## $tables$ldl$Severe
##
## Call:
```

```
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 18.42
##
##        x                 y
##  Min.   : -1.259   Min.   :1.024e-06
##  1st Qu.: 56.370   1st Qu.:7.066e-05
##  Median :114.000   Median :1.353e-03
##  Mean   :114.000   Mean   :4.334e-03
##  3rd Qu.:171.630   3rd Qu.:8.271e-03
##  Max.   :229.259   Max.   :1.523e-02
##
##
## $tables$vaccineVaccinated
## $tables$vaccineVaccinated$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.3425
##
##        x                 y
##  Min.   :-1.0276   Min.   :0.002442
##  1st Qu.:-0.2638   1st Qu.:0.070760
##  Median : 0.5000   Median :0.234795
##  Mean   : 0.5000   Mean   :0.326552
##  3rd Qu.: 1.2638   3rd Qu.:0.530281
##  Max.   : 2.0276   Max.   :0.950099
##
## $tables$vaccineVaccinated$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3634
##
##        x                y
##  Min.   :-1.090   Min.   :0.001981
##  1st Qu.:-0.295   1st Qu.:0.059468
##  Median : 0.500   Median :0.203735
##  Mean   : 0.500   Mean   :0.313730
##  3rd Qu.: 1.295   3rd Qu.:0.529073
##  Max.   : 2.090   Max.   :0.925319
##
##
## $tables$depression
## $tables$depression$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 1.874
##
##        x                 y
```

```
##  Min.   :-5.6225   Min.   :5.960e-06
##  1st Qu.: 0.4388   1st Qu.:8.031e-04
##  Median : 6.5000   Median :1.431e-02
##  Mean   : 6.5000   Mean   :4.120e-02
##  3rd Qu.:12.5612   3rd Qu.:7.939e-02
##  Max.   :18.6225   Max.   :1.401e-01
##
## $tables$depression$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 1.474
##
##        x                y
##  Min.   :-3.421   Min.   :1.343e-05
##  1st Qu.: 1.790   1st Qu.:1.617e-03
##  Median : 7.000   Median :1.976e-02
##  Mean   : 7.000   Mean   :4.793e-02
##  3rd Qu.:12.210   3rd Qu.:8.962e-02
##  Max.   :17.421   Max.   :1.615e-01
##
##
##
## $levels
## [1] "Not_severe" "Severe"
##
## $call
## NaiveBayes.default(x = x, grouping = y, usekernel = TRUE, fL = param$fL,
##     adjust = param$adjust)
##
## $x
##      age genderMale raceAsian raceBlack raceHispanic smokingFormer_smoker
## X1    59          0         0         0            0                    1
## X2    54          1         0         0            0                    1
## X3    55          1         0         1            0                    1
## X4    59          0         0         0            0                    0
## X6    64          1         0         0            0                    0
## X9    67          0         0         0            0                    0
## X10   66          1         0         0            0                    0
## X11   50          1         0         0            1                    1
## X12   67          0         0         0            0                    0
## X13   64          1         0         0            0                    0
## X14   63          0         0         0            0                    0
## X15   53          0         0         0            1                    0
## X17   61          1         0         0            0                    0
## X18   62          0         0         0            0                    0
## X19   58          0         0         0            1                    1
## X21   58          1         0         0            0                    0
## X22   63          0         0         1            0                    0
## X24   55          0         0         0            0                    0
## X25   61          0         0         0            0                    1
## X26   64          0         0         1            0                    0
## X27   63          0         1         0            0                    1
```

```
## X28   59        0         0         0          0                 0
## X29   57        1         0         0          0                 1
## X30   61        0         0         1          0                 0
## X31   66        0         0         1          0                 0
## X33   61        1         1         0          0                 0
## X36   56        1         0         1          0                 0
## X39   63        1         0         1          0                 0
## X40   64        0         0         0          0                 0
## X41   65        1         0         0          0                 0
## X42   55        0         0         1          0                 1
## X45   60        1         0         1          0                 0
## X46   62        1         0         0          0                 1
## X47   55        1         0         0          0                 0
## X49   66        0         0         0          0                 0
## X54   60        1         0         1          0                 0
## X56   61        1         0         0          0                 0
## X57   62        1         1         0          0                 1
## X59   62        1         0         0          0                 1
## X60   55        1         0         0          0                 0
## X61   46        1         0         0          0                 0
## X62   63        1         0         0          0                 1
## X64   66        0         0         0          0                 0
## X65   60        1         1         0          0                 0
## X67   58        0         0         0          1                 1
## X69   65        0         0         0          0                 1
## X70   61        0         0         0          0                 1
## X72   57        0         1         0          0                 0
## X73   58        0         0         0          1                 0
## X74   55        0         0         0          0                 0
## X75   59        0         0         0          0                 1
## X77   65        0         0         0          1                 1
## X78   66        1         0         0          0                 1
## X79   64        0         0         1          0                 0
## X82   59        1         0         0          0                 0
## X85   61        0         0         0          0                 0
## X87   56        1         1         0          0                 0
## X88   49        0         0         0          0                 0
## X89   55        1         0         0          0                 0
## X90   57        0         0         0          0                 0
## X91   65        1         0         1          0                 0
## X92   60        0         0         0          0                 0
## X93   64        0         0         0          0                 0
## X94   60        1         1         0          0                 0
## X95   57        0         0         0          0                 0
## X96   51        0         0         0          0                 0
## X97   60        0         0         0          0                 1
## X98   66        0         0         0          0                 1
## X99   64        0         1         0          0                 1
## X100  64        0         0         0          0                 1
## X101  57        0         0         0          0                 0
## X102  59        0         0         0          0                 1
## X103  61        1         0         1          0                 0
## X104  51        1         0         0          0                 0
## X105  62        0         0         1          0                 0
```

```
## X106  57          1        0        0          0                    0
## X108  60          0        1        0          0                    0
## X109  51          0        0        0          0                    0
## X110  58          0        0        0          0                    1
## X112  62          1        0        1          0                    1
## X113  53          0        0        0          0                    0
## X114  57          1        0        0          0                    0
## X115  56          1        1        0          0                    0
## X116  62          1        0        0          0                    1
## X117  64          1        0        0          1                    0
## X119  62          1        0        0          0                    0
## X120  60          1        0        1          0                    0
## X121  59          0        0        1          0                    0
## X122  58          0        0        0          0                    1
## X123  54          1        0        0          0                    0
## X126  63          1        0        0          0                    0
## X127  54          1        0        0          0                    0
## X128  61          0        0        0          0                    1
## X129  70          1        0        0          0                    0
## X130  60          0        0        0          0                    0
## X131  56          0        0        0          1                    1
## X132  66          1        0        0          1                    0
## X133  57          0        1        0          0                    1
## X135  66          0        0        0          1                    1
## X136  64          1        1        0          0                    0
## X137  54          1        0        0          1                    0
## X138  67          1        0        0          0                    0
## X139  62          0        0        0          0                    1
## X142  57          0        0        0          1                    0
## X144  67          0        1        0          0                    0
## X145  59          0        0        0          0                    1
## X146  53          1        0        1          0                    0
## X147  64          1        0        0          0                    1
## X148  61          0        0        0          1                    0
## X149  61          0        0        0          1                    0
## X150  58          0        0        1          0                    0
## X152  55          0        0        0          0                    0
## X154  58          0        0        0          0                    1
## X155  63          1        0        0          0                    0
## X156  71          0        0        0          0                    0
## X157  67          1        0        1          0                    0
## X159  60          0        0        0          1                    0
## X160  57          0        0        0          1                    0
## X161  59          1        0        0          0                    0
## X162  57          1        0        0          0                    0
## X163  61          0        0        1          0                    0
## X164  64          1        0        0          1                    0
## X165  62          0        0        0          0                    0
## X166  63          1        0        0          0                    1
## X167  54          0        0        1          0                    1
## X168  59          1        0        0          0                    1
## X169  56          0        0        0          0                    0
## X170  62          1        0        0          0                    0
## X171  56          1        0        0          0                    0
```

```
## X172  62          0         0         1            0                    0
## X173  57          0         0         0            0                    0
## X174  58          1         0         1            0                    0
## X175  64          0         0         0            0                    0
## X177  58          0         0         0            0                    0
## X179  57          1         0         0            1                    1
## X180  63          1         0         0            0                    1
## X181  63          1         0         0            0                    0
## X182  53          1         0         0            0                    1
## X183  59          1         0         1            0                    0
## X184  61          1         0         0            0                    0
## X185  62          0         0         0            0                    0
## X186  54          1         0         1            0                    0
## X187  65          0         0         0            0                    0
## X188  49          1         0         1            0                    1
## X189  61          0         0         0            0                    0
## X190  64          0         1         0            0                    0
## X191  63          0         0         0            0                    0
## X192  65          0         0         0            0                    1
## X193  50          1         0         1            0                    0
## X194  72          0         0         0            0                    0
## X195  56          0         0         0            0                    0
## X196  57          0         0         0            0                    1
## X198  62          0         0         0            0                    0
## X200  60          0         0         0            0                    0
## X201  59          1         0         0            0                    1
## X202  52          1         0         0            0                    0
## X204  59          1         0         0            0                    0
## X205  59          0         0         0            0                    0
## X206  57          1         0         0            0                    0
## X207  69          0         0         0            0                    0
## X209  65          0         0         0            1                    0
## X211  59          1         0         1            0                    0
## X212  67          1         1         0            0                    1
## X213  64          1         0         0            0                    1
## X214  60          1         0         1            0                    0
## X215  57          1         0         0            1                    0
## X216  60          0         0         1            0                    0
## X217  59          0         0         1            0                    1
## X218  64          0         0         0            0                    0
## X219  61          0         0         0            0                    0
## X220  60          0         0         0            0                    0
## X221  63          0         0         0            0                    0
## X222  59          1         0         0            1                    1
## X223  60          0         0         0            0                    0
## X224  67          0         0         0            1                    1
## X226  67          1         0         1            0                    0
## X227  66          1         0         1            0                    0
## X228  59          0         0         1            0                    0
## X229  58          1         0         0            0                    0
## X230  60          1         0         0            0                    1
## X231  58          1         0         0            0                    0
## X233  62          1         0         1            0                    1
## X234  55          1         0         0            0                    0
```

```
## X235   58           1         0         0            0                    0
## X236   62           0         1         0            0                    0
## X237   60           1         0         0            0                    0
## X238   67           0         0         0            0                    0
## X239   61           0         0         0            0                    0
## X240   56           0         0         0            0                    0
## X241   52           1         0         0            0                    0
## X244   65           1         0         0            0                    0
## X245   63           1         0         0            0                    0
## X246   56           1         0         0            1                    1
## X247   53           0         0         0            0                    0
## X248   67           0         0         0            0                    0
## X249   61           0         0         0            1                    0
## X251   59           1         0         0            0                    0
## X252   60           0         0         0            1                    0
## X254   56           0         0         0            0                    0
## X255   55           1         0         0            0                    0
## X256   54           0         0         1            0                    0
## X257   63           0         0         0            1                    1
## X258   61           0         0         1            0                    1
## X259   61           0         0         0            0                    0
## X260   56           1         0         0            1                    0
## X261   63           1         0         0            0                    1
## X262   63           0         0         0            1                    0
## X264   58           0         0         0            0                    0
## X265   66           1         0         0            0                    0
## X266   62           1         1         0            0                    0
## X267   64           0         0         0            1                    0
## X268   55           1         0         0            0                    0
## X269   60           1         0         0            0                    1
## X270   52           1         0         1            0                    1
## X273   61           1         1         0            0                    0
## X274   64           0         0         0            0                    0
## X275   53           1         0         0            0                    0
## X276   63           0         0         1            0                    0
## X277   51           1         0         0            0                    0
## X278   56           0         0         0            0                    0
## X279   58           0         0         1            0                    1
## X280   61           0         0         1            0                    0
## X282   59           1         0         0            0                    0
## X283   54           1         0         0            0                    1
## X284   64           1         0         0            0                    0
## X286   61           1         0         0            0                    0
## X289   60           1         0         0            0                    0
## X290   56           0         0         0            0                    1
## X292   66           0         0         1            0                    0
## X293   61           1         0         0            0                    1
## X295   58           1         0         0            0                    1
## X296   56           0         0         0            1                    0
## X298   60           0         0         0            0                    0
## X299   59           0         0         0            0                    0
## X300   61           0         0         1            0                    0
## X301   62           1         0         0            1                    0
## X302   58           0         0         0            0                    0
```

```
## X303   64        0       1       0       0           0
## X305   59        1       0       1       0           1
## X306   61        0       0       0       1           0
## X307   66        0       0       0       0           0
## X311   70        0       0       0       0           0
## X312   59        0       0       0       0           0
## X313   69        1       0       0       0           0
## X314   60        0       0       1       0           0
## X315   65        1       0       0       0           0
## X316   61        0       0       0       1           1
## X317   64        1       0       0       0           0
## X318   55        0       0       0       0           0
## X319   54        1       0       0       0           1
## X321   55        1       0       0       0           0
## X322   60        0       0       1       0           0
## X326   59        0       0       1       0           0
## X327   64        1       0       0       0           0
## X328   57        0       0       0       0           1
## X329   61        0       0       0       1           0
## X330   55        0       0       0       0           0
## X331   57        0       0       0       0           1
## X332   61        1       1       0       0           1
## X333   60        1       0       1       0           0
## X334   62        0       0       0       0           0
## X335   61        0       0       0       0           1
## X336   60        0       0       0       0           1
## X339   60        1       0       0       1           0
## X340   57        1       0       0       0           0
## X341   59        1       0       0       0           0
## X342   56        1       0       0       0           0
## X345   61        1       0       0       0           0
## X347   65        1       1       0       0           0
## X349   60        0       0       0       0           0
## X351   57        0       0       0       0           1
## X353   69        0       0       0       0           0
## X354   56        1       0       0       0           1
## X355   60        0       0       0       0           1
## X356   62        1       0       0       0           0
## X359   60        0       0       0       0           0
## X360   68        1       0       0       0           1
## X361   64        0       0       0       0           0
## X363   57        0       0       0       0           0
## X365   53        1       0       0       0           0
## X366   57        0       0       0       0           0
## X367   60        0       0       0       0           1
## X369   56        1       0       0       0           1
## X371   66        1       0       1       0           0
## X372   59        0       0       0       0           1
## X373   65        0       0       0       0           0
## X374   58        1       0       0       0           1
## X376   59        1       0       0       0           0
## X377   54        0       0       0       0           0
## X378   66        1       0       0       0           0
## X379   52        1       0       0       0           1
```

```
## X380   59         0         0         0         0                 1
## X382   57         0         0         0         0                 0
## X383   56         0         0         0         0                 1
## X385   60         0         0         1         0                 0
## X386   48         1         1         0         0                 0
## X387   60         0         0         0         0                 0
## X388   66         1         0         0         0                 0
## X389   59         1         0         0         0                 0
## X391   52         1         0         0         0                 0
## X392   62         1         0         0         0                 1
## X393   57         0         0         0         0                 1
## X394   65         0         0         0         0                 0
## X395   62         0         0         0         0                 0
## X396   57         0         0         0         1                 0
## X397   59         0         0         1         0                 1
## X398   63         1         0         0         0                 0
## X399   61         0         0         1         0                 1
## X401   62         1         0         0         1                 1
## X402   57         1         0         0         0                 0
## X405   61         1         0         0         0                 0
## X406   62         1         0         0         1                 0
## X407   56         1         0         0         1                 1
## X408   55         0         0         0         0                 1
## X410   67         1         0         0         0                 1
## X411   62         1         0         0         1                 0
## X412   64         1         0         1         0                 0
## X413   61         0         0         0         0                 0
## X414   58         0         0         0         1                 0
## X415   64         0         0         0         0                 0
## X416   61         1         0         0         0                 1
## X417   64         1         0         0         0                 0
## X418   59         0         0         0         0                 0
## X419   60         1         0         0         0                 1
## X420   52         1         0         0         0                 0
## X421   66         1         0         0         0                 0
## X422   59         0         1         0         0                 0
## X423   60         0         0         0         1                 0
## X424   63         1         0         1         0                 0
## X425   55         1         0         1         0                 0
## X426   70         0         0         1         0                 0
## X427   60         0         0         1         0                 1
## X431   60         1         0         1         0                 0
## X432   56         1         0         0         0                 0
## X434   55         0         0         0         0                 1
## X435   58         0         0         0         0                 0
## X437   69         0         1         0         0                 0
## X438   55         1         0         0         0                 0
## X439   69         1         0         0         1                 0
## X440   60         0         0         0         0                 1
## X441   57         1         0         0         0                 1
## X442   67         0         0         0         0                 1
## X443   57         1         0         0         0                 0
## X444   65         1         0         0         1                 0
## X445   57         0         0         0         1                 1
```

```
## X448   66           1          0          0            0                   1
## X450   63           0          0          0            1                   0
## X451   61           1          0          1            0                   0
## X453   56           0          0          0            0                   1
## X454   62           0          0          1            0                   1
## X455   60           1          0          0            1                   0
## X456   60           1          0          0            0                   1
## X457   61           0          0          0            0                   1
## X458   56           1          0          0            0                   0
## X459   66           1          0          0            0                   1
## X460   69           1          1          0            0                   0
## X461   57           1          0          1            0                   1
## X464   64           0          0          0            0                   0
## X465   68           0          0          0            1                   0
## X466   59           1          0          0            0                   0
## X468   66           1          0          1            0                   1
## X469   59           0          0          0            1                   0
## X470   61           0          0          0            0                   1
## X472   61           0          0          1            0                   1
## X473   62           0          0          0            0                   0
## X474   63           0          0          0            0                   0
## X475   62           1          0          0            0                   0
## X476   53           1          0          0            1                   0
## X478   62           0          0          0            0                   0
## X480   67           1          0          0            0                   1
## X481   64           0          0          0            0                   0
## X482   58           1          0          0            0                   1
## X483   64           1          1          0            0                   0
## X484   58           1          0          1            0                   0
## X486   70           0          0          0            0                   0
## X487   66           1          0          1            0                   1
## X488   56           0          0          0            0                   1
## X489   70           1          0          0            0                   0
## X490   63           1          0          0            0                   0
## X491   65           0          0          0            0                   0
## X492   57           1          0          0            0                   1
## X493   62           1          0          0            0                   0
## X494   66           1          0          0            0                   1
## X495   62           1          1          0            0                   1
## X496   63           0          0          0            0                   0
## X497   62           0          0          1            0                   0
## X498   57           1          0          0            0                   0
## X499   57           0          0          0            0                   0
## X500   60           1          0          1            0                   0
## X501   62           1          0          1            0                   0
## X502   66           1          0          0            0                   0
## X503   59           0          0          0            0                   0
## X504   61           0          0          0            0                   0
## X507   59           0          0          0            0                   0
## X509   56           1          0          0            0                   1
## X511   58           1          0          0            0                   0
## X512   68           0          0          0            0                   0
## X513   60           0          0          0            0                   0
## X514   57           0          0          0            0                   0
```

```
## X515  57          0         0         0            0                    0
## X516  60          1         0         0            0                    0
## X518  58          1         0         0            0                    0
## X520  62          1         0         0            0                    0
## X521  58          1         0         0            0                    1
## X522  61          0         0         0            0                    1
## X523  59          0         0         0            0                    1
## X524  68          1         0         0            0                    0
## X525  59          0         0         0            0                    0
## X527  58          0         0         0            0                    0
## X528  62          1         0         1            0                    0
## X529  62          0         1         0            0                    1
## X530  62          1         0         0            0                    0
## X533  64          1         0         0            0                    1
## X535  61          1         0         0            0                    1
## X536  59          1         0         0            0                    1
## X539  58          0         0         0            0                    1
## X540  63          1         0         1            0                    0
## X541  69          0         0         0            1                    0
## X542  65          1         0         0            0                    1
## X543  64          0         0         0            0                    0
## X545  63          0         0         0            0                    0
## X546  63          0         1         0            0                    0
## X547  67          0         0         0            0                    0
## X548  66          1         0         0            0                    1
## X549  54          1         0         0            0                    0
## X550  54          1         0         1            0                    1
## X551  54          1         0         1            0                    1
## X552  62          0         0         0            0                    1
## X553  66          0         0         0            0                    0
## X554  62          1         0         0            1                    0
## X556  61          0         0         0            0                    1
## X557  58          0         0         0            0                    1
## X558  57          1         0         0            0                    0
## X559  65          1         0         0            0                    0
## X560  57          1         0         0            1                    1
## X561  62          1         0         0            0                    1
## X562  63          0         0         0            0                    1
## X563  58          1         0         0            0                    0
## X564  58          0         0         1            0                    0
## X565  62          1         0         0            0                    0
## X566  53          0         0         0            0                    0
## X567  54          0         0         0            0                    0
## X568  68          1         0         0            0                    0
## X569  62          1         0         1            0                    1
## X571  63          1         0         0            0                    1
## X573  65          1         0         0            1                    0
## X574  59          1         0         0            1                    0
## X575  52          0         0         1            0                    0
## X576  59          1         0         0            0                    0
## X577  61          1         0         0            0                    0
## X579  60          0         0         1            0                    1
## X580  54          0         0         0            1                    1
## X582  62          0         0         0            0                    1
```

```
## X584  64          1         0         0           0                  0
## X587  57          0         0         0           0                  0
## X588  63          0         0         0           0                  1
## X589  56          1         0         0           0                  0
## X591  54          0         0         0           0                  0
## X592  60          0         0         1           0                  1
## X593  56          1         0         0           0                  0
## X594  65          0         0         0           0                  0
## X597  56          0         0         0           1                  0
## X598  56          0         0         0           0                  0
## X600  61          0         0         0           1                  1
## X601  65          0         0         0           0                  0
## X602  58          0         0         0           0                  1
## X603  63          0         0         0           0                  1
## X604  52          0         1         0           0                  1
## X605  64          1         0         0           0                  1
## X606  62          0         0         0           1                  1
## X609  63          1         0         0           0                  0
## X610  58          1         0         0           0                  0
## X611  52          1         0         0           0                  1
## X613  63          1         0         1           0                  0
## X614  58          0         0         0           0                  1
## X615  53          1         1         0           0                  0
## X617  57          1         0         0           1                  1
## X618  59          1         1         0           0                  0
## X619  57          0         0         0           0                  1
## X620  55          1         0         0           0                  0
## X623  59          0         0         0           0                  0
## X624  61          0         0         0           0                  0
## X625  56          0         0         0           0                  0
## X626  58          0         0         0           0                  0
## X628  70          1         0         1           0                  0
## X629  59          0         0         0           0                  0
## X630  61          0         0         0           0                  0
## X631  64          1         0         0           0                  1
## X632  59          0         0         0           0                  1
## X633  58          1         0         0           0                  0
## X634  64          1         0         0           0                  0
## X635  55          1         0         0           0                  0
## X636  57          1         0         1           0                  1
## X637  61          1         0         0           0                  1
## X638  56          0         0         1           0                  0
## X640  60          0         0         0           0                  0
## X641  58          0         0         0           0                  0
## X642  60          1         0         1           0                  0
## X643  50          1         0         0           1                  1
## X644  55          0         0         0           0                  0
## X645  54          1         0         0           1                  1
## X646  58          1         0         0           0                  0
## X648  55          1         0         0           0                  0
## X649  57          1         0         0           0                  1
## X650  63          0         0         1           0                  0
## X652  58          0         0         0           0                  0
## X654  64          0         0         0           0                  1
```

```
## X655  68        1        0        0         0               1
## X656  60        0        0        0         0               0
## X657  56        1        0        0         0               0
## X658  61        1        0        1         0               1
## X659  59        0        1        0         0               0
## X660  66        0        0        1         0               0
## X661  64        1        0        0         0               1
## X663  58        0        1        0         0               0
## X664  61        1        0        0         0               0
## X665  61        0        0        0         0               1
## X666  60        0        0        0         0               1
## X667  69        1        0        1         0               0
## X668  65        0        0        0         0               1
## X669  65        1        0        1         0               0
## X670  61        0        0        0         0               0
## X673  65        1        0        0         1               0
## X674  62        0        0        0         0               0
## X675  52        0        0        0         0               0
## X676  60        1        0        0         0               0
## X677  62        1        0        1         0               0
## X678  59        1        0        0         1               1
## X679  63        1        0        1         0               0
## X680  60        0        0        0         0               0
## X681  64        1        1        0         0               1
## X682  57        0        0        1         0               1
## X683  55        1        0        1         0               0
## X684  64        0        1        0         0               0
## X685  57        0        0        1         0               0
## X686  58        0        0        1         0               0
## X687  62        1        0        0         0               0
## X688  64        0        0        0         0               1
## X690  62        1        0        0         0               0
## X691  52        0        0        0         0               0
## X692  52        0        0        0         0               0
## X693  60        0        0        0         0               0
## X694  62        0        1        0         0               1
## X697  57        1        0        0         0               0
## X698  65        1        0        0         0               0
## X699  56        1        0        0         0               0
## X700  57        1        0        0         0               0
## X701  61        1        0        0         0               0
## X702  58        1        1        0         0               0
## X703  63        1        0        0         0               0
## X705  58        0        0        1         0               0
## X706  63        0        0        0         0               0
## X707  57        1        0        0         0               0
## X708  58        0        0        0         1               0
## X709  63        1        0        1         0               1
## X710  65        0        0        0         0               1
## X711  61        1        0        0         0               0
## X712  58        0        0        0         0               0
## X713  51        0        1        0         0               0
## X714  55        0        1        0         0               1
## X715  56        1        0        0         0               0
```

```
## X716   57          0          0          0            0                    0
## X717   62          1          0          0            0                    0
## X718   59          1          0          0            1                    0
## X719   59          1          0          1            0                    0
## X720   62          0          0          0            0                    0
## X721   57          1          0          1            0                    0
## X722   62          1          0          0            0                    0
## X724   50          0          0          0            0                    0
## X725   56          0          0          1            0                    0
## X726   63          1          0          0            0                    0
## X730   67          0          0          1            0                    0
## X731   61          0          0          0            1                    0
## X732   65          1          0          0            0                    0
## X734   57          1          0          0            0                    0
## X735   52          1          0          0            0                    0
## X737   62          0          0          0            0                    0
## X738   56          0          0          1            0                    0
## X739   59          0          0          0            0                    1
## X740   56          0          0          0            0                    1
## X744   55          1          0          0            0                    0
## X745   62          0          0          0            0                    0
## X746   62          0          0          0            0                    0
## X747   61          1          0          1            0                    1
## X748   54          1          0          0            0                    0
## X749   63          0          0          0            0                    0
## X751   58          0          0          0            0                    0
## X752   66          0          0          0            0                    0
## X753   65          0          0          0            0                    1
## X754   58          1          1          0            0                    0
## X757   64          1          0          0            0                    0
## X758   59          0          0          0            0                    0
## X759   58          1          0          1            0                    0
## X761   65          0          0          1            0                    0
## X762   62          0          0          0            0                    0
## X763   62          0          1          0            0                    0
## X764   67          1          0          0            0                    0
## X765   64          1          0          1            0                    0
## X766   58          1          0          1            0                    1
## X767   62          0          0          0            0                    0
## X768   58          0          0          0            0                    1
## X769   61          1          0          0            0                    0
## X770   65          1          0          0            0                    0
## X772   60          0          0          0            0                    1
## X773   64          0          0          0            0                    0
## X774   68          0          0          0            0                    0
## X775   61          0          0          1            0                    0
## X776   59          0          0          0            0                    0
## X777   61          1          1          0            0                    1
## X778   66          1          0          0            0                    0
## X779   63          1          0          0            0                    1
## X780   61          0          0          0            0                    1
## X781   69          1          0          0            0                    0
## X784   57          1          0          0            0                    0
## X786   63          0          0          1            0                    0
```

```
## X787   66            1          0          0            0                   0
## X788   64            0          0          1            0                   0
## X789   56            0          0          1            0                   0
## X790   58            0          0          0            0                   0
## X791   63            1          0          0            0                   1
## X792   67            1          0          0            0                   0
## X794   68            0          0          0            0                   0
## X795   55            1          0          1            0                   0
## X796   61            0          0          0            0                   0
## X797   60            1          0          0            0                   1
## X798   58            1          0          0            0                   0
## X799   58            1          0          0            0                   0
## X800   64            1          0          1            0                   0
## X801   62            0          0          0            0                   1
## X802   50            1          0          0            0                   0
## X803   53            0          0          0            1                   0
## X804   55            0          0          0            0                   1
## X805   55            0          0          0            0                   0
## X807   68            0          0          0            0                   0
## X808   64            1          0          0            0                   0
## X809   58            1          0          0            0                   1
## X810   57            0          0          0            0                   1
## X812   57            0          0          0            0                   1
## X813   64            0          0          1            0                   0
## X814   62            1          0          0            0                   0
## X815   55            0          0          0            0                   0
## X816   63            0          0          1            0                   0
## X817   60            1          0          0            0                   0
## X818   61            1          0          0            0                   1
## X820   61            1          0          0            0                   0
## X821   59            1          1          0            0                   0
## X822   62            0          0          0            0                   0
## X823   67            0          0          0            0                   1
## X824   61            0          0          0            1                   1
## X825   55            1          0          0            1                   0
## X826   64            0          0          1            0                   1
## X830   63            1          0          0            0                   0
## X831   58            0          1          0            0                   1
## X832   55            0          0          0            0                   0
## X833   52            1          0          0            0                   0
## X834   69            1          0          0            0                   1
## X836   56            0          0          1            0                   0
## X837   55            1          0          1            0                   1
## X838   62            1          0          1            0                   1
## X839   53            1          0          0            0                   0
## X840   60            1          0          0            0                   0
## X841   61            1          0          1            0                   0
## X842   56            1          0          0            0                   0
## X843   60            0          0          1            0                   1
## X844   57            0          0          0            0                   0
## X847   70            1          0          0            0                   0
## X848   62            0          1          0            0                   0
## X849   59            1          0          0            0                   0
## X850   58            0          0          0            1                   0
```

```
## X851  64          1         0         0            0                    1
## X852  58          0         0         1            0                    0
## X853  54          1         0         0            0                    0
## X854  68          0         0         0            0                    0
## X855  57          1         0         0            0                    1
## X856  49          0         0         1            0                    0
## X857  61          0         0         0            0                    0
## X858  59          1         0         1            0                    0
## X859  61          1         0         1            0                    0
## X860  61          0         0         0            0                    0
## X861  56          0         0         0            0                    0
## X862  53          0         0         0            0                    1
## X864  61          1         0         0            0                    0
## X865  53          0         0         0            0                    1
## X866  64          1         0         1            0                    1
## X867  60          1         0         0            0                    0
## X868  59          1         0         0            0                    1
## X869  60          0         0         0            1                    1
## X870  56          0         0         0            0                    0
## X871  63          0         0         0            0                    0
## X872  54          0         0         0            0                    0
## X873  56          0         0         1            0                    0
## X874  58          1         0         0            0                    0
## X875  57          1         0         1            0                    0
## X877  64          0         0         0            0                    0
## X878  54          0         0         0            0                    1
## X879  59          0         0         0            0                    0
## X880  62          1         0         1            0                    0
## X881  57          0         0         0            0                    1
## X882  60          0         1         0            0                    1
## X883  57          0         0         0            0                    1
## X884  66          0         0         0            0                    0
## X885  59          0         0         1            0                    0
## X886  61          0         0         0            0                    0
## X887  65          1         0         0            0                    0
## X888  65          1         0         0            0                    0
## X889  65          1         0         0            1                    0
## X890  58          1         0         0            0                    0
## X891  58          0         0         0            0                    1
## X892  59          1         0         1            0                    1
## X894  60          0         0         0            1                    0
## X895  64          1         0         1            0                    0
## X897  58          0         0         0            0                    1
## X899  58          1         0         0            0                    0
## X900  57          0         0         1            0                    1
## X901  68          0         0         0            0                    1
## X902  66          0         0         1            0                    0
## X903  61          0         0         0            0                    0
## X904  57          0         0         0            0                    1
## X905  61          0         0         0            0                    1
## X906  52          1         0         0            0                    1
## X907  61          0         1         0            0                    0
## X908  57          1         0         0            0                    1
## X909  58          1         0         0            0                    1
```

```
## X910  64          0         0         0           0                       1
## X911  54          0         0         1           0                       0
## X913  59          0         0         0           0                       1
## X916  61          1         0         0           1                       0
## X917  66          1         0         0           0                       0
## X918  55          0         0         0           0                       0
## X919  58          1         0         0           0                       0
## X920  54          1         0         0           0                       1
## X921  70          0         0         0           0                       0
## X922  63          1         0         0           0                       0
## X924  57          1         0         0           0                       0
## X925  55          0         0         0           0                       0
## X926  56          0         0         1           0                       1
## X927  64          0         0         0           0                       0
## X929  61          1         0         0           0                       0
## X932  66          1         0         1           0                       0
## X933  57          1         0         0           0                       1
## X935  65          0         0         0           0                       0
## X936  63          1         0         0           0                       0
## X937  57          1         1         0           0                       0
## X939  64          0         0         0           1                       1
## X940  63          1         0         1           0                       1
## X941  64          1         0         0           1                       0
## X942  59          0         0         1           0                       0
## X943  58          1         0         0           0                       0
## X945  65          1         0         0           0                       0
## X946  63          1         0         1           0                       0
## X948  58          0         0         0           0                       1
## X949  58          1         0         0           0                       0
## X950  50          0         0         0           0                       0
## X951  51          0         0         0           0                       0
## X953  69          0         0         0           0                       0
## X954  69          1         0         0           0                       0
## X955  59          0         0         0           0                       1
## X956  62          1         0         0           0                       0
## X957  55          0         0         0           0                       0
## X958  61          0         0         0           0                       0
## X959  54          0         0         0           0                       0
## X960  51          0         0         0           0                       0
## X961  56          0         0         1           0                       0
## X962  63          1         0         0           1                       1
## X963  63          1         0         0           0                       1
## X964  65          1         0         0           0                       0
## X965  59          0         0         0           0                       0
## X966  56          1         0         1           0                       1
## X968  60          1         0         0           1                       0
## X969  60          1         0         0           0                       1
## X970  57          0         0         0           0                       0
## X971  53          0         0         0           0                       0
## X972  60          1         0         1           0                       1
## X973  55          0         0         0           0                       1
## X974  66          1         0         0           0                       1
## X975  56          1         0         0           0                       1
## X976  58          1         0         0           0                       0
```

```
## X977  57          0         0         0            0                    0
## X978  59          1         0         0            0                    0
## X979  67          0         0         0            0                    0
## X980  58          1         0         0            0                    1
## X981  61          1         0         0            0                    1
## X982  56          0         0         1            0                    1
## X983  66          1         0         1            0                    1
## X984  53          0         0         0            0                    0
## X985  59          1         0         1            0                    1
## X986  55          0         0         0            0                    1
## X987  61          0         1         0            0                    0
## X988  51          1         0         1            0                    0
## X989  56          1         0         0            0                    0
## X990  56          0         0         0            1                    1
## X991  55          0         0         1            0                    0
## X992  57          1         0         1            0                    0
## X993  59          0         0         0            0                    0
## X994  63          0         0         0            0                    0
## X995  54          0         0         0            0                    0
## X996  55          0         0         1            0                    1
## X997  57          0         0         0            0                    0
## X998  62          1         0         0            0                    1
## X999  61          1         0         0            0                    1
##      smokingCurrent_smoker height weight  bmi diabetesYes hypertensionYes sbp
## X1                       0  170.3   74.7 25.8           0               0 120
## X2                       0  170.8   75.7 26.0           1               1 133
## X3                       0  172.7   89.5 30.0           0               0 123
## X4                       0  171.7   74.6 25.3           0               0 121
## X6                       0  168.8   87.9 30.8           0               1 132
## X9                       0  168.5   76.5 27.0           0               1 138
## X10                      0  170.3   73.0 25.2           0               1 135
## X11                      0  172.7   93.9 31.5           0               0 128
## X12                      0  169.9   73.9 25.6           0               1 143
## X13                      0  181.2   89.6 27.3           1               1 139
## X14                      1  183.5   78.8 23.4           0               0 129
## X15                      0  168.6   90.3 31.8           0               1 131
## X17                      0  160.1   73.3 28.6           0               1 138
## X18                      0  172.5   83.8 28.1           0               0 128
## X19                      0  161.6   92.3 35.4           0               1 133
## X21                      0  173.0   85.8 28.7           0               0 130
## X22                      0  172.2   77.6 26.2           0               1 134
## X24                      0  160.6   75.9 29.4           0               0 124
## X25                      0  170.7   85.6 29.4           0               1 134
## X26                      0  166.2   79.1 28.7           0               1 131
## X27                      0  169.7   68.9 23.9           0               1 140
## X28                      0  156.6   73.4 29.9           0               1 136
## X29                      0  175.9   78.0 25.2           0               1 136
## X30                      0  166.7   88.7 31.9           0               1 134
## X31                      0  165.9   74.9 27.2           0               1 131
## X33                      0  175.5   80.9 26.3           0               0 130
## X36                      0  173.1   74.1 24.7           0               1 140
## X39                      0  163.0   64.6 24.3           0               1 134
## X40                      0  160.4   69.2 26.9           0               1 133
## X41                      0  172.2   79.0 26.6           0               0 124
```

```
## X42                         0  165.3   84.6 31.0            0                0 122
## X45                         0  179.3   82.9 25.8            0                1 135
## X46                         0  172.7   85.5 28.7            0                0 128
## X47                         0  162.7   85.8 32.4            0                1 131
## X49                         0  166.2   85.6 31.0            1                1 134
## X54                         0  178.2   73.5 23.2            0                0 127
## X56                         0  176.9  104.8 33.5            0                1 133
## X57                         0  174.6   84.6 27.8            0                1 137
## X59                         0  170.5   82.7 28.5            0                1 131
## X60                         1  172.1   65.9 22.2            0                0 121
## X61                         0  173.5   77.9 25.9            0                0 125
## X62                         0  176.2   83.3 26.8            0                0 124
## X64                         0  167.9   73.6 26.1            1                1 153
## X65                         1  169.6   70.3 24.4            0                1 136
## X67                         0  170.4   85.9 29.6            0                1 133
## X69                         0  170.0   81.3 28.1            1                0 125
## X70                         0  181.2   77.0 23.5            0                0 121
## X72                         0  164.6   80.7 29.8            1                0 119
## X73                         0  164.4   78.6 29.1            0                1 132
## X74                         0  163.3   67.5 25.3            0                0 124
## X75                         0  170.6   67.9 23.3            0                0 116
## X77                         0  172.1   71.2 24.0            0                1 133
## X78                         0  178.7   91.0 28.5            0                1 135
## X79                         1  173.9   81.1 26.8            0                1 150
## X82                         0  163.3   78.3 29.4            0                0 114
## X85                         0  164.2   82.6 30.6            0                0 124
## X87                         0  174.0   80.5 26.6            0                0 117
## X88                         0  180.8   88.8 27.2            0                0 117
## X89                         0  169.3   81.0 28.3            0                0 120
## X90                         0  168.0   76.6 27.1            0                1 131
## X91                         0  170.6   78.0 26.8            0                0 128
## X92                         0  163.0   76.0 28.6            0                1 133
## X93                         0  172.0   77.0 26.0            0                1 148
## X94                         0  168.0   76.5 27.1            0                1 136
## X95                         0  176.4   85.3 27.4            0                0 130
## X96                         1  172.3   77.4 26.1            0                0 121
## X97                         0  174.1   78.1 25.8            1                1 136
## X98                         0  174.1   83.1 27.4            0                1 140
## X99                         0  172.2   85.4 28.8            1                0 119
## X100                        0  167.4   72.4 25.9            0                1 132
## X101                        0  175.3   84.5 27.5            0                0 126
## X102                        0  174.2   84.9 28.0            0                1 138
## X103                        0  171.5   82.5 28.1            0                1 141
## X104                        0  176.8   87.9 28.1            0                1 135
## X105                        0  164.5   72.8 26.9            0                1 132
## X106                        0  165.5   87.3 31.9            0                0 122
## X108                        0  172.3   81.3 27.4            0                0 122
## X109                        0  163.2   79.0 29.7            0                1 135
## X110                        0  171.7   80.3 27.3            0                0 128
## X112                        0  161.4   75.1 28.9            1                0 128
## X113                        0  160.5   74.8 29.0            0                0 122
## X114                        0  173.3   75.6 25.2            0                0 114
## X115                        0  169.6   83.0 28.9            1                0 126
## X116                        0  172.9   84.4 28.2            1                1 134
```

```
## X117                    0  176.0   89.0 28.7           0                1 143
## X119                    0  165.3   75.7 27.7           0                0 128
## X120                    0  181.6   98.0 29.7           0                0 128
## X121                    0  181.5   77.4 23.5           0                1 146
## X122                    0  183.3   88.4 26.3           0                0 127
## X123                    0  173.9   67.6 22.4           0                0 116
## X126                    0  176.1   94.9 30.6           0                0 128
## X127                    0  181.0   83.7 25.6           0                0 124
## X128                    0  176.8   89.2 28.5           0                1 151
## X129                    0  167.2   77.6 27.7           0                1 145
## X130                    0  156.7   67.7 27.6           0                1 131
## X131                    0  171.0   84.3 28.8           1                0 122
## X132                    0  176.6   88.6 28.4           1                0 118
## X133                    0  167.7   70.3 25.0           0                0 124
## X135                    0  166.5   80.4 29.0           1                0 126
## X136                    0  173.3   83.8 27.9           0                0 126
## X137                    0  156.0   76.3 31.4           0                0 126
## X138                    0  169.1   76.7 26.8           0                1 154
## X139                    0  170.1   86.0 29.7           0                1 131
## X142                    0  176.9   81.3 26.0           0                1 141
## X144                    0  172.8   88.3 29.6           1                1 134
## X145                    0  165.5   92.7 33.8           0                1 134
## X146                    0  167.3   83.4 29.8           0                0 125
## X147                    0  171.6   70.4 23.9           0                1 131
## X148                    0  174.6   88.1 28.9           0                0 120
## X149                    0  179.3   89.6 27.9           0                1 143
## X150                    0  160.4   72.4 28.1           0                1 133
## X152                    0  175.0   84.3 27.5           1                0 130
## X154                    0  178.5   71.6 22.5           0                1 131
## X155                    0  173.3   77.7 25.9           1                1 132
## X156                    0  171.6   82.0 27.9           0                1 131
## X157                    1  177.5   72.5 23.0           0                1 143
## X159                    0  171.5   84.8 28.8           1                0 128
## X160                    0  165.6   83.3 30.4           0                1 132
## X161                    1  161.1   80.6 31.0           0                1 131
## X162                    0  170.2   83.3 28.8           0                0 117
## X163                    1  165.7   75.2 27.4           0                0 126
## X164                    0  164.7   79.2 29.2           0                0 126
## X165                    1  180.4   86.4 26.6           0                0 125
## X166                    0  176.4   84.1 27.0           0                0 128
## X167                    0  161.4   85.6 32.8           0                1 135
## X168                    0  173.8   83.4 27.6           1                1 131
## X169                    0  168.5   74.4 26.2           1                0 118
## X170                    0  174.0   78.8 26.0           0                0 124
## X171                    0  163.9   75.4 28.1           0                0 125
## X172                    0  162.7   82.6 31.2           0                0 130
## X173                    0  173.0   89.0 29.7           0                0 120
## X174                    0  174.5   78.1 25.7           0                1 131
## X175                    0  160.3   72.3 28.1           0                1 132
## X177                    0  179.1   80.4 25.0           0                1 134
## X179                    0  165.3   96.0 35.1           0                0 127
## X180                    0  173.3   83.3 27.7           0                1 149
## X181                    0  175.0   82.4 26.9           0                1 143
## X182                    0  170.0   83.7 29.0           0                0 116
```

```
## X183                        0  167.0   68.0 24.4            0                1 131
## X184                        0  179.7   79.5 24.6            1                1 145
## X185                        0  176.4   75.2 24.2            0                1 137
## X186                        0  174.3   89.7 29.5            0                0 125
## X187                        0  169.0   67.6 23.7            0                1 140
## X188                        0  157.5   79.2 31.9            0                0 115
## X189                        1  172.3   82.0 27.6            0                1 132
## X190                        0  174.3   79.4 26.1            1                1 142
## X191                        0  161.3   78.4 30.1            0                0 130
## X192                        0  165.3   77.3 28.3            0                1 148
## X193                        0  167.3   84.2 30.1            1                0 124
## X194                        1  166.3   81.2 29.4            0                1 149
## X195                        0  162.6   93.9 35.5            0                0 117
## X196                        0  165.7   64.8 23.6            1                0 123
## X198                        0  173.9   95.1 31.4            0                1 134
## X200                        1  174.0   81.9 27.0            1                0 122
## X201                        0  175.6   86.4 28.0            0                0 129
## X202                        0  166.0   85.7 31.1            0                0 130
## X204                        0  167.4   76.3 27.2            0                1 132
## X205                        0  178.1   89.3 28.2            0                0 119
## X206                        0  166.9   78.5 28.2            0                1 134
## X207                        0  165.6   85.0 31.0            1                1 138
## X209                        0  161.7   76.4 29.2            0                0 121
## X211                        1  173.9   72.5 24.0            0                1 134
## X212                        0  171.3   86.5 29.5            0                0 128
## X213                        0  173.9   83.1 27.5            0                1 147
## X214                        0  168.9   71.5 25.1            0                0 116
## X215                        0  165.2   79.3 29.1            0                0 125
## X216                        0  176.8   80.1 25.6            0                1 135
## X217                        0  171.5   85.3 29.0            1                0 124
## X218                        0  162.0   72.6 27.6            0                1 138
## X219                        1  170.2   74.2 25.6            0                1 134
## X220                        0  172.9   74.6 25.0            0                0 122
## X221                        0  168.4   84.5 29.8            0                0 122
## X222                        0  169.3   87.3 30.5            0                0 125
## X223                        0  168.8   71.9 25.2            1                0 121
## X224                        0  167.6   79.6 28.3            0                1 137
## X226                        0  168.7   74.1 26.0            1                1 141
## X227                        0  167.4   87.0 31.0            1                1 142
## X228                        0  166.2   78.2 28.3            0                1 132
## X229                        0  166.4   80.5 29.1            1                0 126
## X230                        0  174.1   71.7 23.7            0                0 121
## X231                        0  169.4   85.6 29.8            0                0 129
## X233                        0  172.3   75.4 25.4            0                0 124
## X234                        0  162.9   82.8 31.2            0                1 139
## X235                        0  168.3   82.3 29.1            0                1 133
## X236                        0  154.7   85.4 35.7            0                0 127
## X237                        0  161.2   71.7 27.6            0                0 129
## X238                        1  172.5   75.5 25.4            0                1 140
## X239                        0  164.2   71.3 26.4            0                0 122
## X240                        0  160.9   79.2 30.6            0                1 131
## X241                        0  171.1   79.0 27.0            0                0 120
## X244                        0  171.1   80.5 27.5            0                0 128
## X245                        1  172.4   77.3 26.0            0                0 130
```

```
## X246                    0  164.8   85.3 31.4           0               0 130
## X247                    0  165.2   79.2 29.0           0               1 132
## X248                    0  178.3   73.7 23.2           0               0 115
## X249                    0  168.4   65.7 23.2           0               1 138
## X251                    0  156.8   88.4 36.0           0               1 133
## X252                    0  175.8   87.1 28.2           0               1 142
## X254                    0  171.1   79.3 27.1           0               0 128
## X255                    0  159.6   72.7 28.6           0               1 134
## X256                    0  167.3   87.3 31.2           0               0 115
## X257                    0  164.1   82.9 30.8           0               1 141
## X258                    0  167.1   81.5 29.2           0               0 129
## X259                    1  178.7   71.6 22.4           0               0 127
## X260                    0  161.6   72.0 27.6           0               0 128
## X261                    0  169.2   79.1 27.6           0               0 126
## X262                    1  157.2   68.7 27.8           0               0 126
## X264                    0  169.0   74.3 26.0           0               1 132
## X265                    0  174.2   75.4 24.8           0               0 123
## X266                    0  174.3   85.2 28.1           0               0 125
## X267                    0  169.0   80.5 28.2           0               1 138
## X268                    0  177.4   90.7 28.8           0               1 133
## X269                    0  177.6   88.0 27.9           0               0 128
## X270                    0  166.1   87.4 31.7           1               0 114
## X273                    0  169.3   79.2 27.6           0               0 123
## X274                    1  164.2   69.7 25.9           0               1 134
## X275                    0  163.7   65.0 24.3           0               0 125
## X276                    0  164.5   88.9 32.9           0               0 127
## X277                    0  162.7   75.1 28.4           1               0 123
## X278                    0  162.1   64.4 24.5           0               0 122
## X279                    0  162.9   66.3 25.0           1               1 133
## X280                    0  177.4   84.9 27.0           0               0 126
## X282                    1  179.2   76.7 23.9           0               0 122
## X283                    0  167.9   66.0 23.4           0               0 121
## X284                    0  172.6   79.5 26.7           0               0 123
## X286                    0  170.4   91.0 31.3           0               0 120
## X289                    1  175.8   88.0 28.5           0               0 122
## X290                    0  167.5   81.9 29.2           0               0 120
## X292                    1  150.2   58.0 25.7           1               0 122
## X293                    0  179.3   85.5 26.6           0               0 126
## X295                    0  167.5   68.5 24.4           0               1 135
## X296                    0  173.4   78.8 26.2           0               0 125
## X298                    0  165.1   71.5 26.2           0               1 131
## X299                    0  166.0   74.0 26.9           0               0 129
## X300                    0  172.2   86.5 29.2           0               1 134
## X301                    0  165.8   76.9 28.0           1               0 129
## X302                    0  172.7   85.2 28.6           0               0 125
## X303                    0  166.3   74.5 26.9           0               0 126
## X305                    0  159.0   82.5 32.6           0               1 131
## X306                    0  170.3   81.4 28.1           0               1 131
## X307                    0  164.5   82.1 30.3           0               0 119
## X311                    0  179.4   82.9 25.8           1               1 141
## X312                    0  165.3   78.0 28.6           0               0 130
## X313                    1  173.0   91.9 30.7           0               1 141
## X314                    0  184.9   82.5 24.1           0               0 126
## X315                    0  159.0   78.2 30.9           0               1 138
```

```
## X316                        0  168.9   72.9 25.6             0                0 129
## X317                        0  168.1   64.8 22.9             0                0 125
## X318                        0  158.8   72.9 28.9             0                0 119
## X319                        0  169.1   74.1 25.9             0                0 128
## X321                        1  180.6   84.1 25.8             0                1 133
## X322                        0  171.6   89.8 30.5             0                0 121
## X326                        0  179.0   91.1 28.4             0                0 119
## X327                        0  172.6   96.3 32.3             0                1 135
## X328                        0  169.4   86.9 30.3             0                0 113
## X329                        0  174.6   81.7 26.8             1                0 120
## X330                        0  174.9   83.5 27.3             0                0 116
## X331                        0  161.0   72.8 28.1             0                0 119
## X332                        0  161.2   74.1 28.5             0                1 138
## X333                        0  160.9   69.0 26.6             1                1 133
## X334                        0  170.9   77.0 26.4             0                1 139
## X335                        0  167.5   73.4 26.1             0                0 127
## X336                        0  163.2   74.2 27.9             0                1 136
## X339                        0  173.0   87.8 29.3             0                1 139
## X340                        1  165.1   76.2 28.0             0                0 129
## X341                        0  159.0   80.6 31.9             1                1 135
## X342                        0  165.9   68.1 24.7             0                0 130
## X345                        0  176.5   72.9 23.4             0                1 133
## X347                        0  168.8   66.2 23.2             0                0 126
## X349                        0  172.3   86.6 29.2             0                1 146
## X351                        0  168.4   81.6 28.8             1                1 140
## X353                        0  172.1   81.2 27.4             0                1 134
## X354                        0  169.7   82.6 28.7             0                0 128
## X355                        0  164.4   65.7 24.3             0                0 125
## X356                        1  166.1   70.5 25.6             0                1 133
## X359                        0  164.7   56.6 20.9             1                1 132
## X360                        0  167.2   80.2 28.7             1                1 148
## X361                        0  167.1   80.5 28.8             0                0 123
## X363                        0  169.7   80.8 28.1             0                1 138
## X365                        0  168.8   91.4 32.1             0                0 128
## X366                        0  172.0   72.8 24.6             0                1 135
## X367                        0  173.9   91.9 30.4             0                0 121
## X369                        0  173.8   87.3 28.9             0                1 138
## X371                        0  166.0   73.5 26.7             0                1 133
## X372                        0  167.7  103.7 36.9             0                1 139
## X373                        0  178.0   84.8 26.8             0                1 135
## X374                        0  172.7   70.3 23.6             0                0 123
## X376                        0  178.0   75.4 23.8             0                0 121
## X377                        1  152.3   65.2 28.1             0                1 134
## X378                        0  169.8   68.5 23.8             0                1 137
## X379                        0  170.1   78.3 27.1             0                0 119
## X380                        0  171.9   92.6 31.4             0                1 146
## X382                        1  164.5   74.2 27.4             0                1 131
## X383                        0  164.9   85.0 31.2             0                0 121
## X385                        0  170.5   66.4 22.8             0                1 131
## X386                        1  165.0   77.7 28.5             0                0 114
## X387                        0  170.7   81.3 27.9             0                1 135
## X388                        0  168.4   77.4 27.3             0                0 117
## X389                        0  174.7   70.4 23.1             1                0 120
## X391                        0  163.9   74.9 27.9             0                0 118
```

```
## X392                    0  167.7   79.4 28.2            0                1 135
## X393                    0  175.1   80.2 26.2            0                0 121
## X394                    0  175.6   82.8 26.9            0                1 137
## X395                    0  178.2   78.2 24.6            0                0 124
## X396                    1  179.6   89.8 27.8            1                1 133
## X397                    0  166.3   78.3 28.3            0                0 125
## X398                    0  169.0   74.3 26.0            0                1 131
## X399                    0  174.4   75.6 24.8            0                0 129
## X401                    0  176.7   68.4 21.9            1                1 141
## X402                    0  165.5   67.7 24.7            0                0 122
## X405                    0  173.0   79.0 26.4            0                0 129
## X406                    0  174.7   79.6 26.1            0                1 136
## X407                    0  177.4   86.1 27.4            0                0 119
## X408                    0  173.4   75.5 25.1            0                0 122
## X410                    0  166.7   73.6 26.5            0                0 128
## X411                    0  160.7   84.1 32.6            0                1 134
## X412                    0  173.2   76.9 25.7            0                0 125
## X413                    1  171.5   76.6 26.1            0                1 134
## X414                    0  170.6   75.2 25.9            0                0 126
## X415                    0  172.7   83.6 28.0            0                0 130
## X416                    0  164.3   65.4 24.2            0                1 140
## X417                    0  164.7   77.8 28.7            1                1 132
## X418                    0  177.5   86.4 27.4            0                0 129
## X419                    0  178.1   90.1 28.4            0                1 131
## X420                    0  171.9   78.0 26.4            0                1 132
## X421                    0  172.4   78.8 26.5            1                0 128
## X422                    0  168.6   72.4 25.5            0                0 123
## X423                    0  167.8   85.3 30.3            0                0 129
## X424                    0  164.2   79.6 29.5            0                1 133
## X425                    0  173.2   77.8 25.9            0                0 115
## X426                    0  183.8   85.3 25.3            0                1 134
## X427                    0  173.5   65.9 21.9            0                0 130
## X431                    0  166.0   77.8 28.2            0                1 135
## X432                    0  171.4   73.6 25.1            0                1 136
## X434                    0  168.2   73.3 25.9            0                0 122
## X435                    0  175.4   75.5 24.5            0                0 118
## X437                    0  175.2   61.1 19.9            0                1 144
## X438                    0  167.8   87.8 31.2            0                0 130
## X439                    0  172.2   82.0 27.7            1                1 144
## X440                    0  171.4   83.2 28.3            0                0 123
## X441                    0  175.4   81.5 26.5            0                0 121
## X442                    0  165.9   69.4 25.2            0                0 130
## X443                    0  166.2   72.9 26.4            0                0 119
## X444                    1  163.9   61.6 22.9            1                0 130
## X445                    0  169.3   85.6 29.9            0                0 127
## X448                    0  175.6   77.7 25.2            0                1 140
## X450                    0  171.8   87.7 29.7            0                1 133
## X451                    0  163.9   76.5 28.5            0                0 125
## X453                    0  168.4   73.5 25.9            1                0 122
## X454                    0  168.7   83.0 29.1            0                1 134
## X455                    0  166.8   77.8 28.0            1                0 127
## X456                    0  161.6   74.5 28.5            0                0 124
## X457                    0  169.6   78.5 27.3            0                1 131
## X458                    0  160.8   83.3 32.2            0                1 131
```

```
## X459                            0  179.0   77.4 24.2             0                1 135
## X460                            0  176.4   79.0 25.4             1                1 137
## X461                            0  178.9   80.9 25.3             1                0 126
## X464                            0  179.0   79.3 24.7             0                1 147
## X465                            0  165.0   83.9 30.8             0                1 152
## X466                            0  175.3   72.9 23.7             1                0 127
## X468                            0  177.4   78.4 24.9             0                0 124
## X469                            0  166.2   80.8 29.2             0                1 132
## X470                            0  165.5   74.9 27.4             0                0 123
## X472                            0  167.0   82.3 29.5             0                0 128
## X473                            0  177.0   75.9 24.2             0                1 131
## X474                            1  175.6   94.0 30.5             0                0 128
## X475                            1  177.3   84.4 26.8             0                1 134
## X476                            1  178.0   83.9 26.5             0                0 120
## X478                            0  168.8   78.1 27.4             0                1 137
## X480                            0  171.3   88.8 30.2             0                0 130
## X481                            0  167.7   80.0 28.4             0                0 129
## X482                            0  173.2   99.1 33.0             0                1 132
## X483                            0  169.7   71.2 24.7             0                1 132
## X484                            0  161.8   72.8 27.8             0                0 125
## X486                            0  177.2   84.4 26.9             0                1 138
## X487                            0  175.0   83.5 27.3             0                1 137
## X488                            0  172.4   69.5 23.4             1                0 127
## X489                            0  174.0   80.6 26.6             0                1 138
## X490                            0  172.6   70.1 23.5             0                1 146
## X491                            0  177.7   78.8 25.0             0                1 136
## X492                            0  173.9   81.1 26.8             1                1 138
## X493                            0  172.7   79.9 26.8             0                1 140
## X494                            0  158.0   71.7 28.7             0                1 142
## X495                            0  163.2   68.9 25.9             0                0 129
## X496                            1  175.5   76.3 24.8             0                1 133
## X497                            1  172.4   84.4 28.4             0                0 127
## X498                            0  177.7   90.3 28.6             0                1 131
## X499                            0  178.2   81.4 25.6             0                0 123
## X500                            0  168.5   75.0 26.4             0                0 123
## X501                            0  175.5   86.0 27.9             0                1 133
## X502                            0  181.6   76.3 23.1             0                1 138
## X503                            0  190.3   83.8 23.1             0                0 118
## X504                            0  171.5   75.0 25.5             0                0 120
## X507                            1  179.6   76.2 23.6             0                0 126
## X509                            0  157.9   75.0 30.1             0                0 130
## X511                            0  163.4   85.9 32.2             0                0 121
## X512                            1  165.6   69.2 25.2             0                1 134
## X513                            0  168.0   82.7 29.3             0                1 133
## X514                            0  171.6   72.5 24.6             0                0 125
## X515                            0  179.0   83.5 26.0             1                0 130
## X516                            0  164.9   74.6 27.5             1                1 131
## X518                            0  170.5   78.7 27.1             0                0 123
## X520                            0  168.7   80.3 28.2             0                1 147
## X521                            0  178.1   83.6 26.4             1                0 121
## X522                            0  170.0   80.6 27.9             0                1 133
## X523                            0  165.9   82.9 30.1             0                0 125
## X524                            1  163.6   83.0 31.0             0                1 136
## X525                            0  172.4   72.8 24.5             0                0 115
```

```
## X527                       1  167.4   76.2 27.2             0                0 124
## X528                       0  168.8   59.0 20.7             0                1 136
## X529                       0  166.1   77.6 28.1             0                0 126
## X530                       0  172.7   76.1 25.5             0                1 131
## X533                       0  167.8   76.7 27.2             0                0 126
## X535                       0  175.0   89.9 29.3             1                0 123
## X536                       0  176.2   84.9 27.3             0                1 131
## X539                       0  156.7   71.7 29.2             0                1 135
## X540                       0  176.1   69.5 22.4             0                0 121
## X541                       0  164.3   84.0 31.1             1                0 128
## X542                       0  167.0   82.9 29.7             0                1 151
## X543                       0  162.2   77.8 29.6             0                1 135
## X545                       0  178.8   70.8 22.2             0                1 138
## X546                       0  169.6   86.2 30.0             0                0 129
## X547                       0  163.3   76.0 28.5             0                1 139
## X548                       0  162.3   75.9 28.8             0                0 130
## X549                       1  174.3   87.6 28.8             0                0 122
## X550                       0  167.7   63.2 22.5             0                0 123
## X551                       0  157.8   66.3 26.6             0                1 131
## X552                       0  157.1   73.0 29.6             0                1 137
## X553                       0  170.7   86.8 29.8             0                1 137
## X554                       0  165.6   76.7 28.0             0                1 138
## X556                       0  169.1   71.9 25.1             1                0 124
## X557                       0  182.1   74.7 22.5             1                0 130
## X558                       0  167.0   86.0 30.8             0                1 131
## X559                       0  173.8   75.5 25.0             0                1 136
## X560                       0  171.8   71.1 24.1             0                1 132
## X561                       0  166.2   93.1 33.7             0                1 137
## X562                       0  168.8   78.2 27.5             0                0 127
## X563                       0  165.7   75.8 27.6             0                0 129
## X564                       0  179.1   87.0 27.1             0                0 124
## X565                       1  167.8   85.8 30.5             0                0 128
## X566                       0  182.6   85.6 25.7             0                1 136
## X567                       0  180.5   90.6 27.8             0                0 125
## X568                       0  167.4   77.0 27.5             0                1 143
## X569                       0  171.9   78.6 26.6             0                1 134
## X571                       0  168.1   72.2 25.5             0                0 119
## X573                       0  166.5   86.8 31.3             0                1 142
## X574                       1  168.5   74.3 26.2             0                0 117
## X575                       0  151.9   69.2 30.0             0                0 110
## X576                       0  164.0   86.0 32.0             0                1 142
## X577                       0  173.3   75.3 25.0             0                0 127
## X579                       0  168.5   86.6 30.5             0                0 126
## X580                       0  163.6   82.3 30.7             0                0 125
## X582                       0  180.8   74.4 22.7             0                0 122
## X584                       1  171.1   69.2 23.6             0                1 137
## X587                       0  163.2   68.5 25.7             0                1 136
## X588                       0  168.5   83.7 29.5             0                1 136
## X589                       0  165.3   90.4 33.1             0                1 139
## X591                       0  178.9   72.9 22.8             0                0 118
## X592                       0  162.1   79.6 30.3             0                0 122
## X593                       1  182.2   82.0 24.7             0                0 117
## X594                       0  171.4   68.4 23.3             0                1 141
## X597                       0  165.1   87.8 32.2             1                0 125
```

```
## X598                        1  178.0   87.9 27.8           1                0 124
## X600                        0  172.9   83.7 28.0           0                0 128
## X601                        0  176.1   69.3 22.4           1                0 127
## X602                        0  173.7   86.5 28.7           0                0 124
## X603                        0  158.5   65.8 26.2           0                0 130
## X604                        0  167.1   83.5 29.9           0                0 122
## X605                        0  161.7   74.1 28.4           0                1 136
## X606                        0  161.3   78.6 30.2           0                1 131
## X609                        0  170.4   70.4 24.2           0                1 145
## X610                        0  177.1   86.5 27.6           0                1 135
## X611                        0  155.3   83.7 34.7           0                0 115
## X613                        0  173.8   81.5 27.0           1                1 137
## X614                        0  178.9   93.5 29.2           1                1 135
## X615                        0  166.4   69.1 24.9           0                0 120
## X617                        0  172.0   97.0 32.8           0                1 132
## X618                        0  174.3   70.1 23.1           0                0 119
## X619                        0  159.1   68.5 27.1           1                1 132
## X620                        1  169.2   80.9 28.3           0                0 113
## X623                        1  173.2   73.5 24.5           0                1 134
## X624                        0  177.5   83.6 26.5           0                0 129
## X625                        0  168.5   80.2 28.2           1                0 130
## X626                        0  176.3   83.4 26.8           0                1 139
## X628                        0  162.1   81.0 30.8           1                1 134
## X629                        0  164.7   74.3 27.4           1                0 118
## X630                        0  163.1   82.6 31.0           1                0 130
## X631                        0  174.0   66.1 21.8           0                1 131
## X632                        0  163.6   66.5 24.8           1                0 129
## X633                        0  182.4   86.1 25.9           1                0 130
## X634                        1  169.6   76.1 26.4           0                0 130
## X635                        1  176.2   79.0 25.5           0                0 130
## X636                        0  164.3   73.5 27.2           0                0 128
## X637                        0  180.5   90.4 27.7           0                0 128
## X638                        0  165.9   85.9 31.2           0                0 116
## X640                        1  162.7   77.9 29.4           0                1 132
## X641                        0  168.3   79.5 28.1           0                0 126
## X642                        0  162.0   82.4 31.4           0                0 129
## X643                        0  165.1   78.4 28.8           0                0 115
## X644                        0  167.1   77.4 27.7           0                0 118
## X645                        0  163.8   75.7 28.2           0                1 137
## X646                        0  161.6   81.6 31.3           0                0 125
## X648                        0  167.1   80.0 28.6           0                0 127
## X649                        0  169.0   83.1 29.1           0                0 123
## X650                        0  172.5   77.8 26.1           0                0 123
## X652                        0  165.8   83.4 30.4           0                1 132
## X654                        0  178.3   90.9 28.6           0                1 135
## X655                        0  164.5   72.7 26.9           0                1 151
## X656                        1  169.5   76.8 26.7           0                1 133
## X657                        0  175.0   66.0 21.6           0                0 120
## X658                        0  162.3   82.0 31.1           0                1 134
## X659                        0  171.0   72.1 24.7           0                0 127
## X660                        1  162.2   92.6 35.2           0                1 138
## X661                        0  181.0   72.5 22.1           0                1 143
## X663                        0  177.2   82.4 26.2           0                0 129
## X664                        0  179.5   80.4 25.0           1                1 135
```

```
## X665                      0  168.7   79.8 28.1            0                1 134
## X666                      0  170.8   94.1 32.2            0                0 130
## X667                      0  161.1   94.0 36.2            0                1 142
## X668                      0  157.1   71.0 28.7            0                0 127
## X669                      0  163.1   76.7 28.9            0                1 134
## X670                      0  186.7   80.9 23.2            0                1 135
## X673                      0  171.9   90.1 30.5            0                1 142
## X674                      0  178.5   90.4 28.4            0                0 127
## X675                      0  176.1   80.7 26.0            0                0 130
## X676                      0  167.8   73.8 26.2            1                1 139
## X677                      0  166.2   78.1 28.3            0                0 127
## X678                      0  166.7   79.7 28.7            0                1 131
## X679                      0  178.4   86.3 27.1            0                1 136
## X680                      0  168.7   87.3 30.7            0                1 137
## X681                      0  168.0   86.5 30.7            1                1 147
## X682                      0  170.5   84.7 29.1            0                1 134
## X683                      0  171.7   84.2 28.6            0                0 127
## X684                      0  178.5   85.0 26.7            0                1 136
## X685                      0  166.9   83.8 30.1            0                0 123
## X686                      0  169.2   74.8 26.1            0                0 119
## X687                      0  170.1   85.0 29.4            0                1 132
## X688                      0  171.4   86.1 29.3            1                1 136
## X690                      0  161.9   71.2 27.2            0                0 130
## X691                      0  161.1   83.9 32.3            0                0 130
## X692                      0  172.4   81.5 27.4            0                1 136
## X693                      0  180.0   81.7 25.2            0                1 140
## X694                      0  169.8   80.9 28.1            0                0 127
## X697                      1  175.4   80.0 26.0            0                0 127
## X698                      0  167.5   68.1 24.3            0                1 138
## X699                      0  168.1   78.8 27.9            0                0 118
## X700                      1  176.4   95.8 30.8            0                0 129
## X701                      0  170.3   74.8 25.8            0                1 139
## X702                      0  166.1   76.9 27.9            0                0 126
## X703                      0  175.0   84.4 27.6            0                0 130
## X705                      1  184.1   73.9 21.8            0                0 123
## X706                      0  170.4   80.5 27.7            1                0 123
## X707                      0  169.9   74.1 25.7            1                1 139
## X708                      0  169.5   65.3 22.7            0                0 126
## X709                      0  156.6   70.8 28.9            0                0 129
## X710                      0  178.3   82.7 26.0            1                1 143
## X711                      0  169.5   86.5 30.1            0                1 144
## X712                      1  157.3   78.8 31.9            0                0 120
## X713                      0  170.4   77.2 26.6            1                0 121
## X714                      0  176.3   75.6 24.3            0                0 123
## X715                      0  159.5   69.2 27.2            1                0 127
## X716                      0  169.5   75.7 26.3            0                0 116
## X717                      0  171.5   83.8 28.5            0                1 132
## X718                      1  182.7   85.4 25.6            0                0 123
## X719                      0  170.5   65.6 22.6            1                0 125
## X720                      1  172.2   72.1 24.3            0                1 136
## X721                      0  168.5   82.7 29.1            0                0 125
## X722                      0  170.7   80.0 27.5            1                1 133
## X724                      0  168.7   71.0 25.0            0                0 124
## X725                      1  178.2   83.1 26.2            0                0 128
```

```
## X726                        0  174.1   78.0 25.7            0                1 143
## X730                        1  174.6   79.2 26.0            0                0 127
## X731                        0  177.0   88.9 28.4            1                1 133
## X732                        0  172.8   85.8 28.7            0                1 135
## X734                        0  174.3   89.4 29.4            0                1 138
## X735                        0  178.3   77.6 24.4            1                0 130
## X737                        0  178.5   81.3 25.5            0                0 117
## X738                        0  165.6   74.0 27.0            0                0 130
## X739                        0  182.8   66.7 20.0            0                0 120
## X740                        0  165.4   90.1 33.0            0                1 147
## X744                        0  178.9   87.1 27.2            0                1 132
## X745                        0  171.6   75.6 25.7            0                1 134
## X746                        0  179.6   85.2 26.4            1                1 139
## X747                        0  173.2   84.0 28.0            0                0 123
## X748                        0  165.7   79.6 29.0            0                1 134
## X749                        0  175.2   70.9 23.1            1                1 135
## X751                        0  171.3   70.4 24.0            0                0 121
## X752                        1  163.5   85.7 32.1            0                1 141
## X753                        0  173.9   74.4 24.6            0                1 136
## X754                        1  169.1   95.6 33.5            0                0 126
## X757                        0  170.2   76.4 26.4            0                0 124
## X758                        0  179.2   83.3 25.9            0                0 128
## X759                        0  177.2   88.0 28.0            0                0 109
## X761                        1  171.7   88.0 29.8            0                0 115
## X762                        0  168.7   73.0 25.6            0                0 124
## X763                        0  171.6   87.8 29.8            0                1 132
## X764                        0  170.0   80.5 27.9            0                1 138
## X765                        0  179.8   86.3 26.7            1                1 136
## X766                        0  177.2   72.4 23.0            0                0 113
## X767                        0  167.0   91.5 32.8            0                1 138
## X768                        0  163.1   78.2 29.4            0                0 129
## X769                        0  170.2   73.3 25.3            0                0 129
## X770                        1  162.1   80.7 30.7            0                0 125
## X772                        0  167.7   64.1 22.8            0                1 133
## X773                        0  163.9   78.2 29.1            1                1 131
## X774                        0  168.4   71.5 25.2            0                1 137
## X775                        0  164.7   75.5 27.9            0                0 125
## X776                        0  170.3   78.6 27.1            0                0 122
## X777                        0  161.6   75.9 29.1            1                1 132
## X778                        0  165.5   74.6 27.2            1                0 125
## X779                        0  180.6   83.3 25.5            0                1 134
## X780                        0  155.2   71.3 29.6            0                0 128
## X781                        0  164.0   74.3 27.6            0                1 132
## X784                        0  171.8   83.2 28.2            0                0 121
## X786                        1  173.7   74.2 24.6            1                0 127
## X787                        1  169.7   97.8 33.9            0                0 124
## X788                        0  161.5   68.9 26.4            0                0 119
## X789                        0  166.5   94.8 34.2            1                0 124
## X790                        0  174.6   88.2 28.9            0                0 129
## X791                        0  169.4   64.8 22.6            0                1 136
## X792                        0  178.7   64.9 20.3            0                1 143
## X794                        0  176.8   75.3 24.1            0                0 119
## X795                        1  168.5   78.6 27.7            0                0 129
## X796                        0  172.0   79.0 26.7            0                1 146
```

```
## X797                   0  168.5   77.1 27.2           0                1 131
## X798                   1  174.0   86.1 28.4           0                0 124
## X799                   0  162.0   79.2 30.2           0                0 118
## X800                   0  163.0   74.6 28.1           1                1 148
## X801                   0  175.8   73.3 23.7           0                1 152
## X802                   0  176.3   77.6 25.0           0                0 124
## X803                   1  168.6   91.9 32.3           0                0 127
## X804                   0  171.3   74.0 25.2           0                0 125
## X805                   0  171.2   80.8 27.6           0                1 134
## X807                   0  161.8   65.6 25.1           0                1 132
## X808                   0  164.1   75.2 27.9           1                1 134
## X809                   0  170.2   82.4 28.4           0                0 127
## X810                   0  171.2   86.1 29.4           1                0 111
## X812                   0  165.0   96.3 35.4           1                0 125
## X813                   1  168.2   78.9 27.9           0                1 131
## X814                   0  170.9   84.6 29.0           0                0 130
## X815                   0  170.5   65.5 22.5           0                0 121
## X816                   0  171.1   76.7 26.2           0                0 122
## X817                   0  163.9   78.5 29.2           0                1 140
## X818                   0  175.6   89.1 28.9           0                1 144
## X820                   0  178.1   62.2 19.6           1                0 117
## X821                   0  182.4   79.5 23.9           0                1 138
## X822                   1  173.1   81.9 27.3           0                1 131
## X823                   0  178.1   81.2 25.6           0                1 136
## X824                   0  171.3   85.4 29.1           0                0 122
## X825                   0  181.7   85.1 25.8           0                1 133
## X826                   0  167.2   76.8 27.5           1                1 132
## X830                   0  169.8   81.5 28.2           0                1 133
## X831                   0  174.3   86.7 28.5           0                0 128
## X832                   0  152.4   86.8 37.4           0                0 122
## X833                   0  164.5   71.2 26.3           0                0 122
## X834                   0  159.8   81.5 31.9           0                1 142
## X836                   0  178.9   84.7 26.5           0                1 133
## X837                   0  172.0   70.4 23.8           0                0 130
## X838                   0  160.0   70.5 27.5           0                0 128
## X839                   1  165.7   80.4 29.3           0                0 128
## X840                   1  172.4   82.0 27.6           0                1 132
## X841                   0  176.3   86.3 27.8           0                1 136
## X842                   0  164.2   83.8 31.1           0                0 120
## X843                   0  163.9   73.1 27.2           0                0 117
## X844                   0  172.6   62.3 20.9           0                0 126
## X847                   0  163.0   71.3 26.8           0                1 141
## X848                   0  172.5   90.6 30.4           1                0 122
## X849                   0  164.8   72.2 26.6           0                1 140
## X850                   1  169.7   84.4 29.3           0                0 112
## X851                   0  169.9   74.6 25.8           0                1 134
## X852                   0  168.7   73.4 25.8           0                0 130
## X853                   0  171.5   82.6 28.1           1                0 126
## X854                   0  156.1   69.7 28.6           0                1 146
## X855                   0  160.7   90.2 34.9           0                0 124
## X856                   0  169.1   69.4 24.3           0                0 121
## X857                   0  169.1   76.4 26.7           0                0 130
## X858                   0  161.0   80.4 31.0           0                0 130
## X859                   0  178.7   75.5 23.6           0                1 132
```

```
## X860                       0  172.4   81.7 27.5           0               1 131
## X861                       0  165.3   74.8 27.4           0               0 130
## X862                       0  174.2   86.3 28.4           0               0 118
## X864                       0  160.2   71.9 28.0           0               0 123
## X865                       0  168.6   76.5 26.9           0               0 128
## X866                       0  167.5   73.4 26.1           0               0 127
## X867                       0  173.4   80.7 26.8           0               1 138
## X868                       0  167.0   81.2 29.1           0               0 119
## X869                       0  180.4   79.7 24.5           0               1 136
## X870                       0  165.0   67.0 24.6           0               0 118
## X871                       0  166.0   77.1 28.0           0               1 135
## X872                       1  163.7   71.6 26.7           0               0 130
## X873                       0  166.8   77.5 27.9           1               1 136
## X874                       1  165.9   67.6 24.6           0               0 128
## X875                       0  167.8   79.3 28.2           0               0 120
## X877                       1  170.7   83.9 28.8           0               0 125
## X878                       0  172.2   70.2 23.7           0               0 127
## X879                       0  177.8   90.0 28.5           0               0 125
## X880                       0  178.0   82.9 26.2           0               0 128
## X881                       0  171.1   86.2 29.5           0               1 132
## X882                       0  173.3   70.3 23.4           0               0 120
## X883                       0  158.5   86.5 34.4           0               0 130
## X884                       0  166.4   89.1 32.2           0               1 135
## X885                       0  180.6   93.1 28.5           1               1 133
## X886                       0  163.5   73.5 27.5           1               1 145
## X887                       0  181.9   79.2 23.9           0               1 132
## X888                       0  166.2   78.3 28.3           0               0 130
## X889                       0  165.0   78.5 28.9           0               0 126
## X890                       0  171.4   71.1 24.2           1               0 116
## X891                       0  165.9   68.8 25.0           1               1 137
## X892                       0  177.5   87.5 27.8           0               1 137
## X894                       0  175.6   81.7 26.5           0               0 129
## X895                       0  169.8   80.2 27.8           0               0 121
## X897                       0  175.1   74.1 24.2           0               0 130
## X899                       0  175.6   74.8 24.3           0               0 127
## X900                       0  155.7   74.6 30.8           0               0 122
## X901                       0  169.9   80.7 28.0           0               1 150
## X902                       0  169.6   90.2 31.3           0               0 128
## X903                       0  165.7   82.7 30.1           0               0 129
## X904                       0  172.3   76.2 25.7           0               1 132
## X905                       0  186.8   83.2 23.8           0               1 138
## X906                       0  170.7   83.3 28.6           0               0 122
## X907                       0  169.9   84.5 29.3           0               0 127
## X908                       0  175.8   80.3 26.0           0               1 133
## X909                       0  174.3   93.8 30.9           0               0 127
## X910                       0  165.9   84.9 30.9           0               1 145
## X911                       0  171.6   82.8 28.1           0               0 124
## X913                       0  173.3   73.4 24.4           0               1 134
## X916                       0  162.5   82.8 31.4           0               0 125
## X917                       0  163.6   88.2 32.9           0               1 145
## X918                       0  164.6   79.9 29.5           0               0 119
## X919                       0  172.0   94.5 31.9           0               1 139
## X920                       0  164.8   82.2 30.3           0               0 123
## X921                       0  162.9   75.4 28.4           0               1 149
```

```
## X922                        0  167.3   79.4 28.3            1                1 140
## X924                        0  179.0   99.1 30.9            1                0 118
## X925                        0  177.2   93.1 29.7            0                0 126
## X926                        0  165.8   75.6 27.5            0                0 110
## X927                        0  163.4   78.5 29.4            1                0 129
## X929                        0  173.6   77.7 25.8            1                1 143
## X932                        0  170.7   81.3 27.9            1                1 139
## X933                        0  173.2   74.7 24.9            0                0 130
## X935                        0  175.0   73.1 23.8            0                1 139
## X936                        0  175.6   89.3 29.0            0                1 145
## X937                        0  174.2   84.5 27.8            0                1 140
## X939                        0  170.1   86.4 29.9            0                1 153
## X940                        0  168.3   77.8 27.5            0                0 128
## X941                        0  159.3   73.0 28.8            0                1 138
## X942                        0  171.9   83.2 28.2            0                0 130
## X943                        0  171.6   84.7 28.8            0                1 139
## X945                        0  180.7   80.8 24.7            0                0 130
## X946                        0  165.5   80.0 29.2            0                1 137
## X948                        0  162.9   74.7 28.2            0                1 135
## X949                        0  172.5   76.9 25.9            0                0 122
## X950                        0  173.6   74.7 24.8            0                0 112
## X951                        1  176.2   84.5 27.2            0                0 119
## X953                        0  164.5   84.3 31.1            0                0 125
## X954                        1  171.7   74.9 25.4            0                1 137
## X955                        0  183.7   89.5 26.5            0                0 124
## X956                        0  169.2   64.4 22.5            1                0 128
## X957                        0  173.1   71.4 23.8            0                1 135
## X958                        0  162.9   70.2 26.5            0                1 142
## X959                        0  164.1   67.4 25.0            0                0 128
## X960                        1  176.8   78.3 25.0            0                0 113
## X961                        0  168.8   86.1 30.2            1                1 133
## X962                        0  174.5   90.4 29.7            0                1 134
## X963                        0  160.1   78.6 30.7            0                0 123
## X964                        0  169.3   83.2 29.0            0                0 122
## X965                        0  168.7   81.8 28.8            0                1 131
## X966                        0  172.4   83.5 28.1            0                0 125
## X968                        0  168.9   91.4 32.0            1                1 132
## X969                        0  168.9   76.9 27.0            0                1 138
## X970                        0  176.0   85.3 27.6            0                1 135
## X971                        0  171.4   68.5 23.3            0                0 122
## X972                        0  174.0   76.2 25.2            0                0 127
## X973                        0  163.7   73.2 27.3            0                0 120
## X974                        0  170.2   67.7 23.4            0                1 148
## X975                        0  171.8   90.2 30.6            0                1 131
## X976                        0  168.3   79.3 28.0            0                0 125
## X977                        0  179.7   92.9 28.8            0                0 123
## X978                        0  169.7   82.4 28.6            0                0 122
## X979                        0  162.5   83.7 31.7            0                1 149
## X980                        0  170.7   76.5 26.3            0                1 132
## X981                        0  167.7   83.2 29.6            0                0 123
## X982                        0  156.7   74.8 30.5            0                1 136
## X983                        0  164.9   74.8 27.5            0                1 140
## X984                        1  168.5   76.5 26.9            0                0 120
## X985                        0  165.9   84.8 30.8            0                1 132
```

```
## X986                       0  170.1   74.2 25.6            0                0 117
## X987                       0  159.9   73.3 28.7            0                0 121
## X988                       0  176.0   81.7 26.4            0                0 112
## X989                       0  172.5   84.4 28.4            0                0 125
## X990                       0  159.9   78.0 30.5            0                0 128
## X991                       0  170.2   89.0 30.7            1                0 129
## X992                       1  172.2   85.6 28.9            0                0 117
## X993                       0  164.7   83.5 30.8            0                0 129
## X994                       0  174.4   73.1 24.1            0                0 130
## X995                       0  167.5   75.3 26.9            1                1 132
## X996                       0  174.7   80.9 26.5            1                1 131
## X997                       1  169.7   73.3 25.4            0                1 135
## X998                       0  164.7   72.5 26.7            0                1 133
## X999                       0  174.3   82.5 27.2            0                1 137
##        ldl vaccineVaccinated depression
## X1      95                 1          5
## X2      87                 0          2
## X3     139                 1          5
## X4     126                 1          4
## X6      99                 1          9
## X9      97                 0          8
## X10    111                 0          8
## X11    132                 0          5
## X12    103                 0          4
## X13    122                 0          8
## X14     97                 0          6
## X15     86                 0          5
## X17    117                 0         10
## X18    108                 1          7
## X19    133                 1          8
## X21     86                 1         10
## X22    127                 1          5
## X24     91                 0         10
## X25    119                 0          7
## X26     98                 1          6
## X27    115                 0          6
## X28    116                 0          4
## X29     95                 0          7
## X30    111                 0          8
## X31     67                 1          7
## X33    142                 1         13
## X36     84                 1         10
## X39    133                 1         10
## X40    118                 1          9
## X41    129                 1          6
## X42    114                 1          7
## X45    100                 1          7
## X46     98                 1          8
## X47    111                 1          9
## X49    117                 1          7
## X54    115                 0          7
## X56    139                 1          6
## X57    111                 0          6
## X59     89                 1          4
```

```
## X60  117                  0           6
## X61  113                  0           9
## X62  109                  0           7
## X64  138                  1           4
## X65  118                  0           8
## X67  119                  0           9
## X69  127                  0           4
## X70  116                  1           2
## X72  107                  0           6
## X73   82                  0           8
## X74   76                  1           4
## X75  123                  0           6
## X77   86                  0           9
## X78  131                  0           7
## X79  149                  0          10
## X82   84                  0           7
## X85   89                  1           7
## X87   81                  0           4
## X88   76                  0           4
## X89  116                  0           4
## X90  141                  0           6
## X91  125                  0           6
## X92  150                  1           7
## X93  126                  1          11
## X94  108                  0           8
## X95  150                  1           9
## X96   85                  1           7
## X97  121                  1           9
## X98  105                  0           2
## X99  106                  1          11
## X100 108                  1           6
## X101 131                  1           7
## X102 115                  1           9
## X103 121                  0          11
## X104 117                  1           6
## X105 118                  1          12
## X106 112                  0           5
## X108  87                  1           8
## X109 110                  1           9
## X110  91                  0           7
## X112 148                  1           7
## X113  78                  1           8
## X114  85                  0           3
## X115 126                  0           6
## X116 114                  0           2
## X117 109                  0           5
## X119  96                  1           7
## X120 102                  1           6
## X121 137                  0           8
## X122 110                  0           9
## X123 140                  1           8
## X126 114                  1           7
## X127  94                  0           3
## X128 128                  0           6
```

```
## X129  93                   1           5
## X130 127                   1           6
## X131 107                   1           5
## X132 103                   1           6
## X133 118                   1          12
## X135 122                   1           8
## X136  80                   1           8
## X137 101                   0           7
## X138  98                   1           6
## X139 125                   0           9
## X142 174                   0           6
## X144 148                   1           5
## X145  75                   1           3
## X146  92                   1           6
## X147  94                   1           2
## X148 136                   0           8
## X149 135                   0           5
## X150 118                   1           4
## X152 120                   1           8
## X154 131                   1           8
## X155 135                   0           9
## X156 104                   1           7
## X157 126                   0           8
## X159 119                   1           6
## X160 121                   1           8
## X161  72                   1           6
## X162  82                   1           5
## X163 107                   1           5
## X164  93                   1          10
## X165  63                   0           5
## X166 118                   1           6
## X167 127                   0           5
## X168 109                   0           6
## X169  77                   1           5
## X170 112                   1           9
## X171 111                   1           8
## X172 132                   1           5
## X173 106                   0           6
## X174 135                   0           5
## X175 104                   1           4
## X177 153                   1           7
## X179  72                   1          10
## X180 111                   1           2
## X181 110                   0           5
## X182  99                   0           5
## X183 120                   1           5
## X184 120                   1           8
## X185 102                   1           5
## X186  81                   1           7
## X187 121                   1           7
## X188  74                   0           5
## X189 126                   0           7
## X190 108                   0           2
## X191 127                   1           8
```

```
## X192 134                0           7
## X193  87                0           6
## X194  71                0           9
## X195 109                0           8
## X196  73                1          10
## X198  98                0           9
## X200 101                0           5
## X201  98                0           8
## X202  80                1          10
## X204 105                1           9
## X205  84                1           5
## X206 127                0           4
## X207 136                1          12
## X209 100                1           8
## X211 137                1           9
## X212 152                0           7
## X213 110                0           4
## X214 147                1          10
## X215  81                1           7
## X216 129                0          11
## X217  90                1           8
## X218 125                1           4
## X219 119                1           8
## X220 107                0          11
## X221 131                1           8
## X222  91                1           5
## X223 101                0           9
## X224  80                0           7
## X226 120                0           8
## X227 120                1           4
## X228 108                1           7
## X229 119                1           9
## X230  82                1           4
## X231 101                0           7
## X233  98                1           8
## X234 135                0           8
## X235 143                1           9
## X236 138                0          11
## X237 121                1           8
## X238 156                1           4
## X239  92                0           7
## X240  77                0           6
## X241  93                0           4
## X244 111                0           8
## X245 104                0           2
## X246  98                1           5
## X247  70                1           5
## X248 133                1           4
## X249 130                1           7
## X251 106                1           7
## X252 118                1           6
## X254  81                1           7
## X255 135                1           3
## X256 105                1           4
```

```
## X257 126                0          8
## X258 122                1         10
## X259 117                1          5
## X260 118                0          7
## X261 114                1          3
## X262  90                1          7
## X264 122                0          8
## X265 118                0          9
## X266 104                0         12
## X267 146                0          7
## X268 106                1         10
## X269 104                1          8
## X270 102                1         10
## X273 104                1          8
## X274 106                0         11
## X275 110                0          5
## X276 110                1          5
## X277  76                1          3
## X278  82                1          5
## X279 102                0          7
## X280  82                1          5
## X282  98                0         10
## X283  91                1          5
## X284 116                1          9
## X286 103                1          6
## X289 103                0          7
## X290  69                1          6
## X292  81                1          5
## X293  96                0          7
## X295 137                1          7
## X296 139                1          5
## X298  97                0         10
## X299 110                1          8
## X300 126                1          9
## X301 112                0          7
## X302  68                1          7
## X303  93                1         13
## X305  99                0          9
## X306  88                0          7
## X307  94                1          6
## X311 116                0          8
## X312  90                0          6
## X313 114                1          7
## X314  94                1          4
## X315 108                1          6
## X316 123                1          4
## X317 123                1          8
## X318 123                1          3
## X319  77                0          9
## X321 104                1          5
## X322  75                1          6
## X326  62                1          7
## X327 123                0          7
## X328 117                1          4
```

```
## X329 121                  0          5
## X330  93                  1          9
## X331  76                  0          8
## X332 130                  1          9
## X333 122                  1          7
## X334 147                  0          8
## X335 123                  1          9
## X336  62                  1          8
## X339  91                  0          5
## X340 110                  1          6
## X341 145                  0          9
## X342 112                  0          5
## X345 145                  1          6
## X347  78                  1          7
## X349 123                  1          7
## X351 118                  1          9
## X353 123                  1          4
## X354 114                  1          7
## X355 105                  0          5
## X356 140                  0          7
## X359  76                  0          6
## X360 117                  1         11
## X361  95                  1          6
## X363  99                  1         10
## X365 100                  0          6
## X366 123                  1          8
## X367 121                  0          8
## X369 153                  0          9
## X371 132                  1          7
## X372  99                  0          3
## X373  90                  0          7
## X374 110                  1          2
## X376  95                  0          6
## X377  93                  0          8
## X378 118                  1          9
## X379  77                  1          8
## X380 125                  1          9
## X382 129                  0          6
## X383 111                  0          8
## X385  84                  1          6
## X386 124                  0          5
## X387 152                  0          2
## X388  94                  1          9
## X389 115                  0          8
## X391 101                  0          7
## X392 141                  0          7
## X393 103                  0          4
## X394  81                  0          5
## X395  92                  0         10
## X396 112                  0          7
## X397  99                  0          6
## X398 167                  1          7
## X399  99                  1          7
## X401  86                  1          9
```

```
## X402 126                 1           9
## X405 112                 0           3
## X406 113                 0           7
## X407 116                 0           6
## X408 122                 1           8
## X410 111                 0           6
## X411 124                 0           8
## X412 139                 0           2
## X413  81                 1           5
## X414 118                 0           9
## X415 102                 0           5
## X416  85                 0           5
## X417 121                 1           6
## X418 105                 0           2
## X419 145                 1           6
## X420 105                 1           8
## X421 114                 1           8
## X422  70                 1           8
## X423 120                 1           4
## X424 108                 0           8
## X425 127                 1           9
## X426 120                 0           5
## X427 125                 1           7
## X431 105                 0           8
## X432 122                 0          11
## X434  95                 1           7
## X435 145                 0           7
## X437 162                 0           6
## X438  77                 1           8
## X439 105                 1           4
## X440 109                 0           8
## X441 113                 1           7
## X442  92                 0           6
## X443 107                 0           5
## X444 131                 1           5
## X445 127                 1           4
## X448 123                 1           7
## X450 138                 1           9
## X451 121                 0           8
## X453  87                 0           6
## X454 108                 1           6
## X455 110                 1           6
## X456 122                 0           2
## X457  90                 0           7
## X458  92                 1           8
## X459 149                 1          10
## X460 118                 1           8
## X461 120                 0           8
## X464 110                 1           5
## X465 127                 1           5
## X466  41                 1           7
## X468 128                 1          10
## X469 111                 1           5
## X470  72                 0           3
```

```
## X472 116                    1            4
## X473  97                    0            6
## X474  95                    0            6
## X475  95                    1            3
## X476  98                    1            7
## X478 123                    0            8
## X480 105                    0            8
## X481 106                    0            7
## X482 114                    1            4
## X483  99                    1            6
## X484  99                    0           12
## X486 127                    1            6
## X487 123                    1            8
## X488 128                    1            4
## X489 138                    0            8
## X490  83                    1           10
## X491 122                    0            6
## X492 127                    0           13
## X493 116                    1            7
## X494 104                    0            8
## X495 119                    1            7
## X496 123                    0            6
## X497 127                    1            9
## X498 158                    0            2
## X499 131                    1            7
## X500 161                    1            7
## X501  92                    1            6
## X502 115                    1            6
## X503  89                    1            9
## X504 115                    0           10
## X507 100                    1            5
## X509  86                    0            2
## X511  79                    1            5
## X512 130                    1            6
## X513 101                    0            9
## X514 133                    1            8
## X515 108                    0            7
## X516 115                    0            7
## X518 100                    1            8
## X520 103                    0            5
## X521 103                    1           10
## X522  88                    0            4
## X523 132                    1            5
## X524  91                    0            8
## X525 120                    1            8
## X527 123                    1            5
## X528 133                    0            8
## X529 117                    1            6
## X530  87                    1            5
## X533  89                    1            4
## X535 105                    1            9
## X536 105                    0           10
## X539 121                    0            8
## X540 124                    1            7
```

```
## X541 124                1           8
## X542 119                0           6
## X543 110                0           7
## X545 130                0           7
## X546 152                1           8
## X547 101                0           9
## X548 103                1           3
## X549 103                0           6
## X550 103                1           3
## X551 132                0          11
## X552  82                0           7
## X553 122                1           6
## X554 121                1           5
## X556 100                1           6
## X557  88                0          10
## X558  54                0           8
## X559 126                0           6
## X560 144                1          12
## X561 130                0           6
## X562 134                1           8
## X563 130                1          10
## X564 131                1           9
## X565  96                0           7
## X566 135                0           7
## X567 140                1           8
## X568 112                1           8
## X569 107                0           7
## X571  81                1           5
## X573 153                0           5
## X574  93                0           7
## X575 104                0           9
## X576 137                1           4
## X577 118                1           4
## X579  78                1           7
## X580  94                0           1
## X582 126                1           6
## X584 111                1           7
## X587 133                0           8
## X588 116                1           5
## X589  93                0           5
## X591  64                1           6
## X592 110                1          11
## X593 111                1           6
## X594  94                1           4
## X597  89                0           8
## X598 105                1           5
## X600 134                0           5
## X601 137                1           4
## X602 105                0          10
## X603  89                0           5
## X604 105                1           7
## X605  96                0           6
## X606  99                0           8
## X609  99                0           7
```

```
## X610 154                   0           7
## X611  99                   0           7
## X613 108                   0           9
## X614 130                   0           7
## X615 108                   1           8
## X617  93                   1           7
## X618  95                   0           5
## X619 101                   1          11
## X620  74                   1           9
## X623 131                   0           8
## X624 121                   1          10
## X625 101                   1           6
## X626 140                   1           6
## X628 116                   1           7
## X629 115                   1           5
## X630  80                   1           6
## X631 134                   0           8
## X632  99                   1           7
## X633 117                   0           7
## X634  71                   0           7
## X635 100                   1           7
## X636 149                   1           6
## X637 131                   0           7
## X638 138                   1           5
## X640 109                   1           9
## X641 119                   0           9
## X642 117                   1           9
## X643  61                   1          10
## X644  91                   1           8
## X645  83                   1           5
## X646 103                   1           7
## X648 101                   1           4
## X649  76                   1           9
## X650 104                   1           7
## X652 103                   0           7
## X654 146                   0           8
## X655 103                   0           8
## X656  68                   1           9
## X657  71                   0           9
## X658 106                   0           4
## X659 114                   0           9
## X660 136                   1           8
## X661 122                   0           8
## X663  92                   0           6
## X664 123                   1           9
## X665 104                   0           4
## X666 123                   0           5
## X667 121                   1           8
## X668 120                   1           6
## X669 141                   0           9
## X670 102                   1           6
## X673 116                   0           8
## X674 130                   1           5
## X675  86                   1           9
```

```
## X676 111                    0           7
## X677 101                    1           6
## X678 121                    1           8
## X679 139                    1           4
## X680 136                    0           9
## X681 117                    1           9
## X682 102                    1           8
## X683 134                    1           9
## X684 114                    1           9
## X685 102                    0          10
## X686 122                    1           9
## X687 130                    1           3
## X688 127                    0          11
## X690  89                    0           5
## X691 118                    1           5
## X692 122                    0           7
## X693  98                    1           4
## X694 130                    1           9
## X697 119                    1           8
## X698 138                    1           9
## X699  99                    1           9
## X700 107                    1           8
## X701 124                    1           8
## X702 130                    0           8
## X703 108                    0           9
## X705  93                    1           9
## X706 104                    1           8
## X707 130                    1           8
## X708 129                    1          10
## X709  97                    1           8
## X710 116                    1           7
## X711 118                    0           9
## X712 128                    1           3
## X713 133                    1           7
## X714  75                    0           6
## X715  75                    1           8
## X716 118                    0           7
## X717 129                    1           9
## X718 111                    0           8
## X719 133                    1           8
## X720 112                    1           5
## X721  86                    0           9
## X722 114                    1           9
## X724  80                    0           6
## X725  84                    0          12
## X726 124                    0           4
## X730 134                    0           8
## X731 110                    1           9
## X732 124                    1           6
## X734  92                    1           5
## X735  85                    1           9
## X737 119                    1           4
## X738 111                    1          11
## X739 131                    1           9
```

```
## X740 115                 1           8
## X744 116                 0           6
## X745 116                 0           7
## X746 103                 0          10
## X747  81                 1           7
## X748 111                 1           7
## X749  96                 0          10
## X751 124                 0           7
## X752 114                 1           8
## X753  78                 0           9
## X754 107                 0           9
## X757 137                 1           2
## X758  78                 1           7
## X759 118                 0           3
## X761 106                 1           7
## X762 119                 0           9
## X763 157                 0          10
## X764  81                 1           3
## X765 118                 1           4
## X766 103                 0           6
## X767 118                 1           7
## X768 109                 0           8
## X769 104                 1           6
## X770  97                 1           0
## X772 132                 0           6
## X773 112                 1           8
## X774 118                 0           5
## X775 128                 0          11
## X776 118                 1           3
## X777  78                 1           6
## X778 116                 1           6
## X779 119                 1           7
## X780  98                 1           5
## X781  78                 1           5
## X784 112                 1           5
## X786  77                 1           3
## X787 100                 1           5
## X788  98                 1           6
## X789  99                 0           3
## X790 115                 1           7
## X791 113                 1           6
## X792 106                 0           5
## X794 111                 0           4
## X795 130                 1           6
## X796 117                 1           6
## X797 100                 0           7
## X798 103                 1           2
## X799  93                 0           8
## X800  98                 1           9
## X801 134                 0           9
## X802  91                 0           9
## X803 123                 1           8
## X804 113                 1           6
## X805  96                 0           5
```

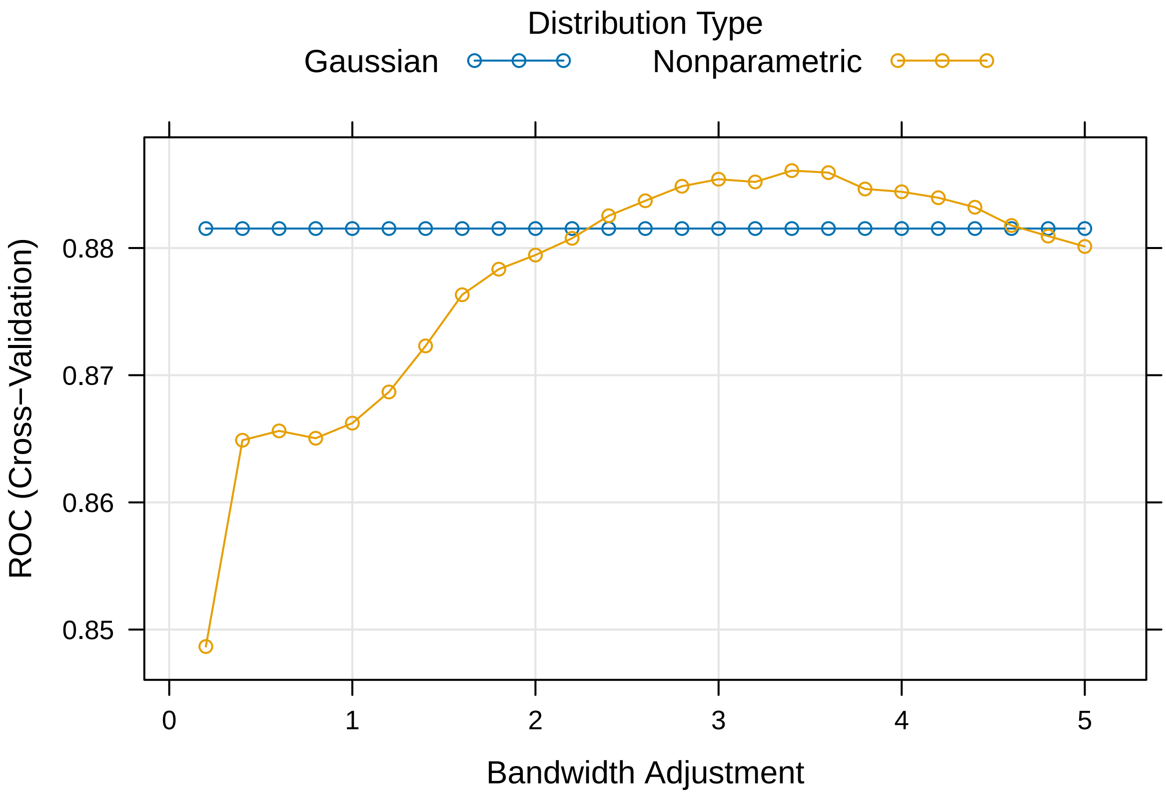
```
## X807 112                 1          8
## X808  84                 1          5
## X809 112                 0          6
## X810 105                 1          1
## X812  98                 1          6
## X813 112                 1          8
## X814 116                 1         10
## X815  61                 1          9
## X816 106                 1          7
## X817  85                 1          6
## X818 137                 1          8
## X820  98                 1          4
## X821  96                 0         10
## X822 132                 0          8
## X823 131                 0          9
## X824 104                 1          5
## X825  79                 0         10
## X826 113                 1          7
## X830 107                 1          8
## X831  98                 1          6
## X832  86                 1          9
## X833  98                 0          5
## X834  83                 1          4
## X836 110                 0         10
## X837  99                 0          8
## X838 114                 0          5
## X839 102                 1          8
## X840 111                 0          7
## X841 109                 1          7
## X842  68                 1          5
## X843 124                 1          8
## X844 110                 1          6
## X847 160                 1          6
## X848 114                 1          9
## X849 141                 1          8
## X850  96                 0          7
## X851 121                 0          7
## X852 107                 1          7
## X853  97                 1          8
## X854 143                 0          7
## X855  90                 1          6
## X856  73                 1          3
## X857 137                 0          6
## X858 111                 1          5
## X859 112                 0          5
## X860 123                 0         13
## X861 104                 1          7
## X862  96                 1          7
## X864 130                 0          4
## X865 121                 1          6
## X866 109                 1          8
## X867  77                 0          8
## X868 102                 1          8
## X869 108                 1         11
```

```
## X870 114                  0           6
## X871  76                  0           7
## X872 101                  1           6
## X873 108                  0           2
## X874  86                  1           8
## X875  98                  1           7
## X877  85                  0           5
## X878  91                  1           2
## X879  73                  1           9
## X880 116                  0           8
## X881 106                  1           4
## X882  94                  1           8
## X883 100                  1           3
## X884 149                  1           5
## X885 115                  1           8
## X886 106                  0           6
## X887 150                  1           7
## X888 109                  0           6
## X889 108                  1           7
## X890 121                  1           9
## X891 149                  1           6
## X892 119                  1           9
## X894 100                  0           7
## X895  98                  1           5
## X897 114                  0           8
## X899  98                  0          11
## X900 110                  1           7
## X901 129                  0           8
## X902  92                  0           3
## X903 128                  1           7
## X904 129                  1           8
## X905 123                  1           7
## X906 128                  1           9
## X907 111                  1           9
## X908 100                  0           9
## X909 135                  1           6
## X910 136                  1           9
## X911  70                  1           9
## X913 127                  1           6
## X916 111                  1           6
## X917 164                  1           9
## X918 126                  0           7
## X919 122                  0           4
## X920  87                  1           7
## X921 134                  0           5
## X922  97                  0           6
## X924  96                  1           5
## X925  99                  1           7
## X926 103                  1           6
## X927 117                  0           8
## X929 106                  0           7
## X932 155                  0           8
## X933  75                  1           7
## X935  96                  1           3
```

```
## X936 115                    0          10
## X937 102                    1           9
## X939 117                    0           9
## X940 108                    0           8
## X941 150                    1           9
## X942 139                    1           9
## X943 127                    0          10
## X945 124                    1           6
## X946 117                    1           7
## X948 121                    0           6
## X949  93                    1           5
## X950  79                    1          11
## X951 145                    1           6
## X953 114                    0           7
## X954 123                    0           4
## X955 128                    1          10
## X956 114                    0           8
## X957  94                    0           7
## X958 140                    1           7
## X959 105                    1           7
## X960 104                    1           7
## X961  97                    0           6
## X962 144                    0           8
## X963 134                    1           9
## X964 102                    1           8
## X965 100                    1          11
## X966  78                    0           6
## X968 130                    1           7
## X969 119                    1           9
## X970 107                    0           6
## X971 112                    1          10
## X972  99                    1          11
## X973  88                    1           8
## X974 133                    0           9
## X975 115                    1           5
## X976  89                    0           7
## X977 111                    1           9
## X978  93                    1           7
## X979 122                    1           7
## X980  89                    1          10
## X981 117                    0           7
## X982 112                    0           4
## X983 157                    0           7
## X984  76                    1          10
## X985 125                    1           8
## X986  83                    0           7
## X987  83                    0           8
## X988 137                    1           6
## X989 114                    1           7
## X990 129                    1          10
## X991 106                    1           6
## X992  95                    1           9
## X993  99                    1           5
## X994  98                    0           7
```

```
## X995 121                 0          7
## X996 120                 0          7
## X997 122                 1          5
## X998 125                 1          5
## X999  98                 0          5
##
## $usekernel
## [1] TRUE
##
## $varnames
##  [1] "age"                   "genderMale"             "raceAsian"
##  [4] "raceBlack"             "raceHispanic"           "smokingFormer_smoker"
##  [7] "smokingCurrent_smoker" "height"                 "weight"
## [10] "bmi"                   "diabetesYes"            "hypertensionYes"
## [13] "sbp"                   "ldl"                    "vaccineVaccinated"
## [16] "depression"
##
## $xNames
##  [1] "age"                   "genderMale"             "raceAsian"
##  [4] "raceBlack"             "raceHispanic"           "smokingFormer_smoker"
##  [7] "smokingCurrent_smoker" "height"                 "weight"
## [10] "bmi"                   "diabetesYes"            "hypertensionYes"
## [13] "sbp"                   "ldl"                    "vaccineVaccinated"
## [16] "depression"
##
## $problemType
## [1] "Classification"
##
## $tuneValue
##    fL usekernel adjust
## 42  1      TRUE    3.4
##
## $obsLevels
## [1] "Not_severe" "Severe"
## attr(,"ordered")
## [1] FALSE
##
## $param
## list()
##
## attr(,"class")
## [1] "NaiveBayes"
```

```
# NB scaled

set.seed(2)
scaled.model.nb = train(x = x.train.scaled,
                 y = y.train.scaled,
                 method = "nb",
                 tuneGrid = nbGrid,
                 metric = "ROC",
                 trControl = ctrl)
plot(scaled.model.nb)
```




```
scaled.model.nb$bestTune
```

```
##    fL usekernel adjust
## 42  1      TRUE    3.4
```

```
scaled.model.nb$finalModel
```

```
## $apriori
## grouping
## Not_severe     Severe
##     0.6425     0.3575
##
## $tables
## $tables$age
## $tables$age$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.7624
##
##        x                  y
##  Min.   :-5.5527   Min.   :1.391e-05
##  1st Qu.:-2.9546   1st Qu.:2.190e-03
##  Median :-0.3566   Median :3.789e-02
##  Mean   :-0.3566   Mean   :9.613e-02
##  3rd Qu.: 2.2414   3rd Qu.:1.865e-01
##  Max.   : 4.8394   Max.   :3.155e-01
##
## $tables$age$Severe
```

```
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.9474
##
##        x                   y
##  Min.   :-5.642222   Min.   :2.631e-05
##  1st Qu.:-2.824892   1st Qu.:2.076e-03
##  Median :-0.007563   Median :3.324e-02
##  Mean   :-0.007563   Mean   :8.865e-02
##  3rd Qu.: 2.809767   3rd Qu.:1.709e-01
##  Max.   : 5.627096   Max.   :2.960e-01
##
##
## $tables$genderMale
## $tables$genderMale$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.4394
##
##        x                 y
##  Min.   :-1.3183   Min.   :0.005056
##  1st Qu.:-0.4092   1st Qu.:0.065590
##  Median : 0.5000   Median :0.296017
##  Mean   : 0.5000   Mean   :0.274341
##  3rd Qu.: 1.4092   3rd Qu.:0.478500
##  Max.   : 2.3183   Max.   :0.501583
##
## $tables$genderMale$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.4928
##
##        x                 y
##  Min.   :-1.4783   Min.   :0.004163
##  1st Qu.:-0.4892   1st Qu.:0.054802
##  Median : 0.5000   Median :0.249263
##  Mean   : 0.5000   Mean   :0.252157
##  3rd Qu.: 1.4892   3rd Qu.:0.451335
##  Max.   : 2.4783   Max.   :0.503657
##
##
## $tables$raceAsian
## $tables$raceAsian$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.2184
```

```
##
##        x                  y
##  Min.   :-0.65534   Min.   :0.001356
##  1st Qu.:-0.07767   1st Qu.:0.058789
##  Median : 0.50000   Median :0.115559
##  Mean   : 0.50000   Mean   :0.431777
##  3rd Qu.: 1.07767   3rd Qu.:0.710201
##  Max.   : 1.65534   Max.   :1.704901
##
## $tables$raceAsian$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.2273
##
##        x                  y
##  Min.   :-0.68188   Min.   :0.001102
##  1st Qu.:-0.09094   1st Qu.:0.056832
##  Median : 0.50000   Median :0.096677
##  Mean   : 0.50000   Mean   :0.422084
##  3rd Qu.: 1.09094   3rd Qu.:0.707112
##  Max.   : 1.68188   Max.   :1.656538
##
##
## $tables$raceBlack
## $tables$raceBlack$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.3518
##
##        x                 y
##  Min.   :-1.0555   Min.   :0.002552
##  1st Qu.:-0.2777   1st Qu.:0.070360
##  Median : 0.5000   Median :0.244896
##  Mean   : 0.5000   Mean   :0.320704
##  3rd Qu.: 1.2777   3rd Qu.:0.517906
##  Max.   : 2.0555   Max.   :0.910590
##
## $tables$raceBlack$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3634
##
##        x                y
##  Min.   :-1.090   Min.   :0.001981
##  1st Qu.:-0.295   1st Qu.:0.059468
##  Median : 0.500   Median :0.203735
##  Mean   : 0.500   Mean   :0.313730
##  3rd Qu.: 1.295   3rd Qu.:0.529073
```

```
##  Max.   : 2.090   Max.   :0.925319
##
##
## $tables$raceHispanic
## $tables$raceHispanic$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.2581
##
##        x                 y
##  Min.   :-0.7743   Min.   :0.001654
##  1st Qu.:-0.1372   1st Qu.:0.077879
##  Median : 0.5000   Median :0.143643
##  Mean   : 0.5000   Mean   :0.391457
##  3rd Qu.: 1.1372   3rd Qu.:0.651065
##  Max.   : 1.7743   Max.   :1.398214
##
## $tables$raceHispanic$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3075
##
##        x                 y
##  Min.   :-0.9224   Min.   :0.001579
##  1st Qu.:-0.2112   1st Qu.:0.062210
##  Median : 0.5000   Median :0.152821
##  Mean   : 0.5000   Mean   :0.350712
##  3rd Qu.: 1.2112   3rd Qu.:0.597910
##  Max.   : 1.9224   Max.   :1.157318
##
##
## $tables$smokingFormer_smoker
## $tables$smokingFormer_smoker$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.4048
##
##        x                 y
##  Min.   :-1.2145   Min.   :0.003377
##  1st Qu.:-0.3572   1st Qu.:0.067287
##  Median : 0.5000   Median :0.283394
##  Mean   : 0.5000   Mean   :0.290960
##  3rd Qu.: 1.3572   3rd Qu.:0.460554
##  Max.   : 2.2145   Max.   :0.699683
##
## $tables$smokingFormer_smoker$Severe
##
## Call:
```

```
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.4607
##
##        x                 y
##  Min.   :-1.382   Min.   :0.003094
##  1st Qu.:-0.441   1st Qu.:0.056076
##  Median : 0.500   Median :0.244153
##  Mean   : 0.500   Mean   :0.265065
##  3rd Qu.: 1.441   3rd Qu.:0.445425
##  Max.   : 2.382   Max.   :0.619975
##
##
## $tables$smokingCurrent_smoker
## $tables$smokingCurrent_smoker$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.2673
##
##        x                  y
##  Min.   :-0.8019   Min.   :0.001728
##  1st Qu.:-0.1509   1st Qu.:0.077124
##  Median : 0.5000   Median :0.151115
##  Mean   : 0.5000   Mean   :0.383183
##  3rd Qu.: 1.1509   3rd Qu.:0.637338
##  Max.   : 1.8019   Max.   :1.338499
##
## $tables$smokingCurrent_smoker$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3118
##
##        x                  y
##  Min.   :-0.9353   Min.   :0.001607
##  1st Qu.:-0.2177   1st Qu.:0.062239
##  Median : 0.5000   Median :0.157377
##  Mean   : 0.5000   Mean   :0.347555
##  3rd Qu.: 1.2177   3rd Qu.:0.592791
##  Max.   : 1.9353   Max.   :1.137104
##
##
## $tables$height
## $tables$height$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.8988
##
##        x                  y
```

```
##  Min.   :-5.9452   Min.   :1.802e-05
##  1st Qu.:-3.0956   1st Qu.:1.898e-03
##  Median :-0.2461   Median :3.268e-02
##  Mean   :-0.2461   Mean   :8.765e-02
##  3rd Qu.: 2.6035   3rd Qu.:1.710e-01
##  Max.   : 5.4531   Max.   :2.897e-01
##
## $tables$height$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.944
##
##        x                 y
##  Min.   :-5.7361   Min.   :1.709e-05
##  1st Qu.:-2.7614   1st Qu.:1.317e-03
##  Median : 0.2133   Median :2.505e-02
##  Mean   : 0.2133   Mean   :8.396e-02
##  3rd Qu.: 3.1880   3rd Qu.:1.602e-01
##  Max.   : 6.1628   Max.   :2.979e-01
##
##
## $tables$weight
## $tables$weight$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.8869
##
##        x                 y
##  Min.   :-5.8049   Min.   :1.167e-05
##  1st Qu.:-2.8143   1st Qu.:1.169e-03
##  Median : 0.1763   Median :2.415e-02
##  Mean   : 0.1763   Mean   :8.351e-02
##  3rd Qu.: 3.1668   3rd Qu.:1.612e-01
##  Max.   : 6.1574   Max.   :2.939e-01
##
## $tables$weight$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.9542
##
##        x                 y
##  Min.   :-5.6761   Min.   :1.826e-05
##  1st Qu.:-2.7052   1st Qu.:1.480e-03
##  Median : 0.2658   Median :2.705e-02
##  Mean   : 0.2658   Mean   :8.406e-02
##  3rd Qu.: 3.2368   3rd Qu.:1.608e-01
##  Max.   : 6.2078   Max.   :2.935e-01
##
```

```
##
## $tables$bmi
## $tables$bmi$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.7902
##
##        x                 y
##  Min.   :-5.2714   Min.   :0.0000155
##  1st Qu.:-2.4599   1st Qu.:0.0017191
##  Median : 0.3515   Median :0.0253085
##  Mean   : 0.3515   Mean   :0.0888335
##  3rd Qu.: 3.1630   3rd Qu.:0.1671165
##  Max.   : 5.9745   Max.   :0.3218230
##
## $tables$bmi$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.9424
##
##        x                y
##  Min.   :-5.618   Min.   :2.766e-05
##  1st Qu.:-2.652   1st Qu.:2.009e-03
##  Median : 0.315   Median :2.867e-02
##  Mean   : 0.315   Mean   :8.419e-02
##  3rd Qu.: 3.282   3rd Qu.:1.585e-01
##  Max.   : 6.248   Max.   :2.943e-01
##
##
## $tables$diabetesYes
## $tables$diabetesYes$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.3137
##
##        x                 y
##  Min.   :-0.9410   Min.   :0.002137
##  1st Qu.:-0.2205   1st Qu.:0.073069
##  Median : 0.5000   Median :0.198557
##  Mean   : 0.5000   Mean   :0.346180
##  3rd Qu.: 1.2205   3rd Qu.:0.570623
##  Max.   : 1.9410   Max.   :1.082367
##
## $tables$diabetesYes$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
```

```
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3568
##
##        x                 y
##  Min.   :-1.0705   Min.   :0.00193
##  1st Qu.:-0.2853   1st Qu.:0.06001
##  Median : 0.5000   Median :0.19888
##  Mean   : 0.5000   Mean   :0.31763
##  3rd Qu.: 1.2853   3rd Qu.:0.53567
##  Max.   : 2.0705   Max.   :0.94928
##
##
## $tables$hypertensionYes
## $tables$hypertensionYes$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.4203
##
##        x                 y
##  Min.   :-1.2610   Min.   :0.003773
##  1st Qu.:-0.3805   1st Qu.:0.066342
##  Median : 0.5000   Median :0.289537
##  Mean   : 0.5000   Mean   :0.283276
##  3rd Qu.: 1.3805   3rd Qu.:0.450622
##  Max.   : 2.2610   Max.   :0.635073
##
## $tables$hypertensionYes$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.4716
##
##        x                 y
##  Min.   :-1.4149   Min.   :0.003319
##  1st Qu.:-0.4574   1st Qu.:0.055554
##  Median : 0.5000   Median :0.246724
##  Mean   : 0.5000   Mean   :0.260511
##  3rd Qu.: 1.4574   3rd Qu.:0.441410
##  Max.   : 2.4149   Max.   :0.586568
##
##
## $tables$sbp
## $tables$sbp$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.7398
##
##        x                 y
##  Min.   :-4.8348   Min.   :0.0000253
##  1st Qu.:-2.3138   1st Qu.:0.0026191
```

```
##  Median : 0.2071   Median :0.0363338
##  Mean   : 0.2071   Mean   :0.0990708
##  3rd Qu.: 2.7281   3rd Qu.:0.1880096
##  Max.   : 5.2490   Max.   :0.3372675
##
## $tables$sbp$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.9012
##
##        x                 y
##  Min.   :-5.0679   Min.   :4.602e-05
##  1st Qu.:-2.3990   1st Qu.:3.181e-03
##  Median : 0.2699   Median :3.867e-02
##  Mean   : 0.2699   Mean   :9.358e-02
##  3rd Qu.: 2.9388   3rd Qu.:1.768e-01
##  Max.   : 5.6076   Max.   :3.105e-01
##
##
## $tables$ldl
## $tables$ldl$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.8996
##
##        x                 y
##  Min.   :-6.1520   Min.   :1.107e-05
##  1st Qu.:-3.2319   1st Qu.:1.429e-03
##  Median :-0.3118   Median :2.945e-02
##  Mean   :-0.3118   Mean   :8.553e-02
##  3rd Qu.: 2.6084   3rd Qu.:1.658e-01
##  Max.   : 5.5285   Max.   :2.901e-01
##
## $tables$ldl$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.9185
##
##        x                 y
##  Min.   :-5.5604   Min.   :2.054e-05
##  1st Qu.:-2.6867   1st Qu.:1.417e-03
##  Median : 0.1869   Median :2.713e-02
##  Mean   : 0.1869   Mean   :8.691e-02
##  3rd Qu.: 3.0605   3rd Qu.:1.659e-01
##  Max.   : 5.9341   Max.   :3.055e-01
##
##
## $tables$vaccineVaccinated
```

```
## $tables$vaccineVaccinated$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.3425
##
##        x                 y
##  Min.   :-1.0276   Min.   :0.002442
##  1st Qu.:-0.2638   1st Qu.:0.070760
##  Median : 0.5000   Median :0.234795
##  Mean   : 0.5000   Mean   :0.326552
##  3rd Qu.: 1.2638   3rd Qu.:0.530281
##  Max.   : 2.0276   Max.   :0.950099
##
## $tables$vaccineVaccinated$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.3634
##
##        x                y
##  Min.   :-1.090   Min.   :0.001981
##  1st Qu.:-0.295   1st Qu.:0.059468
##  Median : 0.500   Median :0.203735
##  Mean   : 0.500   Mean   :0.313730
##  3rd Qu.: 1.295   3rd Qu.:0.529073
##  Max.   : 2.090   Max.   :0.925319
##
##
## $tables$depression
## $tables$depression$Not_severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (514 obs.); Bandwidth 'bw' = 0.8846
##
##        x                 y
##  Min.   :-5.9148   Min.   :1.263e-05
##  1st Qu.:-3.0539   1st Qu.:1.702e-03
##  Median :-0.1929   Median :3.032e-02
##  Mean   :-0.1929   Mean   :8.730e-02
##  3rd Qu.: 2.6680   3rd Qu.:1.682e-01
##  Max.   : 5.5289   Max.   :2.969e-01
##
## $tables$depression$Severe
##
## Call:
##  density.default(x = xx, adjust = ..1)
##
## Data: xx (286 obs.); Bandwidth 'bw' = 0.6955
##
```

```
##        x                  y
##  Min.   :-4.87558   Min.   :0.0000284
##  1st Qu.:-2.41626   1st Qu.:0.0034250
##  Median : 0.04307   Median :0.0418612
##  Mean   : 0.04307   Mean   :0.1015527
##  3rd Qu.: 2.50240   3rd Qu.:0.1898809
##  Max.   : 4.96172   Max.   :0.3422050
##
##
##
## $levels
## [1] "Not_severe" "Severe"
##
## $call
## NaiveBayes.default(x = x, grouping = y, usekernel = TRUE, fL = param$fL,
##     adjust = param$adjust)
##
## $x
##               age genderMale raceAsian raceBlack raceHispanic
## X1   -0.240265582          0         0         0            0
## X2   -1.403779294          1         0         0            0
## X3   -1.171076552          1         0         1            0
## X4   -0.240265582          0         0         0            0
## X6    0.923248131          1         0         0            0
## X9    1.621356358          0         0         0            0
## X10   1.388653616          1         0         0            0
## X11  -2.334590264          1         0         0            1
## X12   1.621356358          0         0         0            0
## X13   0.923248131          1         0         0            0
## X14   0.690545388          0         0         0            0
## X15  -1.636482037          0         0         0            1
## X17   0.225139903          1         0         0            0
## X18   0.457842646          0         0         0            0
## X19  -0.472968324          0         0         0            1
## X21  -0.472968324          1         0         0            0
## X22   0.690545388          0         0         1            0
## X24  -1.171076552          0         0         0            0
## X25   0.225139903          0         0         0            0
## X26   0.923248131          0         0         1            0
## X27   0.690545388          0         1         0            0
## X28  -0.240265582          0         0         0            0
## X29  -0.705671067          1         0         0            0
## X30   0.225139903          0         0         1            0
## X31   1.388653616          0         0         1            0
## X33   0.225139903          1         1         0            0
## X36  -0.938373809          1         0         1            0
## X39   0.690545388          1         0         1            0
## X40   0.923248131          0         0         0            0
## X41   1.155950873          1         0         0            0
## X42  -1.171076552          0         0         1            0
## X45  -0.007562839          1         0         1            0
## X46   0.457842646          1         0         0            0
## X47  -1.171076552          1         0         0            0
## X49   1.388653616          0         0         0            0
```

```
## X54  -0.007562839           1         0         1            0
## X56   0.225139903           1         0         0            0
## X57   0.457842646           1         1         0            0
## X59   0.457842646           1         0         0            0
## X60  -1.171076552           1         0         0            0
## X61  -3.265401234           1         0         0            0
## X62   0.690545388           1         0         0            0
## X64   1.388653616           0         0         0            0
## X65  -0.007562839           1         1         0            0
## X67  -0.472968324           0         0         0            1
## X69   1.155950873           0         0         0            0
## X70   0.225139903           0         0         0            0
## X72  -0.705671067           0         1         0            0
## X73  -0.472968324           0         0         0            1
## X74  -1.171076552           0         0         0            0
## X75  -0.240265582           0         0         0            0
## X77   1.155950873           0         0         0            1
## X78   1.388653616           1         0         0            0
## X79   0.923248131           0         0         1            0
## X82  -0.240265582           1         0         0            0
## X85   0.225139903           0         0         0            0
## X87  -0.938373809           1         1         0            0
## X88  -2.567293006           0         0         0            0
## X89  -1.171076552           1         0         0            0
## X90  -0.705671067           0         0         0            0
## X91   1.155950873           1         0         1            0
## X92  -0.007562839           0         0         0            0
## X93   0.923248131           0         0         0            0
## X94  -0.007562839           1         1         0            0
## X95  -0.705671067           0         0         0            0
## X96  -2.101887522           0         0         0            0
## X97  -0.007562839           0         0         0            0
## X98   1.388653616           0         0         0            0
## X99   0.923248131           0         1         0            0
## X100  0.923248131           0         0         0            0
## X101 -0.705671067           0         0         0            0
## X102 -0.240265582           0         0         0            0
## X103  0.225139903           1         0         1            0
## X104 -2.101887522           1         0         0            0
## X105  0.457842646           0         0         1            0
## X106 -0.705671067           1         0         0            0
## X108 -0.007562839           0         1         0            0
## X109 -2.101887522           0         0         0            0
## X110 -0.472968324           0         0         0            0
## X112  0.457842646           1         0         1            0
## X113 -1.636482037           0         0         0            0
## X114 -0.705671067           1         0         0            0
## X115 -0.938373809           1         1         0            0
## X116  0.457842646           1         0         0            0
## X117  0.923248131           1         0         0            1
## X119  0.457842646           1         0         0            0
## X120 -0.007562839           1         0         1            0
## X121 -0.240265582           0         0         1            0
## X122 -0.472968324           0         0         0            0
```

```
## X123 -1.403779294         1         0         0            0
## X126  0.690545388         1         0         0            0
## X127 -1.403779294         1         0         0            0
## X128  0.225139903         0         0         0            0
## X129  2.319464586         1         0         0            0
## X130 -0.007562839         0         0         0            0
## X131 -0.938373809         0         0         0            1
## X132  1.388653616         1         0         0            1
## X133 -0.705671067         0         1         0            0
## X135  1.388653616         0         0         0            1
## X136  0.923248131         1         1         0            0
## X137 -1.403779294         1         0         0            1
## X138  1.621356358         1         0         0            0
## X139  0.457842646         0         0         0            0
## X142 -0.705671067         0         0         0            1
## X144  1.621356358         0         1         0            0
## X145 -0.240265582         0         0         0            0
## X146 -1.636482037         1         0         1            0
## X147  0.923248131         1         0         0            0
## X148  0.225139903         0         0         0            1
## X149  0.225139903         0         0         0            1
## X150 -0.472968324         0         0         1            0
## X152 -1.171076552         0         0         0            0
## X154 -0.472968324         0         0         0            0
## X155  0.690545388         1         0         0            0
## X156  2.552167328         0         0         0            0
## X157  1.621356358         1         0         1            0
## X159 -0.007562839         0         0         0            1
## X160 -0.705671067         0         0         0            1
## X161 -0.240265582         1         0         0            0
## X162 -0.705671067         1         0         0            0
## X163  0.225139903         0         0         1            0
## X164  0.923248131         1         0         0            1
## X165  0.457842646         0         0         0            0
## X166  0.690545388         1         0         0            0
## X167 -1.403779294         0         0         1            0
## X168 -0.240265582         1         0         0            0
## X169 -0.938373809         0         0         0            0
## X170  0.457842646         1         0         0            0
## X171 -0.938373809         1         0         0            0
## X172  0.457842646         0         0         1            0
## X173 -0.705671067         0         0         0            0
## X174 -0.472968324         1         0         1            0
## X175  0.923248131         0         0         0            0
## X177 -0.472968324         0         0         0            0
## X179 -0.705671067         1         0         0            1
## X180  0.690545388         1         0         0            0
## X181  0.690545388         1         0         0            0
## X182 -1.636482037         1         0         0            0
## X183 -0.240265582         1         0         1            0
## X184  0.225139903         1         0         0            0
## X185  0.457842646         0         0         0            0
## X186 -1.403779294         1         0         1            0
## X187  1.155950873         0         0         0            0
```

```
## X188 -2.567293006          1          0          1            0
## X189  0.225139903          0          0          0            0
## X190  0.923248131          0          1          0            0
## X191  0.690545388          0          0          0            0
## X192  1.155950873          0          0          0            0
## X193 -2.334590264          1          0          1            0
## X194  2.784870071          0          0          0            0
## X195 -0.938373809          0          0          0            0
## X196 -0.705671067          0          0          0            0
## X198  0.457842646          0          0          0            0
## X200 -0.007562839          0          0          0            0
## X201 -0.240265582          1          0          0            0
## X202 -1.869184779          1          0          0            0
## X204 -0.240265582          1          0          0            0
## X205 -0.240265582          0          0          0            0
## X206 -0.705671067          1          0          0            0
## X207  2.086761843          0          0          0            0
## X209  1.155950873          0          0          0            1
## X211 -0.240265582          1          0          1            0
## X212  1.621356358          1          1          0            0
## X213  0.923248131          1          0          0            0
## X214 -0.007562839          1          0          1            0
## X215 -0.705671067          1          0          0            1
## X216 -0.007562839          0          0          1            0
## X217 -0.240265582          0          0          1            0
## X218  0.923248131          0          0          0            0
## X219  0.225139903          0          0          0            0
## X220 -0.007562839          0          0          0            0
## X221  0.690545388          0          0          0            0
## X222 -0.240265582          1          0          0            1
## X223 -0.007562839          0          0          0            0
## X224  1.621356358          0          0          0            1
## X226  1.621356358          1          0          1            0
## X227  1.388653616          1          0          1            0
## X228 -0.240265582          0          0          1            0
## X229 -0.472968324          1          0          0            0
## X230 -0.007562839          1          0          0            0
## X231 -0.472968324          1          0          0            0
## X233  0.457842646          1          0          1            0
## X234 -1.171076552          1          0          0            0
## X235 -0.472968324          1          0          0            0
## X236  0.457842646          0          1          0            0
## X237 -0.007562839          1          0          0            0
## X238  1.621356358          0          0          0            0
## X239  0.225139903          0          0          0            0
## X240 -0.938373809          0          0          0            0
## X241 -1.869184779          1          0          0            0
## X244  1.155950873          1          0          0            0
## X245  0.690545388          1          0          0            0
## X246 -0.938373809          1          0          0            1
## X247 -1.636482037          0          0          0            0
## X248  1.621356358          0          0          0            0
## X249  0.225139903          0          0          0            1
## X251 -0.240265582          1          0          0            0
```

```
## X252 -0.007562839          0          0          0            1
## X254 -0.938373809          0          0          0            0
## X255 -1.171076552          1          0          0            0
## X256 -1.403779294          0          0          1            0
## X257  0.690545388          0          0          0            1
## X258  0.225139903          0          0          1            0
## X259  0.225139903          0          0          0            0
## X260 -0.938373809          1          0          0            1
## X261  0.690545388          1          0          0            0
## X262  0.690545388          0          0          0            1
## X264 -0.472968324          0          0          0            0
## X265  1.388653616          1          0          0            0
## X266  0.457842646          1          1          0            0
## X267  0.923248131          0          0          0            1
## X268 -1.171076552          1          0          0            0
## X269 -0.007562839          1          0          0            0
## X270 -1.869184779          1          0          1            0
## X273  0.225139903          1          1          0            0
## X274  0.923248131          0          0          0            0
## X275 -1.636482037          1          0          0            0
## X276  0.690545388          0          0          1            0
## X277 -2.101887522          1          0          0            0
## X278 -0.938373809          0          0          0            0
## X279 -0.472968324          0          0          1            0
## X280  0.225139903          0          0          1            0
## X282 -0.240265582          1          0          0            0
## X283 -1.403779294          1          0          0            0
## X284  0.923248131          1          0          0            0
## X286  0.225139903          1          0          0            0
## X289 -0.007562839          1          0          0            0
## X290 -0.938373809          0          0          0            0
## X292  1.388653616          0          0          1            0
## X293  0.225139903          1          0          0            0
## X295 -0.472968324          1          0          0            0
## X296 -0.938373809          0          0          0            1
## X298 -0.007562839          0          0          0            0
## X299 -0.240265582          0          0          0            0
## X300  0.225139903          0          0          1            0
## X301  0.457842646          1          0          0            1
## X302 -0.472968324          0          0          0            0
## X303  0.923248131          0          1          0            0
## X305 -0.240265582          1          0          1            0
## X306  0.225139903          0          0          0            1
## X307  1.388653616          0          0          0            0
## X311  2.319464586          0          0          0            0
## X312 -0.240265582          0          0          0            0
## X313  2.086761843          1          0          0            0
## X314 -0.007562839          0          0          1            0
## X315  1.155950873          1          0          0            0
## X316  0.225139903          0          0          0            1
## X317  0.923248131          1          0          0            0
## X318 -1.171076552          0          0          0            0
## X319 -1.403779294          1          0          0            0
## X321 -1.171076552          1          0          0            0
```

```
## X322 -0.007562839           0          0          1             0
## X326 -0.240265582           0          0          1             0
## X327  0.923248131           1          0          0             0
## X328 -0.705671067           0          0          0             0
## X329  0.225139903           0          0          0             1
## X330 -1.171076552           0          0          0             0
## X331 -0.705671067           0          0          0             0
## X332  0.225139903           1          1          0             0
## X333 -0.007562839           1          0          1             0
## X334  0.457842646           0          0          0             0
## X335  0.225139903           0          0          0             0
## X336 -0.007562839           0          0          0             0
## X339 -0.007562839           1          0          0             1
## X340 -0.705671067           1          0          0             0
## X341 -0.240265582           1          0          0             0
## X342 -0.938373809           1          0          0             0
## X345  0.225139903           1          0          0             0
## X347  1.155950873           1          1          0             0
## X349 -0.007562839           0          0          0             0
## X351 -0.705671067           0          0          0             0
## X353  2.086761843           0          0          0             0
## X354 -0.938373809           1          0          0             0
## X355 -0.007562839           0          0          0             0
## X356  0.457842646           1          0          0             0
## X359 -0.007562839           0          0          0             0
## X360  1.854059101           1          0          0             0
## X361  0.923248131           0          0          0             0
## X363 -0.705671067           0          0          0             0
## X365 -1.636482037           1          0          0             0
## X366 -0.705671067           0          0          0             0
## X367 -0.007562839           0          0          0             0
## X369 -0.938373809           1          0          0             0
## X371  1.388653616           1          0          1             0
## X372 -0.240265582           0          0          0             0
## X373  1.155950873           0          0          0             0
## X374 -0.472968324           1          0          0             0
## X376 -0.240265582           1          0          0             0
## X377 -1.403779294           0          0          0             0
## X378  1.388653616           1          0          0             0
## X379 -1.869184779           1          0          0             0
## X380 -0.240265582           0          0          0             0
## X382 -0.705671067           0          0          0             0
## X383 -0.938373809           0          0          0             0
## X385 -0.007562839           0          0          1             0
## X386 -2.799995749           1          1          0             0
## X387 -0.007562839           0          0          0             0
## X388  1.388653616           1          0          0             0
## X389 -0.240265582           1          0          0             0
## X391 -1.869184779           1          0          0             0
## X392  0.457842646           1          0          0             0
## X393 -0.705671067           0          0          0             0
## X394  1.155950873           0          0          0             0
## X395  0.457842646           0          0          0             0
## X396 -0.705671067           0          0          0             1
```

```
## X397 -0.240265582           0          0          1            0
## X398  0.690545388           1          0          0            0
## X399  0.225139903           0          0          1            0
## X401  0.457842646           1          0          0            1
## X402 -0.705671067           1          0          0            0
## X405  0.225139903           1          0          0            0
## X406  0.457842646           1          0          0            1
## X407 -0.938373809           1          0          0            1
## X408 -1.171076552           0          0          0            0
## X410  1.621356358           1          0          0            0
## X411  0.457842646           1          0          0            1
## X412  0.923248131           1          0          1            0
## X413  0.225139903           0          0          0            0
## X414 -0.472968324           0          0          0            1
## X415  0.923248131           0          0          0            0
## X416  0.225139903           1          0          0            0
## X417  0.923248131           1          0          0            0
## X418 -0.240265582           0          0          0            0
## X419 -0.007562839           1          0          0            0
## X420 -1.869184779           1          0          0            0
## X421  1.388653616           1          0          0            0
## X422 -0.240265582           0          1          0            0
## X423 -0.007562839           0          0          0            1
## X424  0.690545388           1          0          1            0
## X425 -1.171076552           1          0          1            0
## X426  2.319464586           0          0          1            0
## X427 -0.007562839           0          0          1            0
## X431 -0.007562839           1          0          1            0
## X432 -0.938373809           1          0          0            0
## X434 -1.171076552           0          0          0            0
## X435 -0.472968324           0          0          0            0
## X437  2.086761843           0          1          0            0
## X438 -1.171076552           1          0          0            0
## X439  2.086761843           1          0          0            1
## X440 -0.007562839           0          0          0            0
## X441 -0.705671067           1          0          0            0
## X442  1.621356358           0          0          0            0
## X443 -0.705671067           1          0          0            0
## X444  1.155950873           1          0          0            1
## X445 -0.705671067           0          0          0            1
## X448  1.388653616           1          0          0            0
## X450  0.690545388           0          0          0            1
## X451  0.225139903           1          0          1            0
## X453 -0.938373809           0          0          0            0
## X454  0.457842646           0          0          1            0
## X455 -0.007562839           1          0          0            1
## X456 -0.007562839           1          0          0            0
## X457  0.225139903           0          0          0            0
## X458 -0.938373809           1          0          0            0
## X459  1.388653616           1          0          0            0
## X460  2.086761843           1          1          0            0
## X461 -0.705671067           1          0          1            0
## X464  0.923248131           0          0          0            0
## X465  1.854059101           0          0          0            1
```

```
## X466 -0.240265582          1         0         0            0
## X468  1.388653616          1         0         1            0
## X469 -0.240265582          0         0         0            1
## X470  0.225139903          0         0         0            0
## X472  0.225139903          0         0         1            0
## X473  0.457842646          0         0         0            0
## X474  0.690545388          0         0         0            0
## X475  0.457842646          1         0         0            0
## X476 -1.636482037          1         0         0            1
## X478  0.457842646          0         0         0            0
## X480  1.621356358          1         0         0            0
## X481  0.923248131          0         0         0            0
## X482 -0.472968324          1         0         0            0
## X483  0.923248131          1         1         0            0
## X484 -0.472968324          1         0         1            0
## X486  2.319464586          0         0         0            0
## X487  1.388653616          1         0         1            0
## X488 -0.938373809          0         0         0            0
## X489  2.319464586          1         0         0            0
## X490  0.690545388          1         0         0            0
## X491  1.155950873          0         0         0            0
## X492 -0.705671067          1         0         0            0
## X493  0.457842646          1         0         0            0
## X494  1.388653616          1         0         0            0
## X495  0.457842646          1         1         0            0
## X496  0.690545388          0         0         0            0
## X497  0.457842646          0         0         1            0
## X498 -0.705671067          1         0         0            0
## X499 -0.705671067          0         0         0            0
## X500 -0.007562839          1         0         1            0
## X501  0.457842646          1         0         1            0
## X502  1.388653616          1         0         0            0
## X503 -0.240265582          0         0         0            0
## X504  0.225139903          0         0         0            0
## X507 -0.240265582          0         0         0            0
## X509 -0.938373809          1         0         0            0
## X511 -0.472968324          1         0         0            0
## X512  1.854059101          0         0         0            0
## X513 -0.007562839          0         0         0            0
## X514 -0.705671067          0         0         0            0
## X515 -0.705671067          0         0         0            0
## X516 -0.007562839          1         0         0            0
## X518 -0.472968324          1         0         0            0
## X520  0.457842646          1         0         0            0
## X521 -0.472968324          1         0         0            0
## X522  0.225139903          0         0         0            0
## X523 -0.240265582          0         0         0            0
## X524  1.854059101          1         0         0            0
## X525 -0.240265582          0         0         0            0
## X527 -0.472968324          0         0         0            0
## X528  0.457842646          1         0         1            0
## X529  0.457842646          0         1         0            0
## X530  0.457842646          1         0         0            0
## X533  0.923248131          1         0         0            0
```

```
## X535  0.225139903          1          0          0            0
## X536 -0.240265582          1          0          0            0
## X539 -0.472968324          0          0          0            0
## X540  0.690545388          1          0          1            0
## X541  2.086761843          0          0          0            1
## X542  1.155950873          1          0          0            0
## X543  0.923248131          0          0          0            0
## X545  0.690545388          0          0          0            0
## X546  0.690545388          0          1          0            0
## X547  1.621356358          0          0          0            0
## X548  1.388653616          1          0          0            0
## X549 -1.403779294          1          0          0            0
## X550 -1.403779294          1          0          1            0
## X551 -1.403779294          1          0          1            0
## X552  0.457842646          0          0          0            0
## X553  1.388653616          0          0          0            0
## X554  0.457842646          1          0          0            1
## X556  0.225139903          0          0          0            0
## X557 -0.472968324          0          0          0            0
## X558 -0.705671067          1          0          0            0
## X559  1.155950873          1          0          0            0
## X560 -0.705671067          1          0          0            1
## X561  0.457842646          1          0          0            0
## X562  0.690545388          0          0          0            0
## X563 -0.472968324          1          0          0            0
## X564 -0.472968324          0          0          1            0
## X565  0.457842646          1          0          0            0
## X566 -1.636482037          0          0          0            0
## X567 -1.403779294          0          0          0            0
## X568  1.854059101          1          0          0            0
## X569  0.457842646          1          0          1            0
## X571  0.690545388          1          0          0            0
## X573  1.155950873          1          0          0            1
## X574 -0.240265582          1          0          0            1
## X575 -1.869184779          0          0          1            0
## X576 -0.240265582          1          0          0            0
## X577  0.225139903          1          0          0            0
## X579 -0.007562839          0          0          1            0
## X580 -1.403779294          0          0          0            1
## X582  0.457842646          0          0          0            0
## X584  0.923248131          1          0          0            0
## X587 -0.705671067          0          0          0            0
## X588  0.690545388          0          0          0            0
## X589 -0.938373809          1          0          0            0
## X591 -1.403779294          0          0          0            0
## X592 -0.007562839          0          0          1            0
## X593 -0.938373809          1          0          0            0
## X594  1.155950873          0          0          0            0
## X597 -0.938373809          0          0          0            1
## X598 -0.938373809          0          0          0            0
## X600  0.225139903          0          0          0            1
## X601  1.155950873          0          0          0            0
## X602 -0.472968324          0          0          0            0
## X603  0.690545388          0          0          0            0
```

```
## X604 -1.869184779          0         1         0            0
## X605  0.923248131          1         0         0            0
## X606  0.457842646          0         0         0            1
## X609  0.690545388          1         0         0            0
## X610 -0.472968324          1         0         0            0
## X611 -1.869184779          1         0         0            0
## X613  0.690545388          1         0         1            0
## X614 -0.472968324          0         0         0            0
## X615 -1.636482037          1         1         0            0
## X617 -0.705671067          1         0         0            1
## X618 -0.240265582          1         1         0            0
## X619 -0.705671067          0         0         0            0
## X620 -1.171076552          1         0         0            0
## X623 -0.240265582          0         0         0            0
## X624  0.225139903          0         0         0            0
## X625 -0.938373809          0         0         0            0
## X626 -0.472968324          0         0         0            0
## X628  2.319464586          1         0         1            0
## X629 -0.240265582          0         0         0            0
## X630  0.225139903          0         0         0            0
## X631  0.923248131          1         0         0            0
## X632 -0.240265582          0         0         0            0
## X633 -0.472968324          1         0         0            0
## X634  0.923248131          1         0         0            0
## X635 -1.171076552          1         0         0            0
## X636 -0.705671067          1         0         1            0
## X637  0.225139903          1         0         0            0
## X638 -0.938373809          0         0         1            0
## X640 -0.007562839          0         0         0            0
## X641 -0.472968324          0         0         0            0
## X642 -0.007562839          1         0         1            0
## X643 -2.334590264          1         0         0            1
## X644 -1.171076552          0         0         0            0
## X645 -1.403779294          1         0         0            1
## X646 -0.472968324          1         0         0            0
## X648 -1.171076552          1         0         0            0
## X649 -0.705671067          1         0         0            0
## X650  0.690545388          0         0         1            0
## X652 -0.472968324          0         0         0            0
## X654  0.923248131          0         0         0            0
## X655  1.854059101          1         0         0            0
## X656 -0.007562839          0         0         0            0
## X657 -0.938373809          1         0         0            0
## X658  0.225139903          1         0         1            0
## X659 -0.240265582          0         1         0            0
## X660  1.388653616          0         0         1            0
## X661  0.923248131          1         0         0            0
## X663 -0.472968324          0         1         0            0
## X664  0.225139903          1         0         0            0
## X665  0.225139903          0         0         0            0
## X666 -0.007562839          0         0         0            0
## X667  2.086761843          1         0         1            0
## X668  1.155950873          0         0         0            0
## X669  1.155950873          1         0         1            0
```

```
## X670  0.225139903          0          0          0             0
## X673  1.155950873          1          0          0             1
## X674  0.457842646          0          0          0             0
## X675 -1.869184779          0          0          0             0
## X676 -0.007562839          1          0          0             0
## X677  0.457842646          1          0          1             0
## X678 -0.240265582          1          0          0             1
## X679  0.690545388          1          0          1             0
## X680 -0.007562839          0          0          0             0
## X681  0.923248131          1          1          0             0
## X682 -0.705671067          0          0          1             0
## X683 -1.171076552          1          0          1             0
## X684  0.923248131          0          1          0             0
## X685 -0.705671067          0          0          1             0
## X686 -0.472968324          0          0          1             0
## X687  0.457842646          1          0          0             0
## X688  0.923248131          0          0          0             0
## X690  0.457842646          1          0          0             0
## X691 -1.869184779          0          0          0             0
## X692 -1.869184779          0          0          0             0
## X693 -0.007562839          0          0          0             0
## X694  0.457842646          0          1          0             0
## X697 -0.705671067          1          0          0             0
## X698  1.155950873          1          0          0             0
## X699 -0.938373809          1          0          0             0
## X700 -0.705671067          1          0          0             0
## X701  0.225139903          1          0          0             0
## X702 -0.472968324          1          1          0             0
## X703  0.690545388          1          0          0             0
## X705 -0.472968324          0          0          1             0
## X706  0.690545388          0          0          0             0
## X707 -0.705671067          1          0          0             0
## X708 -0.472968324          0          0          0             1
## X709  0.690545388          1          0          1             0
## X710  1.155950873          0          0          0             0
## X711  0.225139903          1          0          0             0
## X712 -0.472968324          0          0          0             0
## X713 -2.101887522          0          1          0             0
## X714 -1.171076552          0          1          0             0
## X715 -0.938373809          1          0          0             0
## X716 -0.705671067          0          0          0             0
## X717  0.457842646          1          0          0             0
## X718 -0.240265582          1          0          0             1
## X719 -0.240265582          1          0          1             0
## X720  0.457842646          0          0          0             0
## X721 -0.705671067          1          0          1             0
## X722  0.457842646          1          0          0             0
## X724 -2.334590264          0          0          0             0
## X725 -0.938373809          0          0          1             0
## X726  0.690545388          1          0          0             0
## X730  1.621356358          0          0          1             0
## X731  0.225139903          0          0          0             1
## X732  1.155950873          1          0          0             0
## X734 -0.705671067          1          0          0             0
```

```
## X735 -1.869184779           1          0          0             0
## X737  0.457842646           0          0          0             0
## X738 -0.938373809           0          0          1             0
## X739 -0.240265582           0          0          0             0
## X740 -0.938373809           0          0          0             0
## X744 -1.171076552           1          0          0             0
## X745  0.457842646           0          0          0             0
## X746  0.457842646           0          0          0             0
## X747  0.225139903           1          0          1             0
## X748 -1.403779294           1          0          0             0
## X749  0.690545388           0          0          0             0
## X751 -0.472968324           0          0          0             0
## X752  1.388653616           0          0          0             0
## X753  1.155950873           0          0          0             0
## X754 -0.472968324           1          1          0             0
## X757  0.923248131           1          0          0             0
## X758 -0.240265582           0          0          0             0
## X759 -0.472968324           1          0          1             0
## X761  1.155950873           0          0          1             0
## X762  0.457842646           0          0          0             0
## X763  0.457842646           0          1          0             0
## X764  1.621356358           1          0          0             0
## X765  0.923248131           1          0          1             0
## X766 -0.472968324           1          0          1             0
## X767  0.457842646           0          0          0             0
## X768 -0.472968324           0          0          0             0
## X769  0.225139903           1          0          0             0
## X770  1.155950873           1          0          0             0
## X772 -0.007562839           0          0          0             0
## X773  0.923248131           0          0          0             0
## X774  1.854059101           0          0          0             0
## X775  0.225139903           0          0          1             0
## X776 -0.240265582           0          0          0             0
## X777  0.225139903           1          1          0             0
## X778  1.388653616           1          0          0             0
## X779  0.690545388           1          0          0             0
## X780  0.225139903           0          0          0             0
## X781  2.086761843           1          0          0             0
## X784 -0.705671067           1          0          0             0
## X786  0.690545388           0          0          1             0
## X787  1.388653616           1          0          0             0
## X788  0.923248131           0          0          1             0
## X789 -0.938373809           0          0          1             0
## X790 -0.472968324           0          0          0             0
## X791  0.690545388           1          0          0             0
## X792  1.621356358           1          0          0             0
## X794  1.854059101           0          0          0             0
## X795 -1.171076552           1          0          1             0
## X796  0.225139903           0          0          0             0
## X797 -0.007562839           1          0          0             0
## X798 -0.472968324           1          0          0             0
## X799 -0.472968324           1          0          0             0
## X800  0.923248131           1          0          1             0
## X801  0.457842646           0          0          0             0
```

```
## X802 -2.334590264            1          0          0             0
## X803 -1.636482037            0          0          0             1
## X804 -1.171076552            0          0          0             0
## X805 -1.171076552            0          0          0             0
## X807  1.854059101            0          0          0             0
## X808  0.923248131            1          0          0             0
## X809 -0.472968324            1          0          0             0
## X810 -0.705671067            0          0          0             0
## X812 -0.705671067            0          0          0             0
## X813  0.923248131            0          0          1             0
## X814  0.457842646            1          0          0             0
## X815 -1.171076552            0          0          0             0
## X816  0.690545388            0          0          1             0
## X817 -0.007562839            1          0          0             0
## X818  0.225139903            1          0          0             0
## X820  0.225139903            1          0          0             0
## X821 -0.240265582            1          1          0             0
## X822  0.457842646            0          0          0             0
## X823  1.621356358            0          0          0             0
## X824  0.225139903            0          0          0             1
## X825 -1.171076552            1          0          0             1
## X826  0.923248131            0          0          1             0
## X830  0.690545388            1          0          0             0
## X831 -0.472968324            0          1          0             0
## X832 -1.171076552            0          0          0             0
## X833 -1.869184779            1          0          0             0
## X834  2.086761843            1          0          0             0
## X836 -0.938373809            0          0          1             0
## X837 -1.171076552            1          0          1             0
## X838  0.457842646            1          0          1             0
## X839 -1.636482037            1          0          0             0
## X840 -0.007562839            1          0          0             0
## X841  0.225139903            1          0          1             0
## X842 -0.938373809            1          0          0             0
## X843 -0.007562839            0          0          1             0
## X844 -0.705671067            0          0          0             0
## X847  2.319464586            1          0          0             0
## X848  0.457842646            0          1          0             0
## X849 -0.240265582            1          0          0             0
## X850 -0.472968324            0          0          0             1
## X851  0.923248131            1          0          0             0
## X852 -0.472968324            0          0          1             0
## X853 -1.403779294            1          0          0             0
## X854  1.854059101            0          0          0             0
## X855 -0.705671067            1          0          0             0
## X856 -2.567293006            0          0          1             0
## X857  0.225139903            0          0          0             0
## X858 -0.240265582            1          0          1             0
## X859  0.225139903            1          0          1             0
## X860  0.225139903            0          0          0             0
## X861 -0.938373809            0          0          0             0
## X862 -1.636482037            0          0          0             0
## X864  0.225139903            1          0          0             0
## X865 -1.636482037            0          0          0             0
```

```
## X866  0.923248131            1          0          1            0
## X867 -0.007562839            1          0          0            0
## X868 -0.240265582            1          0          0            0
## X869 -0.007562839            0          0          0            1
## X870 -0.938373809            0          0          0            0
## X871  0.690545388            0          0          0            0
## X872 -1.403779294            0          0          0            0
## X873 -0.938373809            0          0          1            0
## X874 -0.472968324            1          0          0            0
## X875 -0.705671067            1          0          1            0
## X877  0.923248131            0          0          0            0
## X878 -1.403779294            0          0          0            0
## X879 -0.240265582            0          0          0            0
## X880  0.457842646            1          0          1            0
## X881 -0.705671067            0          0          0            0
## X882 -0.007562839            0          1          0            0
## X883 -0.705671067            0          0          0            0
## X884  1.388653616            0          0          0            0
## X885 -0.240265582            0          0          1            0
## X886  0.225139903            0          0          0            0
## X887  1.155950873            1          0          0            0
## X888  1.155950873            1          0          0            0
## X889  1.155950873            1          0          0            1
## X890 -0.472968324            1          0          0            0
## X891 -0.472968324            0          0          0            0
## X892 -0.240265582            1          0          1            0
## X894 -0.007562839            0          0          0            1
## X895  0.923248131            1          0          1            0
## X897 -0.472968324            0          0          0            0
## X899 -0.472968324            1          0          0            0
## X900 -0.705671067            0          0          1            0
## X901  1.854059101            0          0          0            0
## X902  1.388653616            0          0          1            0
## X903  0.225139903            0          0          0            0
## X904 -0.705671067            0          0          0            0
## X905  0.225139903            0          0          0            0
## X906 -1.869184779            1          0          0            0
## X907  0.225139903            0          1          0            0
## X908 -0.705671067            1          0          0            0
## X909 -0.472968324            1          0          0            0
## X910  0.923248131            0          0          0            0
## X911 -1.403779294            0          0          1            0
## X913 -0.240265582            0          0          0            0
## X916  0.225139903            1          0          0            1
## X917  1.388653616            1          0          0            0
## X918 -1.171076552            0          0          0            0
## X919 -0.472968324            1          0          0            0
## X920 -1.403779294            1          0          0            0
## X921  2.319464586            0          0          0            0
## X922  0.690545388            1          0          0            0
## X924 -0.705671067            1          0          0            0
## X925 -1.171076552            0          0          0            0
## X926 -0.938373809            0          0          1            0
## X927  0.923248131            0          0          0            0
```

```
## X929  0.225139903           1          0          0            0
## X932  1.388653616           1          0          1            0
## X933 -0.705671067           1          0          0            0
## X935  1.155950873           0          0          0            0
## X936  0.690545388           1          0          0            0
## X937 -0.705671067           1          1          0            0
## X939  0.923248131           0          0          0            1
## X940  0.690545388           1          0          1            0
## X941  0.923248131           1          0          0            1
## X942 -0.240265582           0          0          1            0
## X943 -0.472968324           1          0          0            0
## X945  1.155950873           1          0          0            0
## X946  0.690545388           1          0          1            0
## X948 -0.472968324           0          0          0            0
## X949 -0.472968324           1          0          0            0
## X950 -2.334590264           0          0          0            0
## X951 -2.101887522           0          0          0            0
## X953  2.086761843           0          0          0            0
## X954  2.086761843           1          0          0            0
## X955 -0.240265582           0          0          0            0
## X956  0.457842646           1          0          0            0
## X957 -1.171076552           0          0          0            0
## X958  0.225139903           0          0          0            0
## X959 -1.403779294           0          0          0            0
## X960 -2.101887522           0          0          0            0
## X961 -0.938373809           0          0          1            0
## X962  0.690545388           1          0          0            1
## X963  0.690545388           1          0          0            0
## X964  1.155950873           1          0          0            0
## X965 -0.240265582           0          0          0            0
## X966 -0.938373809           1          0          1            0
## X968 -0.007562839           1          0          0            1
## X969 -0.007562839           1          0          0            0
## X970 -0.705671067           0          0          0            0
## X971 -1.636482037           0          0          0            0
## X972 -0.007562839           1          0          1            0
## X973 -1.171076552           0          0          0            0
## X974  1.388653616           1          0          0            0
## X975 -0.938373809           1          0          0            0
## X976 -0.472968324           1          0          0            0
## X977 -0.705671067           0          0          0            0
## X978 -0.240265582           1          0          0            0
## X979  1.621356358           0          0          0            0
## X980 -0.472968324           1          0          0            0
## X981  0.225139903           1          0          0            0
## X982 -0.938373809           0          0          1            0
## X983  1.388653616           1          0          1            0
## X984 -1.636482037           0          0          0            0
## X985 -0.240265582           1          0          1            0
## X986 -1.171076552           0          0          0            0
## X987  0.225139903           0          1          0            0
## X988 -2.101887522           1          0          1            0
## X989 -0.938373809           1          0          0            0
## X990 -0.938373809           0          0          0            1
```

```
## X991 -1.171076552          0         0         1            0
## X992 -0.705671067          1         0         1            0
## X993 -0.240265582          0         0         0            0
## X994  0.690545388          0         0         0            0
## X995 -1.403779294          0         0         0            0
## X996 -1.171076552          0         0         1            0
## X997 -0.705671067          0         0         0            0
## X998  0.457842646          1         0         0            0
## X999  0.225139903          1         0         0            0
##      smokingFormer_smoker smokingCurrent_smoker        height       weight
## X1                      1                     0  0.0492639397 -0.650392519
## X2                      1                     0  0.1313021408 -0.512615737
## X3                      1                     0  0.4430473048  1.388703846
## X4                      0                     0  0.2789709027 -0.664170197
## X6                      0                     0 -0.1968506634  1.168260996
## X9                      0                     0 -0.2460735841 -0.402394312
## X10                     0                     0  0.0492639397 -0.884613047
## X11                     1                     0  0.4430473048  1.994921685
## X12                     0                     0 -0.0163666211 -0.760613944
## X13                     0                     0  1.8376967227  1.402481524
## X14                     0                     1  2.2150724476 -0.085507715
## X15                     0                     0 -0.2296659439  1.498925271
## X17                     0                     0 -1.6243153618 -0.843280013
## X18                     0                     0  0.4102320244  0.603376192
## X19                     1                     0 -1.3782007586  1.774478834
## X21                     0                     0  0.4922702254  0.878929755
## X22                     0                     0  0.3610091037 -0.250839853
## X24                     0                     0 -1.5422771607 -0.485060381
## X25                     1                     0  0.1148945006  0.851374399
## X26                     0                     0 -0.6234493089 -0.044174681
## X27                     1                     0 -0.0491819015 -1.449497851
## X28                     0                     0 -2.1985827691 -0.829502335
## X29                     1                     0  0.9680917915 -0.195729140
## X30                     0                     0 -0.5414111079  1.278482421
## X31                     0                     0 -0.6726722295 -0.622837163
## X33                     0                     0  0.9024612307  0.203823526
## X36                     0                     0  0.5086778656 -0.733058588
## X39                     0                     0 -1.1484937957 -2.041938011
## X40                     0                     0 -1.5750924411 -1.408164817
## X41                     0                     0  0.3610091037 -0.057952359
## X42                     1                     0 -0.7711180708  0.713597617
## X45                     0                     0  1.5259515587  0.479377089
## X46                     1                     0  0.4430473048  0.837596721
## X47                     0                     0 -1.1977167163  0.878929755
## X49                     0                     0 -0.6234493089  0.851374399
## X54                     0                     0  1.3454675164 -0.815724657
## X56                     0                     0  1.1321681936  3.496688602
## X57                     1                     0  0.7547924688  0.713597617
## X59                     1                     0  0.0820792202  0.451821733
## X60                     0                     1  0.3446014635 -1.862828195
## X61                     0                     0  0.5743084265 -0.209506818
## X62                     1                     0  1.0173147122  0.534487801
## X64                     0                     0 -0.3445194253 -0.801946978
## X65                     0                     1 -0.0655895417 -1.256610357
```

```
## X67                          1                      0  0.0656715799  0.892707433
## X69                          1                      0  0.0000410191  0.258934239
## X70                          1                      0  1.8376967227 -0.333505922
## X72                          0                      0 -0.8859715523  0.176268170
## X73                          0                      0 -0.9187868327 -0.113063071
## X74                          0                      0 -1.0992708750 -1.642385345
## X75                          1                      0  0.0984868604 -1.587274633
## X77                          1                      0  0.3446014635 -1.132611254
## X78                          1                      0  1.4275057174  1.595369018
## X79                          0                      1  0.6399389873  0.231378882
## X82                          0                      0 -1.0992708750 -0.154396106
## X85                          0                      0 -0.9516021131  0.438044054
## X87                          0                      0  0.6563466275  0.148712813
## X88                          0                      0  1.7720661619  1.292260099
## X89                          0                      0 -0.1148124624  0.217601204
## X90                          0                      0 -0.3281117851 -0.388616634
## X91                          0                      0  0.0984868604 -0.195729140
## X92                          0                      0 -1.1484937957 -0.471282703
## X93                          0                      0  0.3281938233 -0.333505922
## X94                          0                      0 -0.3281117851 -0.402394312
## X95                          0                      0  1.0501299926  0.810041364
## X96                          0                      1  0.3774167439 -0.278395209
## X97                          1                      0  0.6727542677 -0.181951462
## X98                          1                      0  0.6727542677  0.506932445
## X99                          1                      0  0.3610091037  0.823819042
## X100                         1                      0 -0.4265576264 -0.967279116
## X101                         0                      0  0.8696459503  0.699819939
## X102                         1                      0  0.6891619080  0.754930652
## X103                         0                      0  0.2461556223  0.424266376
## X104                         0                      0  1.1157605534  1.168260996
## X105                         0                      0 -0.9023791925 -0.912168404
## X106                         0                      0 -0.7383027904  1.085594927
## X108                         0                      0  0.3774167439  0.258934239
## X109                         0                      0 -1.1156785152 -0.057952359
## X110                         1                      0  0.2789709027  0.121157457
## X112                         1                      0 -1.4110160390 -0.595281806
## X113                         0                      0 -1.5586848009 -0.636614841
## X114                         0                      0  0.5414931461 -0.526393416
## X115                         0                      0 -0.0655895417  0.493154767
## X116                         1                      0  0.4758625852  0.686042261
## X117                         0                      0  0.9844994317  1.319815456
## X119                         0                      0 -0.7711180708 -0.512615737
## X120                         0                      0  1.9033272836  2.559806488
## X121                         0                      0  1.8869196433 -0.278395209
## X122                         1                      0  2.1822571671  1.237149387
## X123                         0                      0  0.6399389873 -1.628607667
## X126                         0                      0  1.0009070720  2.132698466
## X127                         0                      0  1.8048814423  0.589598514
## X128                         1                      0  1.1157605534  1.347370812
## X129                         0                      0 -0.4593729068 -0.250839853
## X130                         0                      0 -2.1821751289 -1.614829989
## X131                         1                      0  0.1641174212  0.672264583
## X132                         0                      0  1.0829452730  1.264704743
## X133                         1                      0 -0.3773347057 -1.256610357
```

```
## X135                     1                        0 -0.5742263883  0.134935135
## X136                     0                        0  0.5414931461  0.603376192
## X137                     0                        0 -2.2970286104 -0.429949669
## X138                     0                        0 -0.1476277428 -0.374838956
## X139                     1                        0  0.0164486593  0.906485111
## X142                     0                        0  1.1321681936  0.258934239
## X144                     0                        0  0.4594549450  1.223371709
## X145                     1                        0 -0.7383027904  1.829589547
## X146                     0                        0 -0.4429652666  0.548265480
## X147                     1                        0  0.2625632625 -1.242832679
## X148                     0                        0  0.7547924688  1.195816352
## X149                     0                        0  1.5259515587  1.402481524
## X150                     0                        0 -1.5750924411 -0.967279116
## X152                     0                        0  0.8204230296  0.672264583
## X154                     1                        0  1.3946904370 -1.077500541
## X155                     0                        0  0.5414931461 -0.237062175
## X156                     0                        0  0.2625632625  0.355377986
## X157                     0                        1  1.2306140349 -0.953501438
## X159                     0                        0  0.2461556223  0.741152974
## X160                     0                        0 -0.7218951502  0.534487801
## X161                     0                        1 -1.4602389597  0.162490492
## X162                     0                        0  0.0328562995  0.534487801
## X163                     0                        1 -0.7054875100 -0.581504128
## X164                     0                        0 -0.8695639121 -0.030397002
## X165                     0                        1  1.7064356010  0.961595824
## X166                     1                        0  1.0501299926  0.644709227
## X167                     1                        0 -1.4110160390  0.851374399
## X168                     1                        0  0.6235313471  0.548265480
## X169                     0                        0 -0.2460735841 -0.691725553
## X170                     0                        0  0.6563466275 -0.085507715
## X171                     0                        0 -1.0008250338 -0.553948772
## X172                     0                        0 -1.1977167163  0.438044054
## X173                     0                        0  0.4922702254  1.319815456
## X174                     0                        0  0.7383848286 -0.181951462
## X175                     0                        0 -1.5915000813 -0.981056794
## X177                     0                        0  1.4931362783  0.134935135
## X179                     1                        0 -0.7711180708  2.284252926
## X180                     1                        0  0.5414931461  0.534487801
## X181                     0                        0  0.8204230296  0.410488698
## X182                     1                        0  0.0000410191  0.589598514
## X183                     0                        0 -0.4921881872 -1.573496954
## X184                     0                        0  1.5915821195  0.010936032
## X185                     0                        0  1.0501299926 -0.581504128
## X186                     0                        0  0.7055695482  1.416259203
## X187                     0                        0 -0.1640353830 -1.628607667
## X188                     1                        0 -2.0509140072 -0.030397002
## X189                     0                        1  0.3774167439  0.355377986
## X190                     0                        0  0.7055695482 -0.002841646
## X191                     0                        0 -1.4274236792 -0.140618428
## X192                     1                        0 -0.7711180708 -0.292172887
## X193                     0                        0 -0.4429652666  0.658486905
## X194                     0                        1 -0.6070416687  0.245156560
## X195                     0                        0 -1.2141243565  1.994921685
## X196                     1                        0 -0.7054875100 -2.014382655
```

```
## X198                        0                      0  0.6399389873  2.160253822
## X200                        0                      1  0.6563466275  0.341600307
## X201                        1                      0  0.9188688709  0.961595824
## X202                        0                      0 -0.6562645893  0.865152077
## X204                        0                      0 -0.4265576264 -0.429949669
## X205                        0                      0  1.3290598762  1.361148490
## X206                        0                      0 -0.5085958274 -0.126840749
## X207                        0                      0 -0.7218951502  0.768708330
## X209                        0                      0 -1.3617931184 -0.416171990
## X211                        0                      1  0.6399389873 -0.953501438
## X212                        1                      0  0.2133403418  0.975373502
## X213                        1                      0  0.6399389873  0.506932445
## X214                        0                      0 -0.1804430232 -1.091278219
## X215                        0                      0 -0.7875257110 -0.016619324
## X216                        0                      0  1.1157605534  0.093602101
## X217                        1                      0  0.2461556223  0.810041364
## X218                        0                      0 -1.3125701978 -0.939723760
## X219                        0                      1  0.0328562995 -0.719280910
## X220                        0                      0  0.4758625852 -0.664170197
## X221                        0                      0 -0.2624812243  0.699819939
## X222                        1                      0 -0.1148124624  1.085594927
## X223                        0                      0 -0.1968506634 -1.036167507
## X224                        1                      0 -0.3937423460  0.024713710
## X226                        0                      0 -0.2132583036 -0.733058588
## X227                        0                      0 -0.4265576264  1.044261893
## X228                        0                      0 -0.6234493089 -0.168173784
## X229                        0                      0 -0.5906340285  0.148712813
## X230                        1                      0  0.6727542677 -1.063722863
## X231                        0                      0 -0.0984048222  0.851374399
## X233                        1                      0  0.3774167439 -0.553948772
## X234                        0                      0 -1.1649014359  0.465599411
## X235                        0                      0 -0.2788888645  0.396711020
## X236                        0                      0 -2.5103279332  0.823819042
## X237                        0                      0 -1.4438313194 -1.063722863
## X238                        0                      1  0.4102320244 -0.540171094
## X239                        0                      0 -0.9516021131 -1.118833576
## X240                        0                      0 -1.4930542401 -0.030397002
## X241                        0                      0  0.1805250614 -0.057952359
## X244                        0                      0  0.1805250614  0.148712813
## X245                        0                      1  0.3938243842 -0.292172887
## X246                        1                      0 -0.8531562719  0.810041364
## X247                        0                      0 -0.7875257110 -0.030397002
## X248                        0                      0  1.3618751566 -0.788169300
## X249                        0                      0 -0.2624812243 -1.890383552
## X251                        0                      0 -2.1657674887  1.237149387
## X252                        0                      0  0.9516841513  1.058039571
## X254                        0                      0  0.1805250614 -0.016619324
## X255                        0                      0 -1.7063535628 -0.925946082
## X256                        0                      0 -0.4429652666  1.085594927
## X257                        1                      0 -0.9680097533  0.479377089
## X258                        1                      0 -0.4757805470  0.286489595
## X259                        0                      1  1.4275057174 -1.077500541
## X260                        0                      0 -1.3782007586 -1.022389829
## X261                        1                      0 -0.1312201026 -0.044174681
```

```
## X262                   0                       1 -2.1001369279 -1.477053207
## X264                   0                       0 -0.1640353830 -0.705503231
## X265                   0                       0  0.6891619080 -0.553948772
## X266                   0                       0  0.7055695482  0.796263686
## X267                   0                       0 -0.1640353830  0.148712813
## X268                   0                       0  1.2142063947  1.554035984
## X269                   1                       0  1.2470216751  1.182038674
## X270                   1                       0 -0.6398569491  1.099372605
## X273                   0                       0 -0.1148124624 -0.030397002
## X274                   0                       1 -0.9516021131 -1.339276426
## X275                   0                       0 -1.0336403142 -1.986827299
## X276                   0                       0 -0.9023791925  1.306037777
## X277                   0                       0 -1.1977167163 -0.595281806
## X278                   0                       0 -1.2961625576 -2.069493368
## X279                   1                       0 -1.1649014359 -1.807717483
## X280                   0                       0  1.2142063947  0.754930652
## X282                   0                       1  1.5095439185 -0.374838956
## X283                   1                       0 -0.3445194253 -1.849050517
## X284                   0                       0  0.4266396646  0.010936032
## X286                   0                       0  0.0656715799  1.595369018
## X289                   0                       1  0.9516841513  1.182038674
## X290                   1                       0 -0.4101499862  0.341600307
## X292                   0                       1 -3.2486717426 -2.951264769
## X293                   1                       0  1.5259515587  0.837596721
## X295                   1                       0 -0.4101499862 -1.504608564
## X296                   0                       0  0.5579007863 -0.085507715
## X298                   0                       0 -0.8039333512 -1.091278219
## X299                   0                       0 -0.6562645893 -0.746836266
## X300                   0                       0  0.3610091037  0.975373502
## X301                   0                       0 -0.6890798698 -0.347283600
## X302                   0                       0  0.4430473048  0.796263686
## X303                   0                       0 -0.6070416687 -0.677947875
## X305                   1                       0 -1.8047994041  0.424266376
## X306                   0                       0  0.0492639397  0.272711917
## X307                   0                       0 -0.9023791925  0.369155664
## X311                   0                       0  1.5423591989  0.479377089
## X312                   0                       0 -0.7711180708 -0.195729140
## X313                   0                       1  0.4922702254  1.719368122
## X314                   0                       0  2.4447794105  0.424266376
## X315                   0                       0 -1.8047994041 -0.168173784
## X316                   1                       0 -0.1804430232 -0.898390725
## X317                   0                       0 -0.3117041449 -2.014382655
## X318                   0                       0 -1.8376146845 -0.898390725
## X319                   1                       0 -0.1476277428 -0.733058588
## X321                   0                       1  1.7392508814  0.644709227
## X322                   0                       0  0.2625632625  1.430036881
## X326                   0                       0  1.4767286381  1.609146697
## X327                   0                       0  0.4266396646  2.325585960
## X328                   1                       0 -0.0984048222  1.030484215
## X329                   0                       0  0.7547924688  0.314044951
## X330                   0                       0  0.8040153894  0.562043158
## X331                   1                       0 -1.4766465999 -0.912168404
## X332                   1                       0 -1.4438313194 -0.733058588
## X333                   0                       0 -1.4930542401 -1.435720173
```

```
## X334                          0                          0  0.1477097810 -0.333505922
## X335                          1                          0 -0.4101499862 -0.829502335
## X336                          1                          0 -1.1156785152 -0.719280910
## X339                          0                          0  0.4922702254  1.154483318
## X340                          0                          1 -0.8039333512 -0.443727347
## X341                          0                          0 -1.8047994041  0.162490492
## X342                          0                          0 -0.6726722295 -1.559719276
## X345                          0                          0  1.0665376328 -0.898390725
## X347                          0                          0 -0.1968506634 -1.821495161
## X349                          0                          0  0.3774167439  0.989151180
## X351                          1                          0 -0.2624812243  0.300267273
## X353                          0                          0  0.3446014635  0.245156560
## X354                          1                          0 -0.0491819015  0.438044054
## X355                          1                          0 -0.9187868327 -1.890383552
## X356                          0                          1 -0.6398569491 -1.229055001
## X359                          0                          0 -0.8695639121 -3.144152263
## X360                          1                          0 -0.4593729068  0.107379779
## X361                          0                          0 -0.4757805470  0.148712813
## X363                          0                          0 -0.0491819015  0.190045848
## X365                          0                          0 -0.1968506634  1.650479731
## X366                          0                          0  0.3281938233 -0.912168404
## X367                          1                          0  0.6399389873  1.719368122
## X369                          1                          0  0.6235313471  1.085594927
## X371                          0                          0 -0.6562645893 -0.815724657
## X372                          1                          0 -0.3773347057  3.345134143
## X373                          0                          0  1.3126522360  0.741152974
## X374                          1                          0  0.4430473048 -1.256610357
## X376                          0                          0  1.3126522360 -0.553948772
## X377                          0                          1 -2.9041112982 -1.959271942
## X378                          0                          0 -0.0327742613 -1.504608564
## X379                          1                          0  0.0164486593 -0.154396106
## X380                          1                          0  0.3117861831  1.815811869
## X382                          0                          1 -0.9023791925 -0.719280910
## X383                          1                          0 -0.8367486317  0.768708330
## X385                          0                          0  0.0820792202 -1.793939805
## X386                          0                          1 -0.8203409914 -0.237062175
## X387                          0                          0  0.1148945006  0.258934239
## X388                          0                          0 -0.2624812243 -0.278395209
## X389                          0                          0  0.7712001090 -1.242832679
## X391                          0                          0 -1.0008250338 -0.622837163
## X392                          1                          0 -0.3773347057 -0.002841646
## X393                          1                          0  0.8368306699  0.107379779
## X394                          0                          0  0.9188688709  0.465599411
## X395                          0                          0  1.3454675164 -0.168173784
## X396                          0                          1  1.5751744793  1.430036881
## X397                          1                          0 -0.6070416687 -0.154396106
## X398                          0                          0 -0.1640353830 -0.705503231
## X399                          1                          0  0.7219771884 -0.526393416
## X401                          1                          0  1.0993529132 -1.518386242
## X402                          0                          0 -0.7383027904 -1.614829989
## X405                          0                          0  0.4922702254 -0.057952359
## X406                          0                          0  0.7712001090  0.024713710
## X407                          1                          0  1.2142063947  0.920262789
## X408                          1                          0  0.5579007863 -0.540171094
```

```
## X410                        1                       0 -0.5414111079 -0.801946978
## X411                        0                       0 -1.5258695205  0.644709227
## X412                        0                       0  0.5250855058 -0.347283600
## X413                        0                       1  0.2461556223 -0.388616634
## X414                        0                       0  0.0984868604 -0.581504128
## X415                        0                       0  0.4430473048  0.575820836
## X416                        1                       0 -0.9351944729 -1.931716586
## X417                        0                       0 -0.8695639121 -0.223284496
## X418                        0                       0  1.2306140349  0.961595824
## X419                        1                       0  1.3290598762  1.471369915
## X420                        0                       0  0.3117861831 -0.195729140
## X421                        0                       0  0.3938243842 -0.085507715
## X422                        0                       0 -0.2296659439 -0.967279116
## X423                        0                       0 -0.3609270655  0.810041364
## X424                        0                       0 -0.9516021131  0.024713710
## X425                        0                       0  0.5250855058 -0.223284496
## X426                        0                       0  2.2642953682  0.810041364
## X427                        1                       0  0.5743084265 -1.862828195
## X431                        0                       0 -0.6562645893 -0.223284496
## X432                        0                       0  0.2297479821 -0.801946978
## X434                        1                       0 -0.2952965047 -0.843280013
## X435                        0                       0  0.8860535905 -0.540171094
## X437                        0                       0  0.8532383101 -2.524156746
## X438                        0                       0 -0.3609270655  1.154483318
## X439                        0                       0  0.3610091037  0.355377986
## X440                        1                       0  0.2297479821  0.520710123
## X441                        1                       0  0.8860535905  0.286489595
## X442                        1                       0 -0.6726722295 -1.380609460
## X443                        0                       0 -0.6234493089 -0.898390725
## X444                        0                       1 -1.0008250338 -2.455268356
## X445                        1                       0 -0.1148124624  0.851374399
## X448                        1                       0  0.9188688709 -0.237062175
## X450                        0                       0  0.2953785429  1.140705640
## X451                        0                       0 -1.0008250338 -0.402394312
## X453                        1                       0 -0.2624812243 -0.815724657
## X454                        1                       0 -0.2132583036  0.493154767
## X455                        0                       0 -0.5250034676 -0.223284496
## X456                        1                       0 -1.3782007586 -0.677947875
## X457                        1                       0 -0.0655895417 -0.126840749
## X458                        0                       0 -1.5094618803  0.534487801
## X459                        1                       0  1.4767286381 -0.278395209
## X460                        0                       0  1.0501299926 -0.057952359
## X461                        1                       0  1.4603209979  0.203823526
## X464                        0                       0  1.4767286381 -0.016619324
## X465                        0                       0 -0.8203409914  0.617153870
## X466                        0                       0  0.8696459503 -0.898390725
## X468                        1                       0  1.2142063947 -0.140618428
## X469                        0                       0 -0.6234493089  0.190045848
## X470                        1                       0 -0.7383027904 -0.622837163
## X472                        1                       0 -0.4921881872  0.396711020
## X473                        0                       0  1.1485758339 -0.485060381
## X474                        0                       1  0.9188688709  2.008699363
## X475                        0                       1  1.1977987545  0.686042261
## X476                        0                       1  1.3126522360  0.617153870
```

```
## X478                       0                      0 -0.1968506634 -0.181951462
## X480                       1                      0  0.2133403418  1.292260099
## X481                       0                      0 -0.3773347057  0.079824423
## X482                       1                      0  0.5250855058  2.711360948
## X483                       0                      0 -0.0491819015 -1.132611254
## X484                       0                      0 -1.3453854782 -0.912168404
## X486                       0                      0  1.1813911143  0.686042261
## X487                       1                      0  0.8204230296  0.562043158
## X488                       1                      0  0.3938243842 -1.366831782
## X489                       0                      0  0.6563466275  0.162490492
## X490                       0                      0  0.4266396646 -1.284165713
## X491                       0                      0  1.2634293153 -0.085507715
## X492                       1                      0  0.6399389873  0.231378882
## X493                       0                      0  0.4430473048  0.066046745
## X494                       1                      0 -1.9688758062 -1.063722863
## X495                       1                      0 -1.1156785152 -1.449497851
## X496                       0                      1  0.9024612307 -0.429949669
## X497                       0                      1  0.3938243842  0.686042261
## X498                       0                      0  1.2634293153  1.498925271
## X499                       0                      0  1.3454675164  0.272711917
## X500                       0                      0 -0.2460735841 -0.609059484
## X501                       0                      0  0.9024612307  0.906485111
## X502                       0                      0  1.9033272836 -0.429949669
## X503                       0                      0  3.3307919819  0.603376192
## X504                       0                      0  0.2461556223 -0.609059484
## X507                       0                      1  1.5751744793 -0.443727347
## X509                       1                      0 -1.9852834464 -0.609059484
## X511                       0                      0 -1.0828632348  0.892707433
## X512                       0                      1 -0.7218951502 -1.408164817
## X513                       0                      0 -0.3281117851  0.451821733
## X514                       0                      0  0.2625632625 -0.953501438
## X515                       0                      0  1.4767286381  0.562043158
## X516                       0                      0 -0.8367486317 -0.664170197
## X518                       0                      0  0.0820792202 -0.099285393
## X520                       0                      0 -0.2132583036  0.121157457
## X521                       1                      0  1.3290598762  0.575820836
## X522                       1                      0  0.0000410191  0.162490492
## X523                       1                      0 -0.6726722295  0.479377089
## X524                       0                      1 -1.0500479544  0.493154767
## X525                       0                      0  0.3938243842 -0.912168404
## X527                       0                      1 -0.4265576264 -0.443727347
## X528                       0                      0 -0.1968506634 -2.813487987
## X529                       1                      0 -0.6398569491 -0.250839853
## X530                       0                      0  0.4430473048 -0.457505025
## X533                       1                      0 -0.3609270655 -0.374838956
## X535                       1                      0  0.8204230296  1.443814559
## X536                       1                      0  1.0173147122  0.754930652
## X539                       1                      0 -2.1821751289 -1.063722863
## X540                       0                      0  1.0009070720 -1.366831782
## X541                       0                      0 -0.9351944729  0.630931548
## X542                       1                      0 -0.4921881872  0.479377089
## X543                       0                      0 -1.2797549173 -0.223284496
## X545                       0                      0  1.4439133577 -1.187721966
## X546                       0                      0 -0.0655895417  0.934040468
```

```
## X547                     0                       0 -1.0992708750 -0.471282703
## X548                     1                       0 -1.2633472771 -0.485060381
## X549                     0                       1  0.7055695482  1.126927962
## X550                     1                       0 -0.3773347057 -2.234825505
## X551                     1                       0 -2.0016910866 -1.807717483
## X552                     1                       0 -2.1165445681 -0.884613047
## X553                     0                       0  0.1148945006  1.016706536
## X554                     0                       0 -0.7218951502 -0.374838956
## X556                     1                       0 -0.1476277428 -1.036167507
## X557                     1                       0  1.9853654846 -0.650392519
## X558                     0                       0 -0.4921881872  0.906485111
## X559                     0                       0  0.6235313471 -0.540171094
## X560                     1                       0  0.2953785429 -1.146388932
## X561                     1                       0 -0.6234493089  1.884700259
## X562                     1                       0 -0.1968506634 -0.168173784
## X563                     0                       0 -0.7054875100 -0.498838059
## X564                     0                       0  1.4931362783  1.044261893
## X565                     0                       1 -0.3609270655  0.878929755
## X566                     0                       0  2.0674036857  0.851374399
## X567                     0                       0  1.7228432412  1.540258306
## X568                     0                       0 -0.4265576264 -0.333505922
## X569                     1                       0  0.3117861831 -0.113063071
## X571                     1                       0 -0.3117041449 -0.994834472
## X573                     0                       0 -0.5742263883  1.016706536
## X574                     0                       1 -0.2460735841 -0.705503231
## X575                     0                       0 -2.9697418591 -1.408164817
## X576                     0                       0 -0.9844173935  0.906485111
## X577                     0                       0  0.5414931461 -0.567726450
## X579                     1                       0 -0.2460735841  0.989151180
## X580                     1                       0 -1.0500479544  0.396711020
## X582                     1                       0  1.7720661619 -0.691725553
## X584                     0                       1  0.1805250614 -1.408164817
## X587                     0                       0 -1.1156785152 -1.504608564
## X588                     1                       0 -0.2460735841  0.589598514
## X589                     0                       0 -0.7711180708  1.512702950
## X591                     0                       0  1.4603209979 -0.898390725
## X592                     1                       0 -1.2961625576  0.024713710
## X593                     0                       1  2.0017731248  0.355377986
## X594                     0                       0  0.2297479821 -1.518386242
## X597                     0                       0 -0.8039333512  1.154483318
## X598                     0                       1  1.3126522360  1.168260996
## X600                     1                       0  0.4758625852  0.589598514
## X601                     0                       0  1.0009070720 -1.394387139
## X602                     1                       0  0.6071237069  0.975373502
## X603                     1                       0 -1.8868376051 -1.876605874
## X604                     1                       0 -0.4757805470  0.562043158
## X605                     1                       0 -1.3617931184 -0.733058588
## X606                     1                       0 -1.4274236792 -0.113063071
## X609                     0                       0  0.0656715799 -1.242832679
## X610                     0                       0  1.1649834741  0.975373502
## X611                     1                       0 -2.4118820919  0.589598514
## X613                     0                       0  0.6235313471  0.286489595
## X614                     1                       0  1.4603209979  1.939810972
## X615                     0                       0 -0.5906340285 -1.421942495
```

```
## X617                      1                      0  0.3281938233  2.422029707
## X618                      0                      0  0.7055695482 -1.284165713
## X619                      1                      0 -1.7883917639 -1.504608564
## X620                      0                      1 -0.1312201026  0.203823526
## X623                      0                      1  0.5250855058 -0.815724657
## X624                      0                      0  1.2306140349  0.575820836
## X625                      0                      0 -0.2460735841  0.107379779
## X626                      0                      0  1.0337223524  0.548265480
## X628                      0                      0 -1.2961625576  0.217601204
## X629                      0                      0 -0.8695639121 -0.705503231
## X630                      0                      0 -1.1320861554  0.438044054
## X631                      1                      0  0.6563466275 -1.835272839
## X632                      1                      0 -1.0500479544 -1.780162127
## X633                      0                      0  2.0345884052  0.920262789
## X634                      0                      1 -0.0655895417 -0.457505025
## X635                      0                      1  1.0173147122 -0.057952359
## X636                      1                      0 -0.9351944729 -0.815724657
## X637                      1                      0  1.7228432412  1.512702950
## X638                      0                      0 -0.6726722295  0.892707433
## X640                      0                      1 -1.1977167163 -0.209506818
## X641                      0                      0 -0.2788888645  0.010936032
## X642                      0                      0 -1.3125701978  0.410488698
## X643                      1                      0 -0.8039333512 -0.140618428
## X644                      0                      0 -0.4757805470 -0.278395209
## X645                      1                      0 -1.0172326740 -0.512615737
## X646                      0                      0 -1.3782007586  0.300267273
## X648                      0                      0 -0.4757805470  0.079824423
## X649                      1                      0 -0.1640353830  0.506932445
## X650                      0                      0  0.4102320244 -0.223284496
## X652                      0                      0 -0.6890798698  0.548265480
## X654                      1                      0  1.3618751566  1.581591340
## X655                      1                      0 -0.9023791925 -0.925946082
## X656                      0                      1 -0.0819971820 -0.361061278
## X657                      0                      0  0.8204230296 -1.849050517
## X658                      1                      0 -1.2633472771  0.355377986
## X659                      0                      0  0.1641174212 -1.008612151
## X660                      0                      1 -1.2797549173  1.815811869
## X661                      1                      0  1.8048814423 -0.953501438
## X663                      0                      0  1.1813911143  0.410488698
## X664                      0                      0  1.5587668391  0.134935135
## X665                      1                      0 -0.2132583036  0.052269066
## X666                      1                      0  0.1313021408  2.022477041
## X667                      0                      0 -1.4602389597  2.008699363
## X668                      1                      0 -2.1165445681 -1.160166610
## X669                      0                      0 -1.1320861554 -0.374838956
## X670                      0                      0  2.7401169343  0.203823526
## X673                      0                      0  0.3117861831  1.471369915
## X674                      0                      0  1.3946904370  1.512702950
## X675                      0                      0  1.0009070720  0.176268170
## X676                      0                      0 -0.3609270655 -0.774391622
## X677                      0                      0 -0.6234493089 -0.181951462
## X678                      1                      0 -0.5414111079  0.038491388
## X679                      0                      0  1.3782827968  0.947818146
## X680                      0                      0 -0.2132583036  1.085594927
```

```
## X681                      1                      0 -0.3281117851  0.975373502
## X682                      1                      0  0.0820792202  0.727375295
## X683                      0                      0  0.2789709027  0.658486905
## X684                      0                      0  1.3946904370  0.768708330
## X685                      0                      0 -0.5085958274  0.603376192
## X686                      0                      0 -0.1312201026 -0.636614841
## X687                      0                      0  0.0164486593  0.768708330
## X688                      1                      0  0.2297479821  0.920262789
## X690                      0                      0 -1.3289778380 -1.132611254
## X691                      0                      0 -1.4602389597  0.617153870
## X692                      0                      0  0.3938243842  0.286489595
## X693                      0                      0  1.6408050402  0.314044951
## X694                      1                      0 -0.0327742613  0.203823526
## X697                      0                      1  0.8860535905  0.079824423
## X698                      0                      0 -0.4101499862 -1.559719276
## X699                      0                      0 -0.3117041449 -0.085507715
## X700                      0                      1  1.0501299926  2.256697569
## X701                      0                      0  0.0492639397 -0.636614841
## X702                      0                      0 -0.6398569491 -0.347283600
## X703                      0                      0  0.8204230296  0.686042261
## X705                      0                      1  2.3135182888 -0.760613944
## X706                      0                      0  0.0656715799  0.148712813
## X707                      0                      0 -0.0163666211 -0.733058588
## X708                      0                      0 -0.0819971820 -1.945494264
## X709                      1                      0 -2.1985827691 -1.187721966
## X710                      1                      0  1.3618751566  0.451821733
## X711                      0                      0 -0.0819971820  0.975373502
## X712                      0                      1 -2.0837292877 -0.085507715
## X713                      0                      0  0.0656715799 -0.305950565
## X714                      1                      0  1.0337223524 -0.526393416
## X715                      0                      0 -1.7227612030 -1.408164817
## X716                      0                      0 -0.0819971820 -0.512615737
## X717                      0                      0  0.2461556223  0.603376192
## X718                      0                      1  2.0838113259  0.823819042
## X719                      0                      0  0.0820792202 -1.904161230
## X720                      0                      1  0.3610091037 -1.008612151
## X721                      0                      0 -0.2460735841  0.451821733
## X722                      0                      0  0.1148945006  0.079824423
## X724                      0                      0 -0.2132583036 -1.160166610
## X725                      0                      1  1.3454675164  0.506932445
## X726                      0                      0  0.6727542677 -0.195729140
## X730                      0                      1  0.7547924688 -0.030397002
## X731                      0                      0  1.1485758339  1.306037777
## X732                      0                      0  0.4594549450  0.878929755
## X734                      0                      0  0.7055695482  1.374926168
## X735                      0                      0  1.3618751566 -0.250839853
## X737                      0                      0  1.3946904370  0.258934239
## X738                      0                      0 -0.7218951502 -0.746836266
## X739                      1                      0  2.1002189661 -1.752606770
## X740                      1                      0 -0.7547104306  1.471369915
## X744                      0                      0  1.4603209979  1.058039571
## X745                      0                      0  0.2625632625 -0.526393416
## X746                      0                      0  1.5751744793  0.796263686
## X747                      1                      0  0.5250855058  0.630931548
```

```
## X748                       0                     0 -0.7054875100  0.024713710
## X749                       0                     0  0.8532383101 -1.173944288
## X751                       0                     0  0.2133403418 -1.242832679
## X752                       0                     1 -1.0664555946  0.865152077
## X753                       1                     0  0.6399389873 -0.691725553
## X754                       0                     1 -0.1476277428  2.229142213
## X757                       0                     0  0.0328562995 -0.416171990
## X758                       0                     0  1.5095439185  0.534487801
## X759                       0                     0  1.1813911143  1.182038674
## X761                       0                     1  0.2789709027  1.182038674
## X762                       0                     0 -0.2132583036 -0.884613047
## X763                       0                     0  0.2625632625  1.154483318
## X764                       0                     0  0.0000410191  0.148712813
## X765                       0                     0  1.6079897598  0.947818146
## X766                       1                     0  1.1813911143 -0.967279116
## X767                       0                     0 -0.4921881872  1.664257409
## X768                       1                     0 -1.1320861554 -0.168173784
## X769                       0                     0  0.0328562995 -0.843280013
## X770                       0                     1 -1.2961625576  0.176268170
## X772                       1                     0 -0.3773347057 -2.110826402
## X773                       0                     0 -1.0008250338 -0.168173784
## X774                       0                     0 -0.2624812243 -1.091278219
## X775                       0                     0 -0.8695639121 -0.540171094
## X776                       0                     0  0.0492639397 -0.113063071
## X777                       1                     0 -1.3782007586 -0.485060381
## X778                       0                     0 -0.7383027904 -0.664170197
## X779                       1                     0  1.7392508814  0.534487801
## X780                       1                     0 -2.4282897321 -1.118833576
## X781                       0                     0 -0.9844173935 -0.705503231
## X784                       0                     0  0.2953785429  0.520710123
## X786                       0                     1  0.6071237069 -0.719280910
## X787                       0                     1 -0.0491819015  2.532251132
## X788                       0                     0 -1.3946083988 -1.449497851
## X789                       0                     0 -0.5742263883  2.118920788
## X790                       0                     0  0.7547924688  1.209594030
## X791                       1                     0 -0.0984048222 -2.014382655
## X792                       0                     0  1.4275057174 -2.000604977
## X794                       0                     0  1.1157605534 -0.567726450
## X795                       0                     1 -0.2460735841 -0.113063071
## X796                       0                     0  0.3281938233 -0.057952359
## X797                       1                     0 -0.2460735841 -0.319728243
## X798                       0                     1  0.6563466275  0.920262789
## X799                       0                     0 -1.3125701978 -0.030397002
## X800                       0                     0 -1.1484937957 -0.664170197
## X801                       1                     0  0.9516841513 -0.843280013
## X802                       0                     0  1.0337223524 -0.250839853
## X803                       0                     1 -0.2296659439  1.719368122
## X804                       1                     0  0.2133403418 -0.746836266
## X805                       0                     0  0.1969327016  0.190045848
## X807                       0                     0 -1.3453854782 -1.904161230
## X808                       0                     0 -0.9680097533 -0.581504128
## X809                       1                     0  0.0328562995  0.410488698
## X810                       1                     0  0.1969327016  0.920262789
## X812                       1                     0 -0.8203409914  2.325585960
```

```
## X813                         0                      1 -0.2952965047 -0.071730037
## X814                         0                      0  0.1477097810  0.713597617
## X815                         0                      0  0.0820792202 -1.917938908
## X816                         0                      0  0.1805250614 -0.374838956
## X817                         0                      0 -1.0008250338 -0.126840749
## X818                         1                      0  0.9188688709  1.333593134
## X820                         0                      0  1.3290598762 -2.372602287
## X821                         0                      0  2.0345884052  0.010936032
## X822                         0                      1  0.5086778656  0.341600307
## X823                         1                      0  1.3290598762  0.245156560
## X824                         1                      0  0.2133403418  0.823819042
## X825                         0                      0  1.9197349238  0.782486008
## X826                         1                      0 -0.4593729068 -0.361061278
## X830                         0                      0 -0.0327742613  0.286489595
## X831                         1                      0  0.7055695482  1.002928858
## X832                         0                      0 -2.8877036580  1.016706536
## X833                         0                      0 -0.9023791925 -1.132611254
## X834                         1                      0 -1.6735382824  0.286489595
## X836                         0                      0  1.4603209979  0.727375295
## X837                         1                      0  0.3281938233 -1.242832679
## X838                         1                      0 -1.6407230020 -1.229055001
## X839                         0                      1 -0.7054875100  0.134935135
## X840                         0                      1  0.3938243842  0.355377986
## X841                         0                      0  1.0337223524  0.947818146
## X842                         0                      0 -0.9516021131  0.603376192
## X843                         1                      0 -1.0008250338 -0.870835369
## X844                         0                      0  0.4266396646 -2.358824609
## X847                         0                      0 -1.1484937957 -1.118833576
## X848                         0                      0  0.4102320244  1.540258306
## X849                         0                      0 -0.8531562719 -0.994834472
## X850                         0                      1 -0.0491819015  0.686042261
## X851                         1                      0 -0.0163666211 -0.664170197
## X852                         0                      0 -0.2132583036 -0.829502335
## X853                         0                      0  0.2461556223  0.438044054
## X854                         0                      0 -2.2806209702 -1.339276426
## X855                         1                      0 -1.5258695205  1.485147593
## X856                         0                      0 -0.1476277428 -1.380609460
## X857                         0                      0 -0.1476277428 -0.416171990
## X858                         0                      0 -1.4766465999  0.134935135
## X859                         0                      0  1.4275057174 -0.540171094
## X860                         0                      0  0.3938243842  0.314044951
## X861                         0                      0 -0.7711180708 -0.636614841
## X862                         1                      0  0.6891619080  0.947818146
## X864                         0                      0 -1.6079077216 -1.036167507
## X865                         1                      0 -0.2296659439 -0.402394312
## X866                         1                      0 -0.4101499862 -0.829502335
## X867                         0                      0  0.5579007863  0.176268170
## X868                         1                      0 -0.4921881872  0.245156560
## X869                         1                      0  1.7064356010  0.038491388
## X870                         0                      0 -0.8203409914 -1.711273736
## X871                         0                      0 -0.6562645893 -0.319728243
## X872                         0                      1 -1.0336403142 -1.077500541
## X873                         0                      0 -0.5250034676 -0.264617531
## X874                         0                      1 -0.6726722295 -1.628607667
```

```
## X875                        0                      0 -0.3609270655 -0.016619324
## X877                        0                      1  0.1148945006  0.617153870
## X878                        1                      0  0.3610091037 -1.270388035
## X879                        0                      0  1.2798369555  1.457592237
## X880                        0                      0  1.3126522360  0.479377089
## X881                        1                      0  0.1805250614  0.934040468
## X882                        1                      0  0.5414931461 -1.256610357
## X883                        1                      0 -1.8868376051  0.975373502
## X884                        0                      0 -0.5906340285  1.333593134
## X885                        0                      0  1.7392508814  1.884700259
## X886                        0                      0 -1.0664555946 -0.815724657
## X887                        0                      0  1.9525502042 -0.030397002
## X888                        0                      0 -0.6234493089 -0.154396106
## X889                        0                      0 -0.8203409914 -0.126840749
## X890                        0                      0  0.2297479821 -1.146388932
## X891                        1                      0 -0.6726722295 -1.463275529
## X892                        1                      0  1.2306140349  1.113150283
## X894                        0                      0  0.9188688709  0.314044951
## X895                        0                      0 -0.0327742613  0.107379779
## X897                        1                      0  0.8368306699 -0.733058588
## X899                        0                      0  0.9188688709 -0.636614841
## X900                        1                      0 -2.3462515310 -0.664170197
## X901                        1                      0 -0.0163666211  0.176268170
## X902                        0                      0 -0.0655895417  1.485147593
## X903                        0                      0 -0.7054875100  0.451821733
## X904                        1                      0  0.3774167439 -0.443727347
## X905                        1                      0  2.7565245745  0.520710123
## X906                        1                      0  0.1148945006  0.534487801
## X907                        0                      0 -0.0163666211  0.699819939
## X908                        1                      0  0.9516841513  0.121157457
## X909                        1                      0  0.7055695482  1.981144006
## X910                        1                      0 -0.6726722295  0.754930652
## X911                        0                      0  0.2625632625  0.465599411
## X913                        1                      0  0.5414931461 -0.829502335
## X916                        0                      0 -1.2305319967  0.465599411
## X917                        0                      0 -1.0500479544  1.209594030
## X918                        0                      0 -0.8859715523  0.066046745
## X919                        0                      0  0.3281938233  2.077587753
## X920                        1                      0 -0.8531562719  0.382933342
## X921                        0                      0 -1.1649014359 -0.553948772
## X922                        0                      0 -0.4429652666 -0.002841646
## X924                        0                      0  1.4767286381  2.711360948
## X925                        0                      0  1.1813911143  1.884700259
## X926                        1                      0 -0.6890798698 -0.526393416
## X927                        0                      0 -1.0828632348 -0.126840749
## X929                        0                      0  0.5907160667 -0.237062175
## X932                        0                      0  0.1148945006  0.258934239
## X933                        1                      0  0.5250855058 -0.650392519
## X935                        0                      0  0.8204230296 -0.870835369
## X936                        0                      0  0.9188688709  1.361148490
## X937                        0                      0  0.6891619080  0.699819939
## X939                        1                      0  0.0164486593  0.961595824
## X940                        1                      0 -0.2788888645 -0.223284496
## X941                        0                      0 -1.7555764835 -0.884613047
```

```
## X942                          0                            0  0.3117861831  0.520710123
## X943                          0                            0  0.2625632625  0.727375295
## X945                          0                            0  1.7556585217  0.190045848
## X946                          0                            0 -0.7383027904  0.079824423
## X948                          1                            0 -1.1649014359 -0.650392519
## X949                          0                            0  0.4102320244 -0.347283600
## X950                          0                            0  0.5907160667 -0.650392519
## X951                          0                            1  1.0173147122  0.699819939
## X953                          0                            0 -0.9023791925  0.672264583
## X954                          0                            1  0.2789709027 -0.622837163
## X955                          1                            0  2.2478877280  1.388703846
## X956                          0                            0 -0.1312201026 -2.069493368
## X957                          0                            0  0.5086778656 -1.105055898
## X958                          0                            0 -1.1649014359 -1.270388035
## X959                          0                            0 -0.9680097533 -1.656163023
## X960                          0                            1  1.1157605534 -0.154396106
## X961                          0                            0 -0.1968506634  0.920262789
## X962                          1                            0  0.7383848286  1.512702950
## X963                          1                            0 -1.6243153618 -0.113063071
## X964                          0                            0 -0.1148124624  0.520710123
## X965                          0                            0 -0.2132583036  0.327822629
## X966                          1                            0  0.3938243842  0.562043158
## X968                          0                            0 -0.1804430232  1.650479731
## X969                          1                            0 -0.1804430232 -0.347283600
## X970                          0                            0  0.9844994317  0.810041364
## X971                          0                            0  0.2297479821 -1.504608564
## X972                          1                            0  0.6563466275 -0.443727347
## X973                          1                            0 -1.0336403142 -0.857057691
## X974                          1                            0  0.0328562995 -1.614829989
## X975                          1                            0  0.2953785429  1.485147593
## X976                          0                            0 -0.2788888645 -0.016619324
## X977                          0                            0  1.5915821195  1.857144903
## X978                          0                            0 -0.0491819015  0.410488698
## X979                          0                            0 -1.2305319967  0.589598514
## X980                          1                            0  0.1148945006 -0.402394312
## X981                          1                            0 -0.3773347057  0.520710123
## X982                          1                            0 -2.1821751289 -0.636614841
## X983                          1                            0 -0.8367486317 -0.636614841
## X984                          0                            1 -0.2460735841 -0.402394312
## X985                          1                            0 -0.6726722295  0.741152974
## X986                          1                            0  0.0164486593 -0.719280910
## X987                          0                            0 -1.6571306422 -0.843280013
## X988                          0                            0  0.9844994317  0.314044951
## X989                          0                            0  0.4102320244  0.686042261
## X990                          1                            0 -1.6571306422 -0.195729140
## X991                          0                            0  0.0328562995  1.319815456
## X992                          0                            1  0.3610091037  0.851374399
## X993                          0                            0 -0.8695639121  0.562043158
## X994                          0                            0  0.7219771884 -0.870835369
## X995                          0                            0 -0.4101499862 -0.567726450
## X996                          1                            0  0.7712001090  0.203823526
## X997                          0                            1 -0.0491819015 -0.843280013
## X998                          1                            0 -0.8695639121 -0.953501438
## X999                          1                            0  0.7055695482  0.424266376
```

```
##                bmi diabetesYes hypertensionYes        sbp         ldl
## X1   -0.63511852           0               0 -1.2354661 -0.76054208
## X2   -0.56203238           1               1  0.3953052 -1.15944958
## X3    0.89969033           0               0 -0.8591342  1.43344917
## X4   -0.81783386           0               0 -1.1100221  0.78522448
## X6    1.19203487           0               1  0.2698613 -0.56108833
## X9   -0.19660170           0               1  1.0225250 -0.66081520
## X10  -0.85437693           0               1  0.6461931  0.03727292
## X11   1.44783635           0               0 -0.2319145  1.08440510
## X12  -0.70820465           0               1  1.6497447 -0.36163458
## X13  -0.08697250           1               1  1.1479689  0.58577073
## X14  -1.51215215           0               0 -0.1064706 -0.66081520
## X15   1.55746555           0               1  0.1444173 -1.20931302
## X17   0.38808738           0               1  1.0225250  0.33645354
## X18   0.20537204           0               0 -0.2319145 -0.11231739
## X19   2.87301599           0               1  0.3953052  1.13426854
## X21   0.42463045           0               0  0.0189734 -1.20931302
## X22  -0.48894625           0               1  0.5207492  0.83508792
## X24   0.68043192           0               0 -0.7336903 -0.95999583
## X25   0.68043192           0               1  0.5207492  0.43618042
## X26   0.42463045           0               1  0.1444173 -0.61095177
## X27  -1.32943681           0               1  1.2734129  0.23672667
## X28   0.86314726           0               1  0.7716371  0.28659011
## X29  -0.85437693           0               1  0.7716371 -0.76054208
## X30   1.59400862           0               1  0.5207492  0.03727292
## X31  -0.12351557           0               1  0.1444173 -2.15671833
## X33  -0.45240318           0               0  0.0189734  1.58303948
## X36  -1.03709226           0               1  1.2734129 -1.30903989
## X39  -1.18326454           0               1  0.5207492  1.13426854
## X40  -0.23314477           0               1  0.3953052  0.38631698
## X41  -0.34277398           0               0 -0.7336903  0.93481479
## X42   1.26512101           0               0 -0.9845782  0.18686323
## X45  -0.63511852           0               1  0.6461931 -0.51122489
## X46   0.42463045           0               0 -0.2319145 -0.61095177
## X47   1.77672396           0               1  0.1444173  0.03727292
## X49   1.26512101           1               1  0.5207492  0.33645354
## X54  -1.58523828           0               0 -0.3573584  0.23672667
## X56   2.17869770           0               1  0.3953052  1.43344917
## X57   0.09574284           0               1  0.8970810  0.03727292
## X59   0.35154431           0               1  0.1444173 -1.05972270
## X60  -1.95066896           0               0 -1.1100221  0.33645354
## X61  -0.59857545           0               0 -0.6082463  0.13699979
## X62  -0.26968784           0               0 -0.7336903 -0.06245396
## X64  -0.52548931           1               1  2.9041842  1.38358573
## X65  -1.14672147           0               1  0.7716371  0.38631698
## X67   0.75351806           0               1  0.3953052  0.43618042
## X69   0.20537204           1               0 -0.6082463  0.83508792
## X70  -1.47560908           0               0 -1.1100221  0.28659011
## X72   0.82660419           1               0 -1.3609100 -0.16218083
## X73   0.57080272           0               1  0.2698613 -1.40876676
## X74  -0.81783386           0               0 -0.7336903 -1.70794739
## X75  -1.54869521           0               0 -1.7372419  0.63563417
## X77  -1.29289374           0               1  0.3953052 -1.20931302
## X78   0.35154431           0               1  0.6461931  1.03454167
```

```
## X79  -0.26968784           0             1  2.5278523  1.93208354
## X82   0.68043192           0             0 -1.9881298 -1.30903989
## X85   1.11894874           0             0 -0.7336903 -1.05972270
## X87  -0.34277398           0             0 -1.6117979 -1.45863020
## X88  -0.12351557           0             0 -1.6117979 -1.70794739
## X89   0.27845818           0             0 -1.2354661  0.28659011
## X90  -0.16005864           0             1  0.1444173  1.53317604
## X91  -0.26968784           0             0 -0.2319145  0.73536104
## X92   0.38808738           0             1  0.3953052  1.98194698
## X93  -0.56203238           0             1  2.2769645  0.78522448
## X94  -0.16005864           0             1  0.7716371 -0.11231739
## X95  -0.05042943           0             0  0.0189734  1.98194698
## X96  -0.52548931           0             0 -1.1100221 -1.25917645
## X97  -0.63511852           1             1  0.7716371  0.53590729
## X98  -0.05042943           0             1  1.2734129 -0.26190770
## X99   0.46117352           1             0 -1.3609100 -0.21204427
## X100 -0.59857545           0             1  0.2698613 -0.11231739
## X101 -0.01388637           0             0 -0.4828024  1.03454167
## X102  0.16882897           0             1  1.0225250  0.23672667
## X103  0.20537204           0             1  1.3988568  0.53590729
## X104  0.20537204           0             1  0.6461931  0.33645354
## X105 -0.23314477           0             1  0.2698613  0.38631698
## X106  1.59400862           0             0 -0.9845782  0.08713636
## X108 -0.05042943           0             0 -0.9845782 -1.15944958
## X109  0.79006113           0             1  0.6461931 -0.01259052
## X110 -0.08697250           0             0 -0.2319145 -0.95999583
## X112  0.49771658           1             0 -0.2319145  1.88222010
## X113  0.53425965           0             0 -0.9845782 -1.60822051
## X114 -0.85437693           0             0 -1.9881298 -1.25917645
## X115  0.49771658           1             0 -0.4828024  0.78522448
## X116  0.24191511           1             1  0.5207492  0.18686323
## X117  0.42463045           0             1  1.6497447 -0.06245396
## X119  0.05919977           0             0 -0.2319145 -0.71067864
## X120  0.79006113           0             0 -0.2319145 -0.41149802
## X121 -1.47560908           0             1  2.0260766  1.33372229
## X122 -0.45240318           0             0 -0.3573584 -0.01259052
## X123 -1.87758282           0             0 -1.7372419  1.48331260
## X126  1.11894874           0             0 -0.2319145  0.18686323
## X127 -0.70820465           0             0 -0.7336903 -0.81040552
## X128  0.35154431           0             1  2.6532963  0.88495135
## X129  0.05919977           0             1  1.9006326 -0.86026895
## X130  0.02265670           0             1  0.1444173  0.83508792
## X131  0.46117352           1             0 -0.9845782 -0.16218083
## X132  0.31500124           1             0 -1.4863540 -0.36163458
## X133 -0.92746306           0             0 -0.7336903  0.38631698
## X135  0.53425965           1             0 -0.4828024  0.58577073
## X136  0.13228591           0             0 -0.4828024 -1.50849364
## X137  1.41129328           0             0 -0.4828024 -0.46136145
## X138 -0.26968784           0             1  3.0296281 -0.61095177
## X139  0.79006113           0             1  0.1444173  0.73536104
## X142 -0.56203238           0             1  1.3988568  3.17866947
## X144  0.75351806           1             1  0.5207492  1.88222010
## X145  2.28832691           0             1  0.5207492 -1.75781083
## X146  0.82660419           0             0 -0.6082463 -0.91013239
```

```
## X147 -1.32943681           0              1  0.1444173 -0.81040552
## X148  0.49771658           0              0 -1.2354661  1.28385885
## X149  0.13228591           0              1  1.6497447  1.23399542
## X150  0.20537204           0              1  0.3953052  0.38631698
## X152 -0.01388637           1              0  0.0189734  0.48604386
## X154 -1.84103976           0              1  0.1444173  1.03454167
## X155 -0.59857545           1              1  0.2698613  1.23399542
## X156  0.13228591           0              1  0.1444173 -0.31177114
## X157 -1.65832442           0              1  1.6497447  0.78522448
## X159  0.46117352           1              0 -0.2319145  0.43618042
## X160  1.04586260           0              1  0.2698613  0.53590729
## X161  1.26512101           0              1  0.1444173 -1.90740114
## X162  0.46117352           0              0 -1.6117979 -1.40876676
## X163 -0.05042943           0              0 -0.4828024 -0.16218083
## X164  0.60734579           0              0 -0.4828024 -0.86026895
## X165 -0.34277398           0              0 -0.6082463 -2.35617208
## X166 -0.19660170           0              0 -0.2319145  0.38631698
## X167  1.92289623           0              1  0.6461931  0.83508792
## X168  0.02265670           1              1  0.1444173 -0.06245396
## X169 -0.48894625           1              0 -1.4863540 -1.65808395
## X170 -0.56203238           0              0 -0.7336903  0.08713636
## X171  0.20537204           0              0 -0.6082463  0.03727292
## X172  1.33820714           0              0  0.0189734  1.08440510
## X173  0.79006113           0              0 -1.2354661 -0.21204427
## X174 -0.67166159           0              1  0.1444173  1.23399542
## X175  0.20537204           0              1  0.2698613 -0.31177114
## X177 -0.92746306           0              1  0.5207492  2.13153729
## X179  2.76338679           0              0 -0.3573584 -1.90740114
## X180  0.05919977           0              1  2.4024084  0.03727292
## X181 -0.23314477           0              1  1.6497447 -0.01259052
## X182  0.53425965           0              0 -1.7372419 -0.56108833
## X183 -1.14672147           0              1  0.1444173  0.48604386
## X184 -1.07363533           1              1  1.9006326  0.48604386
## X185 -1.21980760           0              1  0.8970810 -0.41149802
## X186  0.71697499           0              0 -0.6082463 -1.45863020
## X187 -1.40252294           0              1  1.2734129  0.53590729
## X188  1.59400862           0              0 -1.8626858 -1.80767426
## X189  0.02265670           0              1  0.2698613  0.78522448
## X190 -0.52548931           1              1  1.5243008 -0.11231739
## X191  0.93623340           0              0  0.0189734  0.83508792
## X192  0.27845818           0              1  2.2769645  1.18413198
## X193  0.93623340           1              0 -0.7336903 -1.15944958
## X194  0.68043192           0              1  2.4024084 -1.95726458
## X195  2.90955906           0              0 -1.6117979 -0.06245396
## X196 -1.43906601           1              0 -0.8591342 -1.85753770
## X198  1.41129328           0              1  0.5207492 -0.61095177
## X200 -0.19660170           1              0 -0.9845782 -0.46136145
## X201  0.16882897           0              0 -0.1064706 -0.61095177
## X202  1.30166407           0              0  0.0189734 -1.50849364
## X204 -0.12351557           0              1  0.2698613 -0.26190770
## X205  0.24191511           0              0 -1.3609100 -1.30903989
## X206  0.24191511           0              1  0.5207492  0.83508792
## X207  1.26512101           1              1  1.0225250  1.28385885
## X209  0.60734579           0              0 -1.1100221 -0.51122489
```

```
## X211 -1.29289374           0                     1  0.5207492  1.33372229
## X212  0.71697499           0                     0 -0.2319145  2.08167385
## X213 -0.01388637           0                     1  2.1515205 -0.01259052
## X214 -0.89091999           0                     0 -1.7372419  1.83235667
## X215  0.57080272           0                     0 -0.6082463 -1.45863020
## X216 -0.70820465           0                     1  0.6461931  0.93481479
## X217  0.53425965           1                     0 -0.7336903 -1.00985927
## X218  0.02265670           0                     1  1.0225250  0.73536104
## X219 -0.70820465           0                     1  0.5207492  0.43618042
## X220 -0.92746306           0                     0 -0.9845782 -0.16218083
## X221  0.82660419           0                     0 -0.9845782  1.03454167
## X222  1.08240567           0                     0 -0.6082463 -0.95999583
## X223 -0.85437693           1                     0 -1.1100221 -0.46136145
## X224  0.27845818           0                     1  0.8970810 -1.50849364
## X226 -0.56203238           1                     1  1.3988568  0.48604386
## X227  1.26512101           1                     1  1.5243008  0.48604386
## X228  0.27845818           0                     1  0.2698613 -0.11231739
## X229  0.57080272           1                     0 -0.4828024  0.43618042
## X230 -1.40252294           0                     0 -1.1100221 -1.40876676
## X231  0.82660419           0                     0 -0.1064706 -0.46136145
## X233 -0.78129079           0                     0 -0.7336903 -0.61095177
## X234  1.33820714           0                     1  1.1479689  1.23399542
## X235  0.57080272           0                     1  0.3953052  1.63290292
## X236  2.98264519           0                     0 -0.3573584  1.38358573
## X237  0.02265670           0                     0 -0.1064706  0.53590729
## X238 -0.78129079           0                     1  1.2734129  2.28112760
## X239 -0.41586011           0                     0 -0.9845782 -0.91013239
## X240  1.11894874           0                     1  0.1444173 -1.65808395
## X241 -0.19660170           0                     0 -1.2354661 -0.86026895
## X244 -0.01388637           0                     0 -0.2319145  0.03727292
## X245 -0.56203238           0                     0  0.0189734 -0.31177114
## X246  1.41129328           0                     0  0.0189734 -0.61095177
## X247  0.53425965           0                     1  0.2698613 -2.00712801
## X248 -1.58523828           0                     0 -1.8626858  1.13426854
## X249 -1.58523828           0                     1  1.0225250  0.98467823
## X251  3.09227440           0                     1  0.3953052 -0.21204427
## X252  0.24191511           0                     1  1.5243008  0.38631698
## X254 -0.16005864           0                     0 -0.2319145 -1.45863020
## X255  0.38808738           0                     1  0.5207492  1.23399542
## X256  1.33820714           0                     0 -1.8626858 -0.26190770
## X257  1.19203487           0                     1  1.3988568  0.78522448
## X258  0.60734579           0                     0 -0.1064706  0.58577073
## X259 -1.87758282           0                     0 -0.3573584  0.33645354
## X260  0.02265670           0                     0 -0.2319145  0.38631698
## X261  0.02265670           0                     0 -0.4828024  0.18686323
## X262  0.09574284           0                     0 -0.4828024 -1.00985927
## X264 -0.56203238           0                     1  0.2698613  0.58577073
## X265 -1.00054920           0                     0 -0.8591342  0.38631698
## X266  0.20537204           0                     0 -0.6082463 -0.31177114
## X267  0.24191511           0                     1  1.0225250  1.78249323
## X268  0.46117352           0                     1  0.3953052 -0.21204427
## X269  0.13228591           0                     0 -0.2319145 -0.31177114
## X270  1.52092248           1                     0 -1.9881298 -0.41149802
## X273  0.02265670           0                     0 -0.8591342 -0.31177114
```

```
## X274 -0.59857545           0               1  0.5207492 -0.21204427
## X275 -1.18326454           0               0 -0.6082463 -0.01259052
## X276  1.95943930           0               0 -0.3573584 -0.01259052
## X277  0.31500124           1               0 -0.8591342 -1.70794739
## X278 -1.11017840           0               0 -0.9845782 -1.40876676
## X279 -0.92746306           1               1  0.3953052 -0.41149802
## X280 -0.19660170           0               0 -0.4828024 -1.40876676
## X282 -1.32943681           0               0 -0.9845782 -0.61095177
## X283 -1.51215215           0               0 -1.1100221 -0.95999583
## X284 -0.30623091           0               0 -0.8591342  0.28659011
## X286  1.37475021           0               0 -1.2354661 -0.36163458
## X289  0.35154431           0               0 -0.9845782 -0.36163458
## X290  0.60734579           0               0 -1.2354661 -2.05699145
## X292 -0.67166159           1               0 -0.9845782 -1.45863020
## X293 -0.34277398           0               0 -0.4828024 -0.71067864
## X295 -1.14672147           0               1  0.6461931  1.33372229
## X296 -0.48894625           0               0 -0.6082463  1.43344917
## X298 -0.48894625           0               1  0.1444173 -0.66081520
## X299 -0.23314477           0               0 -0.1064706 -0.01259052
## X300  0.60734579           0               1  0.5207492  0.78522448
## X301  0.16882897           1               0 -0.1064706  0.08713636
## X302  0.38808738           0               0 -0.6082463 -2.10685489
## X303 -0.23314477           0               0 -0.4828024 -0.86026895
## X305  1.84981009           0               1  0.1444173 -0.56108833
## X306  0.20537204           0               1  0.1444173 -1.10958614
## X307  1.00931953           0               0 -1.3609100 -0.81040552
## X311 -0.63511852           1               1  1.3988568  0.28659011
## X312  0.38808738           0               0  0.0189734 -1.00985927
## X313  1.15549180           0               1  1.3988568  0.18686323
## X314 -1.25635067           0               0 -0.4828024 -0.81040552
## X315  1.22857794           0               1  1.0225250 -0.11231739
## X316 -0.70820465           0               0 -0.1064706  0.63563417
## X317 -1.69486748           0               0 -0.6082463  0.63563417
## X318  0.49771658           0               0 -1.3609100  0.63563417
## X319 -0.59857545           0               0 -0.2319145 -1.65808395
## X321 -0.63511852           0               1  0.3953052 -0.31177114
## X322  1.08240567           0               0 -1.1100221 -1.75781083
## X326  0.31500124           0               0 -1.3609100 -2.40603551
## X327  1.74018089           0               1  0.6461931  0.63563417
## X328  1.00931953           0               0 -2.1135737  0.33645354
## X329 -0.26968784           1               0 -1.2354661  0.53590729
## X330 -0.08697250           0               0 -1.7372419 -0.86026895
## X331  0.20537204           0               0 -1.3609100 -1.70794739
## X332  0.35154431           0               1  1.0225250  0.98467823
## X333 -0.34277398           1               1  0.3953052  0.58577073
## X334 -0.41586011           0               1  1.1479689  1.83235667
## X335 -0.52548931           0               0 -0.3573584  0.63563417
## X336  0.13228591           0               1  0.7716371 -2.40603551
## X339  0.64388885           0               1  1.1479689 -0.95999583
## X340  0.16882897           0               0 -0.1064706 -0.01259052
## X341  1.59400862           1               1  0.6461931  1.73262979
## X342 -1.03709226           0               0  0.0189734  0.08713636
## X345 -1.51215215           0               1  0.3953052  1.73262979
## X347 -1.58523828           0               0 -0.4828024 -1.60822051
```

```
## X349  0.60734579              0                      1  2.0260766  0.63563417
## X351  0.46117352              1                      1  1.2734129  0.38631698
## X353 -0.05042943              0                      1  0.5207492  0.63563417
## X354  0.42463045              0                      0 -0.2319145  0.18686323
## X355 -1.18326454              0                      0 -0.6082463 -0.26190770
## X356 -0.70820465              0                      1  0.3953052  1.48331260
## X359 -2.42572884              1                      1  0.2698613 -1.70794739
## X360  0.42463045              1                      1  2.2769645  0.33645354
## X361  0.46117352              0                      0 -0.8591342 -0.76054208
## X363  0.20537204              0                      1  1.0225250 -0.56108833
## X365  1.66709475              0                      0 -0.2319145 -0.51122489
## X366 -1.07363533              0                      1  0.6461931  0.63563417
## X367  1.04586260              0                      0 -1.1100221  0.53590729
## X369  0.49771658              0                      1  1.0225250  2.13153729
## X371 -0.30623091              0                      1  0.3953052  1.08440510
## X372  3.42116201              0                      1  1.1479689 -0.56108833
## X373 -0.26968784              0                      1  0.6461931 -1.00985927
## X374 -1.43906601              0                      0 -0.8591342 -0.01259052
## X376 -1.36597987              0                      0 -1.1100221 -0.76054208
## X377  0.20537204              0                      1  0.5207492 -0.86026895
## X378 -1.36597987              0                      1  0.8970810  0.38631698
## X379 -0.16005864              0                      0 -1.3609100 -1.65808395
## X380  1.41129328              0                      1  2.0260766  0.73536104
## X382 -0.05042943              0                      1  0.1444173  0.93481479
## X383  1.33820714              0                      0 -1.1100221  0.03727292
## X385 -1.73141055              0                      1  0.1444173 -1.30903989
## X386  0.35154431              0                      0 -1.9881298  0.68549761
## X387  0.13228591              0                      1  0.6461931  2.08167385
## X388 -0.08697250              0                      0 -1.6117979 -0.81040552
## X389 -1.62178135              1                      0 -1.2354661  0.23672667
## X391  0.13228591              0                      0 -1.4863540 -0.46136145
## X392  0.24191511              0                      1  0.6461931  1.53317604
## X393 -0.48894625              0                      0 -1.1100221 -0.36163458
## X394 -0.23314477              0                      1  0.8970810 -1.45863020
## X395 -1.07363533              0                      0 -0.7336903 -0.91013239
## X396  0.09574284              1                      1  0.3953052  0.08713636
## X397  0.27845818              0                      0 -0.6082463 -0.56108833
## X398 -0.56203238              0                      1  0.1444173  2.82962541
## X399 -1.00054920              0                      0 -0.1064706 -0.56108833
## X401 -2.06029816              1                      1  1.3988568 -1.20931302
## X402 -1.03709226              0                      0 -0.9845782  0.78522448
## X405 -0.41586011              0                      0 -0.1064706  0.08713636
## X406 -0.52548931              0                      1  0.7716371  0.13699979
## X407 -0.05042943              0                      0 -1.3609100  0.28659011
## X408 -0.89091999              0                      0 -0.9845782  0.58577073
## X410 -0.37931704              0                      0 -0.2319145  0.03727292
## X411  1.84981009              0                      1  0.5207492  0.68549761
## X412 -0.67166159              0                      0 -0.6082463  1.43344917
## X413 -0.52548931              0                      1  0.5207492 -1.45863020
## X414 -0.59857545              0                      0 -0.4828024  0.38631698
## X415  0.16882897              0                      0  0.0189734 -0.41149802
## X416 -1.21980760              0                      1  1.2734129 -1.25917645
## X417  0.42463045              1                      1  0.2698613  0.53590729
## X418 -0.05042943              0                      0 -0.1064706 -0.26190770
```

```
## X419  0.31500124          0                1  0.1444173  1.73262979
## X420 -0.41586011          0                1  0.2698613 -0.26190770
## X421 -0.37931704          1                0 -0.2319145  0.18686323
## X422 -0.74474772          0                0 -0.8591342 -2.00712801
## X423  1.00931953          0                0 -0.1064706  0.48604386
## X424  0.71697499          0                1  0.3953052 -0.11231739
## X425 -0.59857545          0                0 -1.8626858  0.83508792
## X426 -0.81783386          0                1  0.5207492  0.48604386
## X427 -2.06029816          0                0  0.0189734  0.73536104
## X431  0.24191511          0                1  0.6461931 -0.26190770
## X432 -0.89091999          0                1  0.7716371  0.58577073
## X434 -0.59857545          0                0 -0.9845782 -0.76054208
## X435 -1.11017840          0                0 -1.4863540  1.73262979
## X437 -2.79115952          0                1  1.7751887  2.58030823
## X438  1.33820714          0                0  0.0189734 -1.65808395
## X439  0.05919977          1                1  1.7751887 -0.26190770
## X440  0.27845818          0                0 -0.8591342 -0.06245396
## X441 -0.37931704          0                0 -1.1100221  0.13699979
## X442 -0.85437693          0                0  0.0189734 -0.91013239
## X443 -0.41586011          0                0 -1.3609100 -0.16218083
## X444 -1.69486748          1                0  0.0189734  1.03454167
## X445  0.86314726          0                0 -0.3573584  0.83508792
## X448 -0.85437693          0                1  1.2734129  0.63563417
## X450  0.79006113          0                1  0.3953052  1.38358573
## X451  0.35154431          0                0 -0.6082463  0.53590729
## X453 -0.59857545          1                0 -0.9845782 -1.15944958
## X454  0.57080272          0                1  0.5207492 -0.11231739
## X455  0.16882897          1                0 -0.3573584 -0.01259052
## X456  0.35154431          0                0 -0.7336903  0.58577073
## X457 -0.08697250          0                1  0.1444173 -1.00985927
## X458  1.70363782          0                1  0.1444173 -0.91013239
## X459 -1.21980760          0                1  0.6461931  1.93208354
## X460 -0.78129079          1                1  0.8970810  0.38631698
## X461 -0.81783386          1                0 -0.4828024  0.48604386
## X464 -1.03709226          0                1  2.1515205 -0.01259052
## X465  1.19203487          0                1  2.7787402  0.83508792
## X466 -1.40252294          1                0 -0.3573584 -3.45316770
## X468 -0.96400613          0                0 -0.7336903  0.88495135
## X469  0.60734579          0                1  0.2698613  0.03727292
## X470 -0.05042943          0                0 -0.8591342 -1.90740114
## X472  0.71697499          0                0 -0.2319145  0.28659011
## X473 -1.21980760          0                1  0.1444173 -0.66081520
## X474  1.08240567          0                0 -0.2319145 -0.76054208
## X475 -0.26968784          0                1  0.5207492 -0.76054208
## X476 -0.37931704          0                0 -1.2354661 -0.61095177
## X478 -0.05042943          0                1  0.8970810  0.63563417
## X480  0.97277646          0                0  0.0189734 -0.26190770
## X481  0.31500124          0                0 -0.1064706 -0.21204427
## X482  1.99598236          0                1  0.2698613  0.18686323
## X483 -1.03709226          0                1  0.2698613 -0.56108833
## X484  0.09574284          0                0 -0.6082463 -0.56108833
## X486 -0.23314477          0                1  1.0225250  0.83508792
## X487 -0.08697250          0                1  0.8970810  0.63563417
## X488 -1.51215215          1                0 -0.3573584  0.88495135
```

```
## X489 -0.34277398           0                 1  1.0225250  1.38358573
## X490 -1.47560908           0                 1  2.0260766 -1.35890333
## X491 -0.92746306           0                 1  0.7716371  0.58577073
## X492 -0.26968784           1                 1  1.0225250  0.83508792
## X493 -0.26968784           0                 1  1.2734129  0.28659011
## X494  0.42463045           0                 1  1.5243008 -0.31177114
## X495 -0.59857545           0                 0 -0.1064706  0.43618042
## X496 -1.00054920           0                 1  0.3953052  0.63563417
## X497  0.31500124           0                 0 -0.3573584  0.83508792
## X498  0.38808738           0                 1  0.1444173  2.38085448
## X499 -0.70820465           0                 0 -0.8591342  1.03454167
## X500 -0.41586011           0                 0 -0.8591342  2.53044479
## X501  0.13228591           0                 1  0.3953052 -0.91013239
## X502 -1.62178135           0                 1  1.0225250  0.23672667
## X503 -1.62178135           0                 0 -1.4863540 -1.05972270
## X504 -0.74474772           0                 0 -1.2354661  0.23672667
## X507 -1.43906601           0                 0 -0.4828024 -0.51122489
## X509  0.93623340           0                 0  0.0189734 -1.20931302
## X511  1.70363782           0                 0 -1.1100221 -1.55835708
## X512 -0.85437693           0                 1  0.5207492  0.98467823
## X513  0.64388885           0                 1  0.3953052 -0.46136145
## X514 -1.07363533           0                 0 -0.6082463  1.13426854
## X515 -0.56203238           1                 0  0.0189734 -0.11231739
## X516 -0.01388637           1                 1  0.1444173  0.23672667
## X518 -0.16005864           0                 0 -0.8591342 -0.51122489
## X520  0.24191511           0                 1  2.1515205 -0.36163458
## X521 -0.41586011           1                 0 -1.1100221 -0.36163458
## X522  0.13228591           0                 1  0.3953052 -1.10958614
## X523  0.93623340           0                 0 -0.6082463  1.08440510
## X524  1.26512101           0                 1  0.7716371 -0.95999583
## X525 -1.11017840           0                 0 -1.8626858  0.48604386
## X527 -0.12351557           0                 0 -0.7336903  0.63563417
## X528 -2.49881498           0                 1  0.7716371  1.13426854
## X529  0.20537204           0                 0 -0.4828024  0.33645354
## X530 -0.74474772           0                 1  0.1444173 -1.15944958
## X533 -0.12351557           0                 0 -0.4828024 -1.05972270
## X535  0.64388885           1                 0 -0.8591342 -0.26190770
## X536 -0.08697250           0                 1  0.1444173 -0.26190770
## X539  0.60734579           0                 1  0.6461931  0.53590729
## X540 -1.87758282           0                 0 -1.1100221  0.68549761
## X541  1.30166407           1                 0 -0.2319145  0.68549761
## X542  0.79006113           0                 1  2.6532963  0.43618042
## X543  0.75351806           0                 1  0.6461931 -0.01259052
## X545 -1.95066896           0                 1  1.0225250  0.98467823
## X546  0.89969033           0                 0 -0.1064706  2.08167385
## X547  0.35154431           0                 1  1.1479689 -0.46136145
## X548  0.46117352           0                 0  0.0189734 -0.36163458
## X549  0.46117352           0                 0 -0.9845782 -0.36163458
## X550 -1.84103976           0                 0 -0.8591342 -0.36163458
## X551 -0.34277398           0                 1  0.1444173  1.08440510
## X552  0.75351806           0                 1  0.8970810 -1.40876676
## X553  0.82660419           0                 1  0.8970810  0.58577073
## X554  0.16882897           0                 1  1.0225250  0.53590729
## X556 -0.89091999           1                 0 -0.7336903 -0.51122489
```

```
## X557 -1.84103976              1                             0  0.0189734 -1.10958614
## X558  1.19203487              0                             1  0.1444173 -2.80494301
## X559 -0.92746306              0                             1  0.7716371  0.78522448
## X560 -1.25635067              0                             1  0.2698613  1.68276635
## X561  2.25178384              0                             1  0.8970810  0.98467823
## X562 -0.01388637              0                             0 -0.3573584  1.18413198
## X563  0.02265670              0                             0 -0.1064706  0.98467823
## X564 -0.16005864              0                             0 -0.7336903  1.03454167
## X565  1.08240567              0                             0 -0.2319145 -0.71067864
## X566 -0.67166159              0                             1  0.7716371  1.23399542
## X567  0.09574284              0                             0 -0.6082463  1.48331260
## X568 -0.01388637              0                             1  1.6497447  0.08713636
## X569 -0.34277398              0                             1  0.5207492 -0.16218083
## X571 -0.74474772              0                             0 -1.3609100 -1.45863020
## X573  1.37475021              0                             1  1.5243008  2.13153729
## X574 -0.48894625              0                             0 -1.6117979 -0.86026895
## X575  0.89969033              0                             0 -2.4899056 -0.31177114
## X576  1.63055169              0                             1  1.5243008  1.33372229
## X577 -0.92746306              0                             0 -0.3573584  0.38631698
## X579  1.08240567              0                             0 -0.4828024 -1.60822051
## X580  1.15549180              0                             0 -0.6082463 -0.81040552
## X582 -1.76795362              0                             0 -0.9845782  0.78522448
## X584 -1.43906601              0                             1  0.8970810  0.03727292
## X587 -0.67166159              0                             1  0.7716371  1.13426854
## X588  0.71697499              0                             1  0.7716371  0.28659011
## X589  2.03252543              0                             1  1.1479689 -0.86026895
## X591 -1.73141055              0                             0 -1.4863540 -2.30630864
## X592  1.00931953              0                             0 -0.9845782 -0.01259052
## X593 -1.03709226              0                             0 -1.6117979  0.03727292
## X594 -1.54869521              0                             1  1.3988568 -0.81040552
## X597  1.70363782              1                             0 -0.6082463 -1.05972270
## X598  0.09574284              1                             0 -0.7336903 -0.26190770
## X600  0.16882897              0                             0 -0.2319145  1.18413198
## X601 -1.87758282              1                             0 -0.3573584  1.33372229
## X602  0.42463045              0                             0 -0.7336903 -0.26190770
## X603 -0.48894625              0                             0  0.0189734 -1.05972270
## X604  0.86314726              0                             0 -0.9845782 -0.26190770
## X605  0.31500124              0                             1  0.7716371 -0.71067864
## X606  0.97277646              0                             1  0.1444173 -0.56108833
## X609 -1.21980760              0                             1  1.9006326 -0.56108833
## X610  0.02265670              0                             1  0.6461931  2.18140073
## X611  2.61721452              0                             0 -1.8626858 -0.56108833
## X613 -0.19660170              1                             1  0.8970810 -0.11231739
## X614  0.60734579              1                             1  0.6461931  0.98467823
## X615 -0.96400613              0                             0 -1.2354661 -0.11231739
## X617  1.92289623              0                             1  0.2698613 -0.86026895
## X618 -1.62178135              0                             0 -1.3609100 -0.76054208
## X619 -0.16005864              1                             1  0.2698613 -0.46136145
## X620  0.27845818              0                             0 -2.1135737 -1.80767426
## X623 -1.11017840              0                             1  0.5207492  1.03454167
## X624 -0.37931704              0                             0 -0.1064706  0.53590729
## X625  0.24191511              1                             0  0.0189734 -0.46136145
## X626 -0.26968784              0                             1  1.1479689  1.48331260
## X628  1.19203487              1                             1  0.5207492  0.28659011
```

```
## X629 -0.05042943                1                0 -1.4863540  0.23672667
## X630  1.26512101                1                0  0.0189734 -1.50849364
## X631 -2.09684123                0                1  0.1444173  1.18413198
## X632 -1.00054920                1                0 -0.1064706 -0.56108833
## X633 -0.59857545                1                0  0.0189734  0.33645354
## X634 -0.41586011                0                0  0.0189734 -1.95726458
## X635 -0.74474772                0                0  0.0189734 -0.51122489
## X636 -0.12351557                0                0 -0.2319145  1.93208354
## X637  0.05919977                0                0 -0.2319145  1.03454167
## X638  1.33820714                0                0 -1.7372419  1.38358573
## X640  0.68043192                0                1  0.2698613 -0.06245396
## X641  0.20537204                0                0 -0.4828024  0.43618042
## X642  1.41129328                0                0 -0.1064706  0.33645354
## X643  0.46117352                0                0 -1.8626858 -2.45589895
## X644  0.05919977                0                0 -1.4863540 -0.95999583
## X645  0.24191511                0                1  0.8970810 -1.35890333
## X646  1.37475021                0                0 -0.6082463 -0.36163458
## X648  0.38808738                0                0 -0.3573584 -0.46136145
## X649  0.57080272                0                0 -0.8591342 -1.70794739
## X650 -0.52548931                0                0 -0.8591342 -0.31177114
## X652  1.04586260                0                1  0.2698613 -0.36163458
## X654  0.38808738                0                1  0.6461931  1.78249323
## X655 -0.23314477                0                1  2.6532963 -0.36163458
## X656 -0.30623091                0                1  0.3953052 -2.10685489
## X657 -2.16992737                0                0 -1.2354661 -1.95726458
## X658  1.30166407                0                1  0.5207492 -0.21204427
## X659 -1.03709226                0                0 -0.3573584  0.18686323
## X660  2.79992985                0                1  1.0225250  1.28385885
## X661 -1.98721203                0                1  1.6497447  0.58577073
## X663 -0.48894625                0                0 -0.1064706 -0.91013239
## X664 -0.92746306                1                1  0.6461931  0.63563417
## X665  0.20537204                0                1  0.5207492 -0.31177114
## X666  1.70363782                0                0  0.0189734  0.63563417
## X667  3.16536053                0                1  1.5243008  0.53590729
## X668  0.42463045                0                0 -0.3573584  0.48604386
## X669  0.49771658                0                1  0.5207492  1.53317604
## X670 -1.58523828                0                1  0.6461931 -0.41149802
## X673  1.08240567                0                1  1.5243008  0.28659011
## X674  0.31500124                0                0 -0.3573584  0.98467823
## X675 -0.56203238                0                0  0.0189734 -1.20931302
## X676 -0.48894625                1                1  1.1479689  0.03727292
## X677  0.27845818                0                0 -0.3573584 -0.46136145
## X678  0.42463045                0                1  0.1444173  0.53590729
## X679 -0.16005864                0                1  0.7716371  1.43344917
## X680  1.15549180                0                1  0.8970810  1.28385885
## X681  1.15549180                1                1  2.1515205  0.33645354
## X682  0.57080272                0                1  0.5207492 -0.41149802
## X683  0.38808738                0                0 -0.3573584  1.18413198
## X684 -0.30623091                0                1  0.7716371  0.18686323
## X685  0.93623340                0                0 -0.8591342 -0.41149802
## X686 -0.52548931                0                0 -1.3609100  0.58577073
## X687  0.68043192                0                1  0.2698613  0.98467823
## X688  0.64388885                1                1  0.7716371  0.83508792
## X690 -0.12351557                0                0  0.0189734 -1.05972270
```

```
## X691  1.74018089              0                0  0.0189734  0.38631698
## X692 -0.05042943              0                1  0.7716371  0.58577073
## X693 -0.85437693              0                1  1.2734129 -0.61095177
## X694  0.20537204              0                0 -0.3573584  0.98467823
## X697 -0.56203238              0                0 -0.3573584  0.43618042
## X698 -1.18326454              0                1  1.0225250  1.38358573
## X699  0.13228591              0                0 -1.4863540 -0.56108833
## X700  1.19203487              0                0 -0.1064706 -0.16218083
## X701 -0.63511852              0                1  1.1479689  0.68549761
## X702  0.13228591              0                0 -0.4828024  0.98467823
## X703  0.02265670              0                0  0.0189734 -0.11231739
## X705 -2.09684123              0                0 -0.8591342 -0.86026895
## X706  0.05919977              1                0 -0.8591342 -0.31177114
## X707 -0.67166159              1                1  1.1479689  0.98467823
## X708 -1.76795362              0                0 -0.4828024  0.93481479
## X709  0.49771658              0                0 -0.1064706 -0.66081520
## X710 -0.56203238              1                1  1.6497447  0.28659011
## X711  0.93623340              0                1  1.7751887  0.38631698
## X712  1.59400862              0                0 -1.2354661  0.88495135
## X713 -0.34277398              1                0 -1.1100221  1.13426854
## X714 -1.18326454              0                0 -0.8591342 -1.75781083
## X715 -0.12351557              1                0 -0.3573584 -1.75781083
## X716 -0.45240318              0                0 -1.7372419  0.38631698
## X717  0.35154431              0                1  0.2698613  0.93481479
## X718 -0.70820465              0                0 -0.8591342  0.03727292
## X719 -1.80449669              1                0 -0.6082463  1.13426854
## X720 -1.18326454              0                1  0.7716371  0.08713636
## X721  0.57080272              0                0 -0.6082463 -1.20931302
## X722 -0.01388637              1                1  0.3953052  0.18686323
## X724 -0.92746306              0                0 -0.7336903 -1.50849364
## X725 -0.48894625              0                0 -0.2319145 -1.30903989
## X726 -0.67166159              0                1  1.6497447  0.68549761
## X730 -0.56203238              0                0 -0.3573584  1.18413198
## X731  0.31500124              1                1  0.3953052 -0.01259052
## X732  0.42463045              0                1  0.6461931  0.68549761
## X734  0.68043192              0                1  1.0225250 -0.91013239
## X735 -1.14672147              1                0  0.0189734 -1.25917645
## X737 -0.74474772              0                0 -1.6117979  0.43618042
## X738 -0.19660170              0                0  0.0189734  0.03727292
## X739 -2.75461645              0                0 -1.2354661  1.03454167
## X740  1.99598236              0                1  2.1515205  0.23672667
## X744 -0.12351557              0                1  0.2698613  0.28659011
## X745 -0.67166159              0                1  0.5207492  0.28659011
## X746 -0.41586011              1                1  1.1479689 -0.36163458
## X747  0.16882897              0                0 -0.8591342 -1.45863020
## X748  0.53425965              0                1  0.5207492  0.03727292
## X749 -1.62178135              1                1  0.6461931 -0.71067864
## X751 -1.29289374              0                0 -1.1100221  0.68549761
## X752  1.66709475              0                1  1.3988568  0.18686323
## X753 -1.07363533              0                1  0.7716371 -1.60822051
## X754  2.17869770              0                0 -0.4828024 -0.16218083
## X757 -0.41586011              0                0 -0.7336903  1.33372229
## X758 -0.59857545              0                0 -0.2319145 -1.60822051
## X759  0.16882897              0                0 -2.6153495  0.38631698
```

```
## X761  0.82660419              0               0 -1.8626858 -0.21204427
## X762 -0.70820465              0               0 -0.7336903  0.43618042
## X763  0.82660419              0               1  0.2698613  2.33099104
## X764  0.13228591              0               1  1.0225250 -1.45863020
## X765 -0.30623091              1               1  0.7716371  0.38631698
## X766 -1.65832442              0               0 -2.1135737 -0.36163458
## X767  1.92289623              0               1  1.0225250  0.38631698
## X768  0.68043192              0               0 -0.1064706 -0.06245396
## X769 -0.81783386              0               0 -0.1064706 -0.31177114
## X770  1.15549180              0               0 -0.6082463 -0.66081520
## X772 -1.73141055              0               1  0.3953052  1.08440510
## X773  0.57080272              1               1  0.1444173  0.08713636
## X774 -0.85437693              0               1  0.8970810  0.38631698
## X775  0.13228591              0               0 -0.6082463  0.88495135
## X776 -0.16005864              0               0 -0.9845782  0.38631698
## X777  0.57080272              1               1  0.2698613 -1.60822051
## X778 -0.12351557              1               0 -0.6082463  0.28659011
## X779 -0.74474772              0               1  0.5207492  0.43618042
## X780  0.75351806              0               0 -0.2319145 -0.61095177
## X781  0.02265670              0               1  0.2698613 -1.60822051
## X784  0.24191511              0               0 -1.1100221  0.08713636
## X786 -1.07363533              1               0 -0.3573584 -1.65808395
## X787  2.32486997              0               0 -0.7336903 -0.51122489
## X788 -0.41586011              0               0 -1.3609100 -0.61095177
## X789  2.43449918              1               0 -0.7336903 -0.56108833
## X790  0.49771658              0               0 -0.1064706  0.23672667
## X791 -1.80449669              0               1  0.7716371  0.13699979
## X792 -2.64498725              0               1  1.6497447 -0.21204427
## X794 -1.25635067              0               0 -1.3609100  0.03727292
## X795  0.05919977              0               0 -0.1064706  0.98467823
## X796 -0.30623091              0               1  2.0260766  0.33645354
## X797 -0.12351557              0               1  0.1444173 -0.51122489
## X798  0.31500124              0               0 -0.7336903 -0.36163458
## X799  0.97277646              0               0 -1.4863540 -0.86026895
## X800  0.20537204              1               1  2.2769645 -0.61095177
## X801 -1.40252294              0               1  2.7787402  1.18413198
## X802 -0.92746306              0               0 -0.7336903 -0.95999583
## X803  1.74018089              0               0 -0.3573584  0.63563417
## X804 -0.85437693              0               0 -0.6082463  0.13699979
## X805  0.02265670              0               1  0.5207492 -0.71067864
## X807 -0.89091999              0               1  0.2698613  0.08713636
## X808  0.13228591              1               1  0.5207492 -1.30903989
## X809  0.31500124              0               0 -0.3573584  0.08713636
## X810  0.68043192              1               0 -2.3644616 -0.26190770
## X812  2.87301599              1               0 -0.6082463 -0.61095177
## X813  0.13228591              0               1  0.1444173  0.08713636
## X814  0.53425965              0               0  0.0189734  0.28659011
## X815 -1.84103976              0               0 -1.1100221 -2.45589895
## X816 -0.48894625              0               0 -0.9845782 -0.21204427
## X817  0.60734579              0               1  1.2734129 -1.25917645
## X818  0.49771658              0               1  1.7751887  1.33372229
## X820 -2.90078872              1               0 -1.6117979 -0.61095177
## X821 -1.32943681              0               1  1.0225250 -0.71067864
## X822 -0.08697250              0               1  0.1444173  1.08440510
```

```
## X823 -0.70820465              0                  1  0.7716371  1.03454167
## X824  0.57080272              0                  0 -0.9845782 -0.31177114
## X825 -0.63511852              0                  1  0.3953052 -1.55835708
## X826 -0.01388637              1                  1  0.2698613  0.13699979
## X830  0.24191511              0                  1  0.3953052 -0.16218083
## X831  0.35154431              0                  0 -0.2319145 -0.61095177
## X832  3.60387735              0                  0 -0.9845782 -1.20931302
## X833 -0.45240318              0                  0 -0.9845782 -0.61095177
## X834  1.59400862              0                  1  1.5243008 -1.35890333
## X836 -0.37931704              0                  1  0.3953052 -0.01259052
## X837 -1.36597987              0                  0  0.0189734 -0.56108833
## X838 -0.01388637              0                  0 -0.2319145  0.18686323
## X839  0.64388885              0                  0 -0.2319145 -0.41149802
## X840  0.02265670              0                  1  0.2698613  0.03727292
## X841  0.09574284              0                  1  0.7716371 -0.06245396
## X842  1.30166407              0                  0 -1.2354661 -2.10685489
## X843 -0.12351557              0                  0 -1.6117979  0.68549761
## X844 -2.42572884              0                  0 -0.4828024 -0.01259052
## X847 -0.26968784              0                  1  1.3988568  2.48058135
## X848  1.04586260              1                  0 -0.9845782  0.18686323
## X849 -0.34277398              0                  1  1.2734129  1.53317604
## X850  0.64388885              0                  0 -2.2390177 -0.71067864
## X851 -0.63511852              0                  1  0.5207492  0.53590729
## X852 -0.63511852              0                  0  0.0189734 -0.16218083
## X853  0.20537204              1                  0 -0.4828024 -0.66081520
## X854  0.38808738              0                  1  2.0260766  1.63290292
## X855  2.69030065              0                  0 -0.7336903 -1.00985927
## X856 -1.18326454              0                  0 -1.1100221 -1.85753770
## X857 -0.30623091              0                  0  0.0189734  1.33372229
## X858  1.26512101              0                  0  0.0189734  0.03727292
## X859 -1.43906601              0                  1  0.2698613  0.08713636
## X860 -0.01388637              0                  1  0.1444173  0.63563417
## X861 -0.05042943              0                  0  0.0189734 -0.31177114
## X862  0.31500124              0                  0 -1.4863540 -0.71067864
## X864  0.16882897              0                  0 -0.8591342  0.98467823
## X865 -0.23314477              0                  0 -0.2319145  0.53590729
## X866 -0.52548931              0                  0 -0.3573584 -0.06245396
## X867 -0.26968784              0                  1  1.0225250 -1.65808395
## X868  0.57080272              0                  0 -1.3609100 -0.41149802
## X869 -1.11017840              0                  1  0.7716371 -0.11231739
## X870 -1.07363533              0                  0 -1.4863540  0.18686323
## X871  0.16882897              0                  1  0.6461931 -1.70794739
## X872 -0.30623091              0                  0  0.0189734 -0.46136145
## X873  0.13228591              1                  1  0.7716371 -0.11231739
## X874 -1.07363533              0                  0 -0.2319145 -1.20931302
## X875  0.24191511              0                  0 -1.2354661 -0.61095177
## X877  0.46117352              0                  0 -0.6082463 -1.25917645
## X878 -1.40252294              0                  0 -0.3573584 -0.95999583
## X879  0.35154431              0                  0 -0.6082463 -1.85753770
## X880 -0.48894625              0                  0 -0.2319145  0.28659011
## X881  0.71697499              0                  1  0.2698613 -0.21204427
## X882 -1.51215215              0                  0 -1.2354661 -0.81040552
## X883  2.50758531              0                  0  0.0189734 -0.51122489
## X884  1.70363782              0                  1  0.6461931  1.93208354
```

```
## X885  0.35154431              1                          1  0.3953052  0.23672667
## X886 -0.01388637              1                          1  1.9006326 -0.21204427
## X887 -1.32943681              0                          1  0.2698613  1.98194698
## X888  0.27845818              0                          0  0.0189734 -0.06245396
## X889  0.49771658              0                          0 -0.4828024 -0.11231739
## X890 -1.21980760              1                          0 -1.7372419  0.53590729
## X891 -0.92746306              1                          1  0.8970810  1.93208354
## X892  0.09574284              0                          1  0.8970810  0.43618042
## X894 -0.37931704              0                          0 -0.1064706 -0.51122489
## X895  0.09574284              0                          0 -1.1100221 -0.61095177
## X897 -1.21980760              0                          0  0.0189734  0.18686323
## X899 -1.18326454              0                          0 -0.3573584 -0.61095177
## X900  1.19203487              0                          0 -0.9845782 -0.01259052
## X901  0.16882897              0                          1  2.5278523  0.93481479
## X902  1.37475021              0                          0 -0.2319145 -0.91013239
## X903  0.93623340              0                          0 -0.1064706  0.88495135
## X904 -0.67166159              0                          1  0.2698613  0.93481479
## X905 -1.36597987              0                          1  1.0225250  0.63563417
## X906  0.38808738              0                          0 -0.9845782  0.88495135
## X907  0.64388885              0                          0 -0.3573584  0.03727292
## X908 -0.56203238              0                          1  0.3953052 -0.51122489
## X909  1.22857794              0                          0 -0.3573584  1.23399542
## X910  1.22857794              0                          1  1.9006326  1.28385885
## X911  0.20537204              0                          0 -0.7336903 -2.00712801
## X913 -1.14672147              0                          1  0.5207492  0.83508792
## X916  1.41129328              0                          0 -0.6082463  0.03727292
## X917  1.95943930              0                          1  1.9006326  2.68003510
## X918  0.71697499              0                          0 -1.3609100  0.78522448
## X919  1.59400862              0                          1  1.1479689  0.58577073
## X920  1.00931953              0                          0 -0.8591342 -1.15944958
## X921  0.31500124              0                          1  2.4024084  1.18413198
## X922  0.27845818              1                          1  1.2734129 -0.66081520
## X924  1.22857794              1                          0 -1.4863540 -0.71067864
## X925  0.79006113              0                          0 -0.4828024 -0.56108833
## X926 -0.01388637              0                          0 -2.4899056 -0.36163458
## X927  0.68043192              1                          0 -0.1064706  0.33645354
## X929 -0.63511852              1                          1  1.6497447 -0.21204427
## X932  0.13228591              1                          1  1.1479689  2.23126416
## X933 -0.96400613              0                          0  0.0189734 -1.75781083
## X935 -1.36597987              0                          1  1.1479689 -0.71067864
## X936  0.53425965              0                          1  1.9006326  0.23672667
## X937  0.09574284              0                          1  1.2734129 -0.41149802
## X939  0.86314726              0                          1  2.9041842  0.33645354
## X940 -0.01388637              0                          0 -0.2319145 -0.11231739
## X941  0.46117352              0                          1  1.0225250  1.98194698
## X942  0.24191511              0                          0  0.0189734  1.43344917
## X943  0.46117352              0                          1  1.1479689  0.83508792
## X945 -1.03709226              0                          0  0.0189734  0.68549761
## X946  0.60734579              0                          1  0.8970810  0.33645354
## X948  0.24191511              0                          1  0.6461931  0.53590729
## X949 -0.59857545              0                          0 -0.9845782 -0.86026895
## X950 -1.00054920              0                          0 -2.2390177 -1.55835708
## X951 -0.12351557              0                          0 -1.3609100  1.73262979
## X953  1.30166407              0                          0 -0.6082463  0.18686323
```

```
## X954 -0.78129079           0                         1  0.8970810  0.63563417
## X955 -0.37931704           0                         0 -0.7336903  0.88495135
## X956 -1.84103976           1                         0 -0.2319145  0.18686323
## X957 -1.36597987           0                         1  0.6461931 -0.81040552
## X958 -0.37931704           0                         1  1.5243008  1.48331260
## X959 -0.92746306           0                         0 -0.2319145 -0.26190770
## X960 -0.92746306           0                         0 -2.1135737 -0.31177114
## X961  0.97277646           1                         1  0.3953052 -0.66081520
## X962  0.79006113           0                         1  0.5207492  1.68276635
## X963  1.15549180           0                         0 -0.8591342  1.18413198
## X964  0.53425965           0                         0 -0.9845782 -0.41149802
## X965  0.46117352           0                         1  0.1444173 -0.51122489
## X966  0.20537204           0                         0 -0.6082463 -1.60822051
## X968  1.63055169           1                         1  0.2698613  0.98467823
## X969 -0.19660170           0                         1  1.0225250  0.43618042
## X970  0.02265670           0                         1  0.6461931 -0.16218083
## X971 -1.54869521           0                         0 -0.9845782  0.08713636
## X972 -0.85437693           0                         0 -0.3573584 -0.56108833
## X973 -0.08697250           0                         0 -1.2354661 -1.10958614
## X974 -1.51215215           0                         1  2.2769645  1.13426854
## X975  1.11894874           0                         1  0.1444173  0.23672667
## X976  0.16882897           0                         0 -0.6082463 -1.05972270
## X977  0.46117352           0                         0 -0.8591342  0.03727292
## X978  0.38808738           0                         0 -0.9845782 -0.86026895
## X979  1.52092248           0                         1  2.4024084  0.58577073
## X980 -0.45240318           0                         1  0.2698613 -1.05972270
## X981  0.75351806           0                         0 -0.8591342  0.33645354
## X982  1.08240567           0                         1  0.7716371  0.08713636
## X983 -0.01388637           0                         1  1.2734129  2.33099104
## X984 -0.23314477           0                         0 -1.2354661 -1.70794739
## X985  1.19203487           0                         1  0.2698613  0.73536104
## X986 -0.70820465           0                         0 -1.6117979 -1.35890333
## X987  0.42463045           0                         0 -1.1100221 -1.35890333
## X988 -0.41586011           0                         0 -2.2390177  1.33372229
## X989  0.31500124           0                         0 -0.6082463  0.18686323
## X990  1.08240567           0                         0 -0.2319145  0.93481479
## X991  1.15549180           1                         0 -0.1064706 -0.21204427
## X992  0.49771658           0                         0 -1.6117979 -0.76054208
## X993  1.19203487           0                         0 -0.1064706 -0.56108833
## X994 -1.25635067           0                         0  0.0189734 -0.61095177
## X995 -0.23314477           1                         1  0.2698613  0.53590729
## X996 -0.37931704           1                         1  0.1444173  0.48604386
## X997 -0.78129079           0                         1  0.6461931  0.58577073
## X998 -0.30623091           0                         1  0.3953052  0.73536104
## X999 -0.12351557           0                         1  0.8970810 -0.61095177
##       vaccineVaccinated  depression
## X1                    1 -0.90094190
## X2                    0 -2.31696060
## X3                    1 -0.90094190
## X4                    1 -1.37294814
## X6                    1  0.98708304
## X9                    0  0.51507680
## X10                   0  0.51507680
## X11                   0 -0.90094190
```

```
## X12                        0 -1.37294814
## X13                        0  0.51507680
## X14                        0 -0.42893567
## X15                        0 -0.90094190
## X17                        0  1.45908927
## X18                        1  0.04307057
## X19                        1  0.51507680
## X21                        1  1.45908927
## X22                        1 -0.90094190
## X24                        0  1.45908927
## X25                        0  0.04307057
## X26                        1 -0.42893567
## X27                        0 -0.42893567
## X28                        0 -1.37294814
## X29                        0  0.04307057
## X30                        0  0.51507680
## X31                        1  0.04307057
## X33                        1  2.87510798
## X36                        1  1.45908927
## X39                        1  1.45908927
## X40                        1  0.98708304
## X41                        1 -0.42893567
## X42                        1  0.04307057
## X45                        1  0.04307057
## X46                        1  0.51507680
## X47                        1  0.98708304
## X49                        1  0.04307057
## X54                        0  0.04307057
## X56                        1 -0.42893567
## X57                        0 -0.42893567
## X59                        1 -1.37294814
## X60                        0 -0.42893567
## X61                        0  0.98708304
## X62                        0  0.04307057
## X64                        1 -1.37294814
## X65                        0  0.51507680
## X67                        0  0.98708304
## X69                        0 -1.37294814
## X70                        1 -2.31696060
## X72                        0 -0.42893567
## X73                        0  0.51507680
## X74                        1 -1.37294814
## X75                        0 -0.42893567
## X77                        0  0.98708304
## X78                        0  0.04307057
## X79                        0  1.45908927
## X82                        0  0.04307057
## X85                        1  0.04307057
## X87                        0 -1.37294814
## X88                        0 -1.37294814
## X89                        0 -1.37294814
## X90                        0 -0.42893567
## X91                        0 -0.42893567
## X92                        1  0.04307057
```

```
## X93                        1  1.93109551
## X94                        0  0.51507680
## X95                        1  0.98708304
## X96                        1  0.04307057
## X97                        1  0.98708304
## X98                        0 -2.31696060
## X99                        1  1.93109551
## X100                       1 -0.42893567
## X101                       1  0.04307057
## X102                       1  0.98708304
## X103                       0  1.93109551
## X104                       1 -0.42893567
## X105                       1  2.40310174
## X106                       0 -0.90094190
## X108                       1  0.51507680
## X109                       1  0.98708304
## X110                       0  0.04307057
## X112                       1  0.04307057
## X113                       1  0.51507680
## X114                       0 -1.84495437
## X115                       0 -0.42893567
## X116                       0 -2.31696060
## X117                       0 -0.90094190
## X119                       1  0.04307057
## X120                       1 -0.42893567
## X121                       0  0.51507680
## X122                       0  0.98708304
## X123                       1  0.51507680
## X126                       1  0.04307057
## X127                       0 -1.84495437
## X128                       0 -0.42893567
## X129                       1 -0.90094190
## X130                       1 -0.42893567
## X131                       1 -0.90094190
## X132                       1 -0.42893567
## X133                       1  2.40310174
## X135                       1  0.51507680
## X136                       1  0.51507680
## X137                       0  0.04307057
## X138                       1 -0.42893567
## X139                       0  0.98708304
## X142                       0 -0.42893567
## X144                       1 -0.90094190
## X145                       1 -1.84495437
## X146                       1 -0.42893567
## X147                       1 -2.31696060
## X148                       0  0.51507680
## X149                       0 -0.90094190
## X150                       1 -1.37294814
## X152                       1  0.51507680
## X154                       1  0.51507680
## X155                       0  0.98708304
## X156                       1  0.04307057
## X157                       0  0.51507680
```

```
## X159                       1 -0.42893567
## X160                       1  0.51507680
## X161                       1 -0.42893567
## X162                       1 -0.90094190
## X163                       1 -0.90094190
## X164                       1  1.45908927
## X165                       0 -0.90094190
## X166                       1 -0.42893567
## X167                       0 -0.90094190
## X168                       0 -0.42893567
## X169                       1 -0.90094190
## X170                       1  0.98708304
## X171                       1  0.51507680
## X172                       1 -0.90094190
## X173                       0 -0.42893567
## X174                       0 -0.90094190
## X175                       1 -1.37294814
## X177                       1  0.04307057
## X179                       1  1.45908927
## X180                       1 -2.31696060
## X181                       0 -0.90094190
## X182                       0 -0.90094190
## X183                       1 -0.90094190
## X184                       1  0.51507680
## X185                       1 -0.90094190
## X186                       1  0.04307057
## X187                       1  0.04307057
## X188                       0 -0.90094190
## X189                       0  0.04307057
## X190                       0 -2.31696060
## X191                       1  0.51507680
## X192                       0  0.04307057
## X193                       0 -0.42893567
## X194                       0  0.98708304
## X195                       0  0.51507680
## X196                       1  1.45908927
## X198                       0  0.98708304
## X200                       0 -0.90094190
## X201                       0  0.51507680
## X202                       1  1.45908927
## X204                       1  0.98708304
## X205                       1 -0.90094190
## X206                       0 -1.37294814
## X207                       1  2.40310174
## X209                       1  0.51507680
## X211                       1  0.98708304
## X212                       0  0.04307057
## X213                       0 -1.37294814
## X214                       1  1.45908927
## X215                       1  0.04307057
## X216                       0  1.93109551
## X217                       1  0.51507680
## X218                       1 -1.37294814
## X219                       1  0.51507680
```

```
## X220                    0  1.93109551
## X221                    1  0.51507680
## X222                    1 -0.90094190
## X223                    0  0.98708304
## X224                    0  0.04307057
## X226                    0  0.51507680
## X227                    1 -1.37294814
## X228                    1  0.04307057
## X229                    1  0.98708304
## X230                    1 -1.37294814
## X231                    0  0.04307057
## X233                    1  0.51507680
## X234                    0  0.51507680
## X235                    1  0.98708304
## X236                    0  1.93109551
## X237                    1  0.51507680
## X238                    1 -1.37294814
## X239                    0  0.04307057
## X240                    0 -0.42893567
## X241                    0 -1.37294814
## X244                    0  0.51507680
## X245                    0 -2.31696060
## X246                    1 -0.90094190
## X247                    1 -0.90094190
## X248                    1 -1.37294814
## X249                    1  0.04307057
## X251                    1  0.04307057
## X252                    1 -0.42893567
## X254                    1  0.04307057
## X255                    1 -1.84495437
## X256                    1 -1.37294814
## X257                    0  0.51507680
## X258                    1  1.45908927
## X259                    1 -0.90094190
## X260                    0  0.04307057
## X261                    1 -1.84495437
## X262                    1  0.04307057
## X264                    0  0.51507680
## X265                    0  0.98708304
## X266                    0  2.40310174
## X267                    0  0.04307057
## X268                    1  1.45908927
## X269                    1  0.51507680
## X270                    1  1.45908927
## X273                    1  0.51507680
## X274                    0  1.93109551
## X275                    0 -0.90094190
## X276                    1 -0.90094190
## X277                    1 -1.84495437
## X278                    1 -0.90094190
## X279                    0  0.04307057
## X280                    1 -0.90094190
## X282                    0  1.45908927
## X283                    1 -0.90094190
```

```
## X284                    1  0.98708304
## X286                    1 -0.42893567
## X289                    0  0.04307057
## X290                    1 -0.42893567
## X292                    1 -0.90094190
## X293                    0  0.04307057
## X295                    1  0.04307057
## X296                    1 -0.90094190
## X298                    0  1.45908927
## X299                    1  0.51507680
## X300                    1  0.98708304
## X301                    0  0.04307057
## X302                    1  0.04307057
## X303                    1  2.87510798
## X305                    0  0.98708304
## X306                    0  0.04307057
## X307                    1 -0.42893567
## X311                    0  0.51507680
## X312                    0 -0.42893567
## X313                    1  0.04307057
## X314                    1 -1.37294814
## X315                    1 -0.42893567
## X316                    1 -1.37294814
## X317                    1  0.51507680
## X318                    1 -1.84495437
## X319                    0  0.98708304
## X321                    1 -0.90094190
## X322                    1 -0.42893567
## X326                    1  0.04307057
## X327                    0  0.04307057
## X328                    1 -1.37294814
## X329                    0 -0.90094190
## X330                    1  0.98708304
## X331                    0  0.51507680
## X332                    1  0.98708304
## X333                    1  0.04307057
## X334                    0  0.51507680
## X335                    1  0.98708304
## X336                    1  0.51507680
## X339                    0 -0.90094190
## X340                    1 -0.42893567
## X341                    0  0.98708304
## X342                    0 -0.90094190
## X345                    1 -0.42893567
## X347                    1  0.04307057
## X349                    1  0.04307057
## X351                    1  0.98708304
## X353                    1 -1.37294814
## X354                    1  0.04307057
## X355                    0 -0.90094190
## X356                    0  0.04307057
## X359                    0 -0.42893567
## X360                    1  1.93109551
## X361                    1 -0.42893567
```

```
## X363                     1  1.45908927
## X365                     0 -0.42893567
## X366                     1  0.51507680
## X367                     0  0.51507680
## X369                     0  0.98708304
## X371                     1  0.04307057
## X372                     0 -1.84495437
## X373                     0  0.04307057
## X374                     1 -2.31696060
## X376                     0 -0.42893567
## X377                     0  0.51507680
## X378                     1  0.98708304
## X379                     1  0.51507680
## X380                     1  0.98708304
## X382                     0 -0.42893567
## X383                     0  0.51507680
## X385                     1 -0.42893567
## X386                     0 -0.90094190
## X387                     0 -2.31696060
## X388                     1  0.98708304
## X389                     0  0.51507680
## X391                     0  0.04307057
## X392                     0  0.04307057
## X393                     0 -1.37294814
## X394                     0 -0.90094190
## X395                     0  1.45908927
## X396                     0  0.04307057
## X397                     0 -0.42893567
## X398                     1  0.04307057
## X399                     1  0.04307057
## X401                     1  0.98708304
## X402                     1  0.98708304
## X405                     0 -1.84495437
## X406                     0  0.04307057
## X407                     0 -0.42893567
## X408                     1  0.51507680
## X410                     0 -0.42893567
## X411                     0  0.51507680
## X412                     0 -2.31696060
## X413                     1 -0.90094190
## X414                     0  0.98708304
## X415                     0 -0.90094190
## X416                     0 -0.90094190
## X417                     1 -0.42893567
## X418                     0 -2.31696060
## X419                     1 -0.42893567
## X420                     1  0.51507680
## X421                     1  0.51507680
## X422                     1  0.51507680
## X423                     1 -1.37294814
## X424                     0  0.51507680
## X425                     1  0.98708304
## X426                     0 -0.90094190
## X427                     1  0.04307057
```

```
## X431                       0  0.51507680
## X432                       0  1.93109551
## X434                       1  0.04307057
## X435                       0  0.04307057
## X437                       0 -0.42893567
## X438                       1  0.51507680
## X439                       1 -1.37294814
## X440                       0  0.51507680
## X441                       1  0.04307057
## X442                       0 -0.42893567
## X443                       0 -0.90094190
## X444                       1 -0.90094190
## X445                       1 -1.37294814
## X448                       1  0.04307057
## X450                       1  0.98708304
## X451                       0  0.51507680
## X453                       0 -0.42893567
## X454                       1 -0.42893567
## X455                       1 -0.42893567
## X456                       0 -2.31696060
## X457                       0  0.04307057
## X458                       1  0.51507680
## X459                       1  1.45908927
## X460                       1  0.51507680
## X461                       0  0.51507680
## X464                       1 -0.90094190
## X465                       1 -0.90094190
## X466                       1  0.04307057
## X468                       1  1.45908927
## X469                       1 -0.90094190
## X470                       0 -1.84495437
## X472                       1 -1.37294814
## X473                       0 -0.42893567
## X474                       0 -0.42893567
## X475                       1 -1.84495437
## X476                       1  0.04307057
## X478                       0  0.51507680
## X480                       0  0.51507680
## X481                       0  0.04307057
## X482                       1 -1.37294814
## X483                       1 -0.42893567
## X484                       0  2.40310174
## X486                       1 -0.42893567
## X487                       1  0.51507680
## X488                       1 -1.37294814
## X489                       0  0.51507680
## X490                       1  1.45908927
## X491                       0 -0.42893567
## X492                       0  2.87510798
## X493                       1  0.04307057
## X494                       0  0.51507680
## X495                       1  0.04307057
## X496                       0 -0.42893567
## X497                       1  0.98708304
```

```
## X498                       0 -2.31696060
## X499                       1  0.04307057
## X500                       1  0.04307057
## X501                       1 -0.42893567
## X502                       1 -0.42893567
## X503                       1  0.98708304
## X504                       0  1.45908927
## X507                       1 -0.90094190
## X509                       0 -2.31696060
## X511                       1 -0.90094190
## X512                       1 -0.42893567
## X513                       0  0.98708304
## X514                       1  0.51507680
## X515                       0  0.04307057
## X516                       0  0.04307057
## X518                       1  0.51507680
## X520                       0 -0.90094190
## X521                       1  1.45908927
## X522                       0 -1.37294814
## X523                       1 -0.90094190
## X524                       0  0.51507680
## X525                       1  0.51507680
## X527                       1 -0.90094190
## X528                       0  0.51507680
## X529                       1 -0.42893567
## X530                       1 -0.90094190
## X533                       1 -1.37294814
## X535                       1  0.98708304
## X536                       0  1.45908927
## X539                       0  0.51507680
## X540                       1  0.04307057
## X541                       1  0.51507680
## X542                       0 -0.42893567
## X543                       0  0.04307057
## X545                       0  0.04307057
## X546                       1  0.51507680
## X547                       0  0.98708304
## X548                       1 -1.84495437
## X549                       0 -0.42893567
## X550                       1 -1.84495437
## X551                       0  1.93109551
## X552                       0  0.04307057
## X553                       1 -0.42893567
## X554                       1 -0.90094190
## X556                       1 -0.42893567
## X557                       0  1.45908927
## X558                       0  0.51507680
## X559                       0 -0.42893567
## X560                       1  2.40310174
## X561                       0 -0.42893567
## X562                       1  0.51507680
## X563                       1  1.45908927
## X564                       1  0.98708304
## X565                       0  0.04307057
```

```
## X566                        0  0.04307057
## X567                        1  0.51507680
## X568                        1  0.51507680
## X569                        0  0.04307057
## X571                        1 -0.90094190
## X573                        0 -0.90094190
## X574                        0  0.04307057
## X575                        0  0.98708304
## X576                        1 -1.37294814
## X577                        1 -1.37294814
## X579                        1  0.04307057
## X580                        0 -2.78896684
## X582                        1 -0.42893567
## X584                        1  0.04307057
## X587                        0  0.51507680
## X588                        1 -0.90094190
## X589                        0 -0.90094190
## X591                        1 -0.42893567
## X592                        1  1.93109551
## X593                        1 -0.42893567
## X594                        1 -1.37294814
## X597                        0  0.51507680
## X598                        1 -0.90094190
## X600                        0 -0.90094190
## X601                        1 -1.37294814
## X602                        0  1.45908927
## X603                        0 -0.90094190
## X604                        1  0.04307057
## X605                        0 -0.42893567
## X606                        0  0.51507680
## X609                        0  0.04307057
## X610                        0  0.04307057
## X611                        0  0.04307057
## X613                        0  0.98708304
## X614                        0  0.04307057
## X615                        1  0.51507680
## X617                        1  0.04307057
## X618                        0 -0.90094190
## X619                        1  1.93109551
## X620                        1  0.98708304
## X623                        0  0.51507680
## X624                        1  1.45908927
## X625                        1 -0.42893567
## X626                        1 -0.42893567
## X628                        1  0.04307057
## X629                        1 -0.90094190
## X630                        1 -0.42893567
## X631                        0  0.51507680
## X632                        1  0.04307057
## X633                        0  0.04307057
## X634                        0  0.04307057
## X635                        1  0.04307057
## X636                        1 -0.42893567
## X637                        0  0.04307057
```

```
## X638                      1 -0.90094190
## X640                      1  0.98708304
## X641                      0  0.98708304
## X642                      1  0.98708304
## X643                      1  1.45908927
## X644                      1  0.51507680
## X645                      1 -0.90094190
## X646                      1  0.04307057
## X648                      1 -1.37294814
## X649                      1  0.98708304
## X650                      1  0.04307057
## X652                      0  0.04307057
## X654                      0  0.51507680
## X655                      0  0.51507680
## X656                      1  0.98708304
## X657                      0  0.98708304
## X658                      0 -1.37294814
## X659                      0  0.98708304
## X660                      1  0.51507680
## X661                      0  0.51507680
## X663                      0 -0.42893567
## X664                      1  0.98708304
## X665                      0 -1.37294814
## X666                      0 -0.90094190
## X667                      1  0.51507680
## X668                      1 -0.42893567
## X669                      0  0.98708304
## X670                      1 -0.42893567
## X673                      0  0.51507680
## X674                      1 -0.90094190
## X675                      1  0.98708304
## X676                      0  0.04307057
## X677                      1 -0.42893567
## X678                      1  0.51507680
## X679                      1 -1.37294814
## X680                      0  0.98708304
## X681                      1  0.98708304
## X682                      1  0.51507680
## X683                      1  0.98708304
## X684                      1  0.98708304
## X685                      0  1.45908927
## X686                      1  0.98708304
## X687                      1 -1.84495437
## X688                      0  1.93109551
## X690                      0 -0.90094190
## X691                      1 -0.90094190
## X692                      0  0.04307057
## X693                      1 -1.37294814
## X694                      1  0.98708304
## X697                      1  0.51507680
## X698                      1  0.98708304
## X699                      1  0.98708304
## X700                      1  0.51507680
## X701                      1  0.51507680
```

```
## X702                         0  0.51507680
## X703                         0  0.98708304
## X705                         1  0.98708304
## X706                         1  0.51507680
## X707                         1  0.51507680
## X708                         1  1.45908927
## X709                         1  0.51507680
## X710                         1  0.04307057
## X711                         0  0.98708304
## X712                         1 -1.84495437
## X713                         1  0.04307057
## X714                         0 -0.42893567
## X715                         1  0.51507680
## X716                         0  0.04307057
## X717                         1  0.98708304
## X718                         0  0.51507680
## X719                         1  0.51507680
## X720                         1 -0.90094190
## X721                         0  0.98708304
## X722                         1  0.98708304
## X724                         0 -0.42893567
## X725                         0  2.40310174
## X726                         0 -1.37294814
## X730                         0  0.51507680
## X731                         1  0.98708304
## X732                         1 -0.42893567
## X734                         1 -0.90094190
## X735                         1  0.98708304
## X737                         1 -1.37294814
## X738                         1  1.93109551
## X739                         1  0.98708304
## X740                         1  0.51507680
## X744                         0 -0.42893567
## X745                         0  0.04307057
## X746                         0  1.45908927
## X747                         1  0.04307057
## X748                         1  0.04307057
## X749                         0  1.45908927
## X751                         0  0.04307057
## X752                         1  0.51507680
## X753                         0  0.98708304
## X754                         0  0.98708304
## X757                         1 -2.31696060
## X758                         1  0.04307057
## X759                         0 -1.84495437
## X761                         1  0.04307057
## X762                         0  0.98708304
## X763                         0  1.45908927
## X764                         1 -1.84495437
## X765                         1 -1.37294814
## X766                         0 -0.42893567
## X767                         1  0.04307057
## X768                         0  0.51507680
## X769                         1 -0.42893567
```

```
## X770                        1 -3.26097307
## X772                        0 -0.42893567
## X773                        1  0.51507680
## X774                        0 -0.90094190
## X775                        0  1.93109551
## X776                        1 -1.84495437
## X777                        1 -0.42893567
## X778                        1 -0.42893567
## X779                        1  0.04307057
## X780                        1 -0.90094190
## X781                        1 -0.90094190
## X784                        1 -0.90094190
## X786                        1 -1.84495437
## X787                        1 -0.90094190
## X788                        1 -0.42893567
## X789                        0 -1.84495437
## X790                        1  0.04307057
## X791                        1 -0.42893567
## X792                        0 -0.90094190
## X794                        0 -1.37294814
## X795                        1 -0.42893567
## X796                        1 -0.42893567
## X797                        0  0.04307057
## X798                        1 -2.31696060
## X799                        0  0.51507680
## X800                        1  0.98708304
## X801                        0  0.98708304
## X802                        0  0.98708304
## X803                        1  0.51507680
## X804                        1 -0.42893567
## X805                        0 -0.90094190
## X807                        1  0.51507680
## X808                        1 -0.90094190
## X809                        0 -0.42893567
## X810                        1 -2.78896684
## X812                        1 -0.42893567
## X813                        1  0.51507680
## X814                        1  1.45908927
## X815                        1  0.98708304
## X816                        1  0.04307057
## X817                        1 -0.42893567
## X818                        1  0.51507680
## X820                        1 -1.37294814
## X821                        0  1.45908927
## X822                        0  0.51507680
## X823                        0  0.98708304
## X824                        1 -0.90094190
## X825                        0  1.45908927
## X826                        1  0.04307057
## X830                        1  0.51507680
## X831                        1 -0.42893567
## X832                        1  0.98708304
## X833                        0 -0.90094190
## X834                        1 -1.37294814
```

```
## X836                        0  1.45908927
## X837                        0  0.51507680
## X838                        0 -0.90094190
## X839                        1  0.51507680
## X840                        0  0.04307057
## X841                        1  0.04307057
## X842                        1 -0.90094190
## X843                        1  0.51507680
## X844                        1 -0.42893567
## X847                        1 -0.42893567
## X848                        1  0.98708304
## X849                        1  0.51507680
## X850                        0  0.04307057
## X851                        0  0.04307057
## X852                        1  0.04307057
## X853                        1  0.51507680
## X854                        0  0.04307057
## X855                        1 -0.42893567
## X856                        1 -1.84495437
## X857                        0 -0.42893567
## X858                        1 -0.90094190
## X859                        0 -0.90094190
## X860                        0  2.87510798
## X861                        1  0.04307057
## X862                        1  0.04307057
## X864                        0 -1.37294814
## X865                        1 -0.42893567
## X866                        1  0.51507680
## X867                        0  0.51507680
## X868                        1  0.51507680
## X869                        1  1.93109551
## X870                        0 -0.42893567
## X871                        0  0.04307057
## X872                        1 -0.42893567
## X873                        0 -2.31696060
## X874                        1  0.51507680
## X875                        1  0.04307057
## X877                        0 -0.90094190
## X878                        1 -2.31696060
## X879                        1  0.98708304
## X880                        0  0.51507680
## X881                        1 -1.37294814
## X882                        1  0.51507680
## X883                        1 -1.84495437
## X884                        1 -0.90094190
## X885                        1  0.51507680
## X886                        0 -0.42893567
## X887                        1  0.04307057
## X888                        0 -0.42893567
## X889                        1  0.04307057
## X890                        1  0.98708304
## X891                        1 -0.42893567
## X892                        1  0.98708304
## X894                        0  0.04307057
```

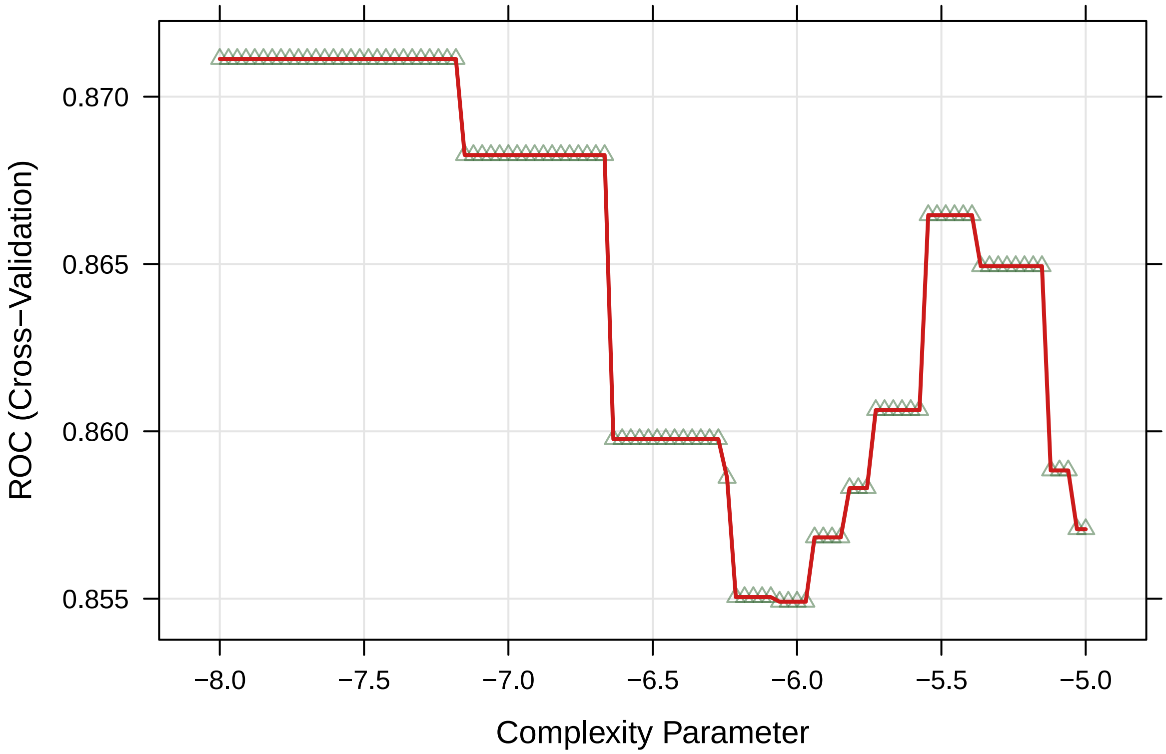
```
## X895                        1 -0.90094190
## X897                        0  0.51507680
## X899                        0  1.93109551
## X900                        1  0.04307057
## X901                        0  0.51507680
## X902                        0 -1.84495437
## X903                        1  0.04307057
## X904                        1  0.51507680
## X905                        1  0.04307057
## X906                        1  0.98708304
## X907                        1  0.98708304
## X908                        0  0.98708304
## X909                        1 -0.42893567
## X910                        1  0.98708304
## X911                        1  0.98708304
## X913                        1 -0.42893567
## X916                        1 -0.42893567
## X917                        1  0.98708304
## X918                        0  0.04307057
## X919                        0 -1.37294814
## X920                        1  0.04307057
## X921                        0 -0.90094190
## X922                        0 -0.42893567
## X924                        1 -0.90094190
## X925                        1  0.04307057
## X926                        1 -0.42893567
## X927                        0  0.51507680
## X929                        0  0.04307057
## X932                        0  0.51507680
## X933                        1  0.04307057
## X935                        1 -1.84495437
## X936                        0  1.45908927
## X937                        1  0.98708304
## X939                        0  0.98708304
## X940                        0  0.51507680
## X941                        1  0.98708304
## X942                        1  0.98708304
## X943                        0  1.45908927
## X945                        1 -0.42893567
## X946                        1  0.04307057
## X948                        0 -0.42893567
## X949                        1 -0.90094190
## X950                        1  1.93109551
## X951                        1 -0.42893567
## X953                        0  0.04307057
## X954                        0 -1.37294814
## X955                        1  1.45908927
## X956                        0  0.51507680
## X957                        0  0.04307057
## X958                        1  0.04307057
## X959                        1  0.04307057
## X960                        1  0.04307057
## X961                        0 -0.42893567
## X962                        0  0.51507680
```

```
## X963                 1  0.98708304
## X964                 1  0.51507680
## X965                 1  1.93109551
## X966                 0 -0.42893567
## X968                 1  0.04307057
## X969                 1  0.98708304
## X970                 0 -0.42893567
## X971                 1  1.45908927
## X972                 1  1.93109551
## X973                 1  0.51507680
## X974                 0  0.98708304
## X975                 1 -0.90094190
## X976                 0  0.04307057
## X977                 1  0.98708304
## X978                 1  0.04307057
## X979                 1  0.04307057
## X980                 1  1.45908927
## X981                 0  0.04307057
## X982                 0 -1.37294814
## X983                 0  0.04307057
## X984                 1  1.45908927
## X985                 1  0.51507680
## X986                 0  0.04307057
## X987                 0  0.51507680
## X988                 1 -0.42893567
## X989                 1  0.04307057
## X990                 1  1.45908927
## X991                 1 -0.42893567
## X992                 1  0.98708304
## X993                 1 -0.90094190
## X994                 0  0.04307057
## X995                 0  0.04307057
## X996                 0  0.04307057
## X997                 1 -0.90094190
## X998                 1 -0.90094190
## X999                 0 -0.90094190
##
## $usekernel
## [1] TRUE
##
## $varnames
##  [1] "age"                   "genderMale"            "raceAsian"
##  [4] "raceBlack"             "raceHispanic"          "smokingFormer_smoker"
##  [7] "smokingCurrent_smoker" "height"                "weight"
## [10] "bmi"                   "diabetesYes"           "hypertensionYes"
## [13] "sbp"                   "ldl"                   "vaccineVaccinated"
## [16] "depression"
##
## $xNames
##  [1] "age"                   "genderMale"            "raceAsian"
##  [4] "raceBlack"             "raceHispanic"          "smokingFormer_smoker"
##  [7] "smokingCurrent_smoker" "height"                "weight"
## [10] "bmi"                   "diabetesYes"           "hypertensionYes"
## [13] "sbp"                   "ldl"                   "vaccineVaccinated"
```

```
## [16] "depression"
##
## $problemType
## [1] "Classification"
##
## $tuneValue
##    fL usekernel adjust
## 42  1      TRUE    3.4
##
## $obsLevels
## [1] "Not_severe" "Severe"
## attr(,"ordered")
## [1] FALSE
##
## $param
## list()
##
## attr(,"class")
## [1] "NaiveBayes"
```

CART

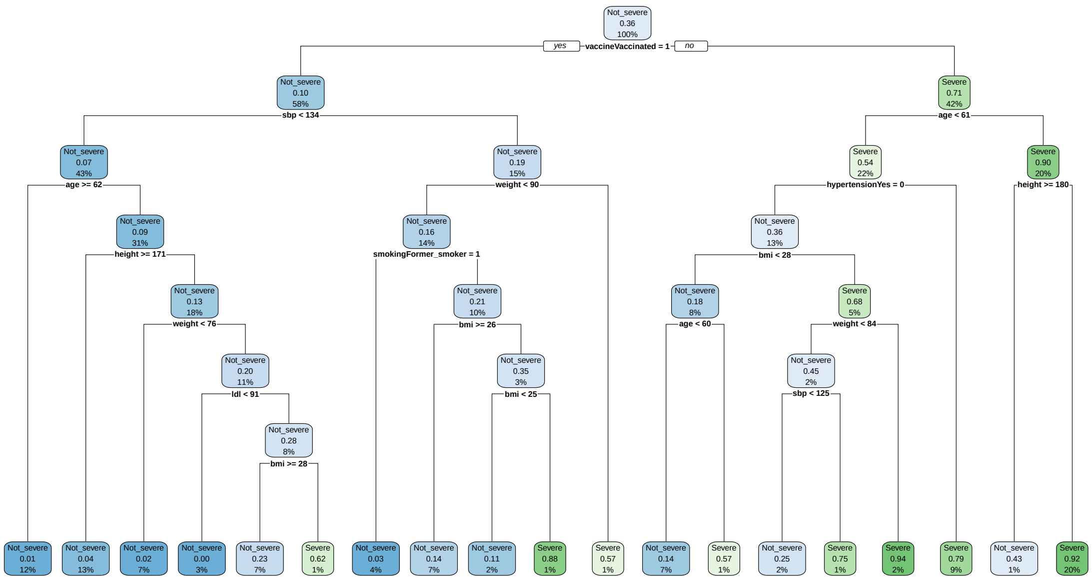
```r
set.seed(2)
model.cart = train(x = x.train,
                   y = y.train,
                  method = "rpart",
                  tuneGrid = data.frame(cp = exp(seq(-8,-5, len = 100))),
                  trControl = ctrl,
                  metric = "ROC")

plot(model.cart, xTrans = log)
```



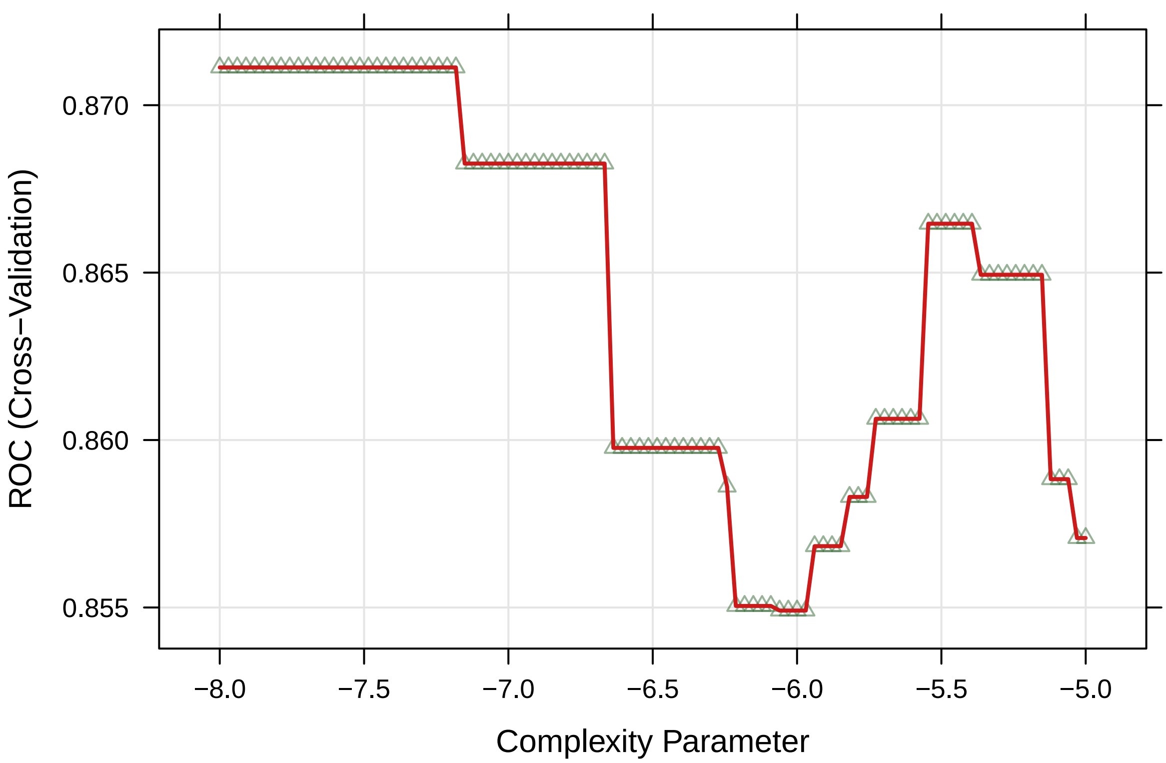

```r
model.cart$bestTune
```

```
##              cp
## 28 0.0007602842
```

```r
rpart.plot(model.cart$finalModel)
```



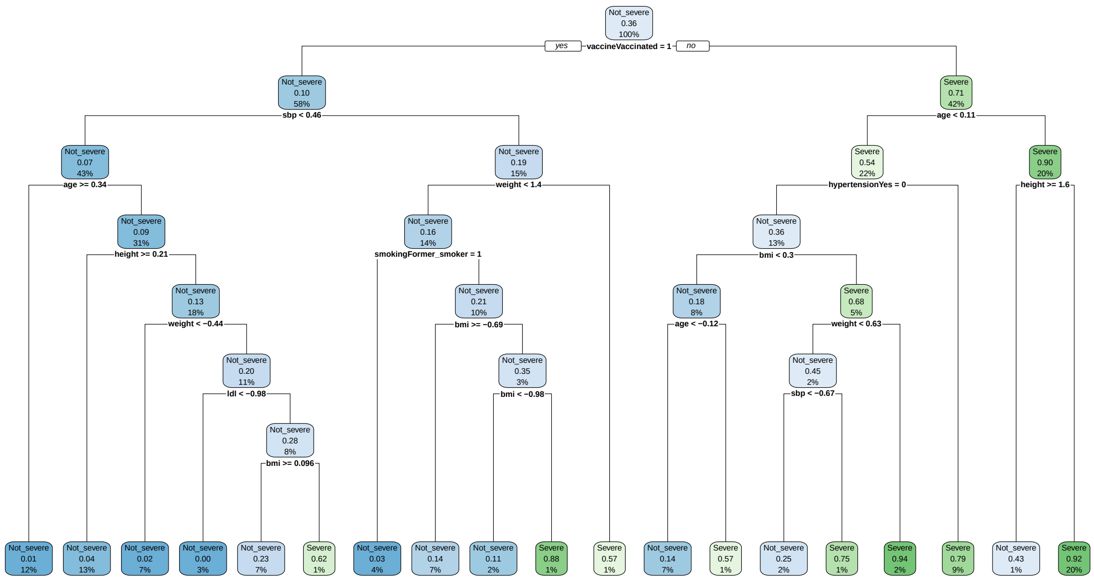

```r
# CART scaled
set.seed(2)
scaled.model.cart = train(x = x.train.scaled,
                     y = y.train.scaled,
                    method = "rpart",
                    tuneGrid = data.frame(cp = exp(seq(-8,-5, len = 100))),
                    trControl = ctrl,
                    metric = "ROC")

plot(scaled.model.cart, xTrans = log)
```



```
scaled.model.cart$bestTune
```

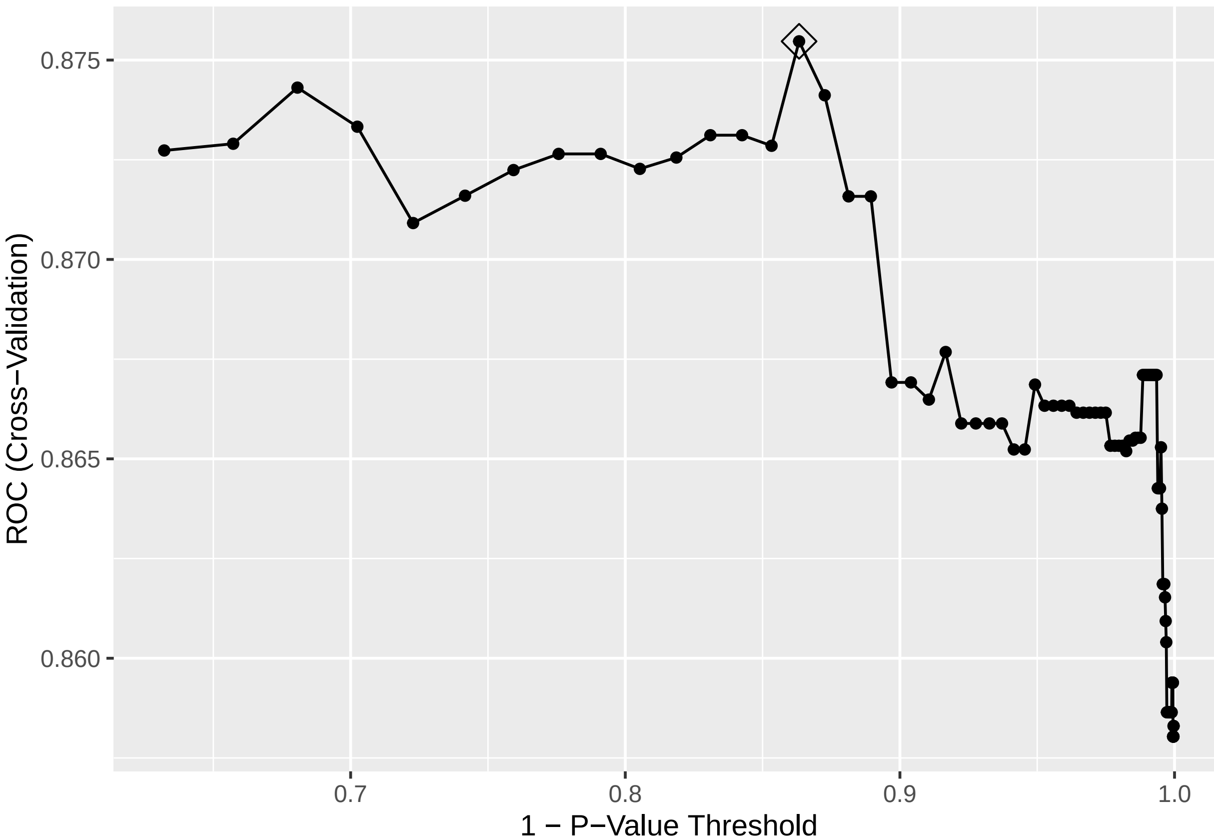
```
##              cp
## 28 0.0007602842
```

```
rpart.plot(scaled.model.cart$finalModel)
```



Conditional Inference Trees (CIT)

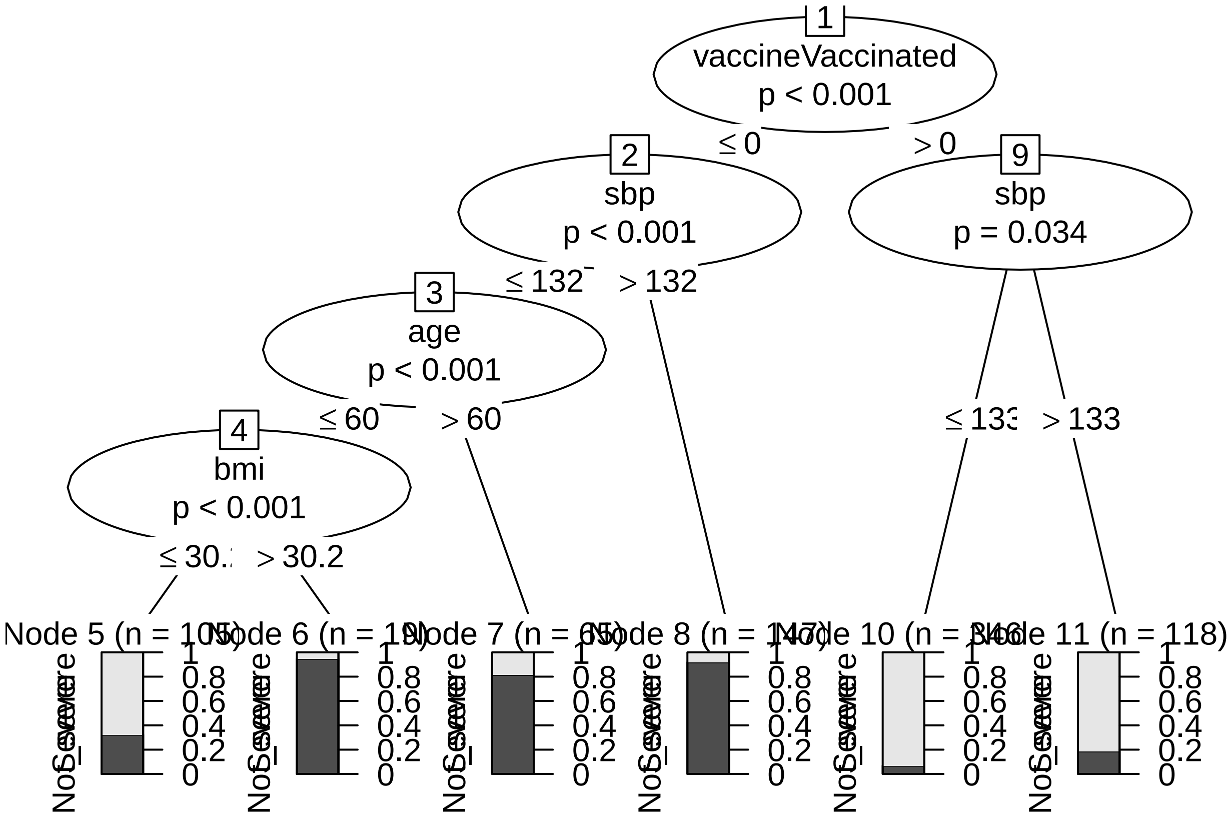
```
set.seed(2)

model.cit = train(x = x.train,
                  y = y.train,
                  method = "ctree",
                  tuneGrid = data.frame(mincriterion = 1-exp(seq(-8, -1, length = 100))),
                  trControl = ctrl)

ggplot(model.cit, highlight = TRUE)
```



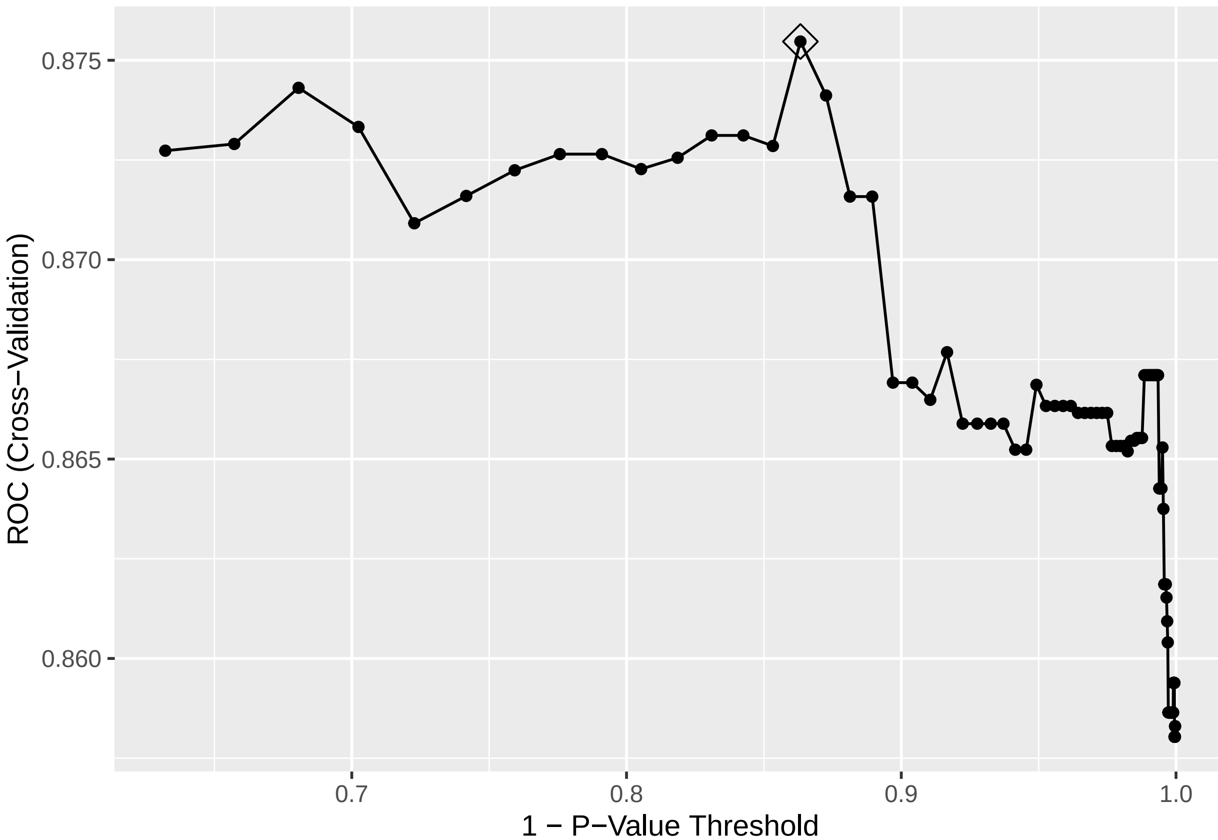

```
model.cit$bestTune
```

```
##    mincriterion
## 15    0.8632908
```

```
plot(model.cit$finalModel)
```



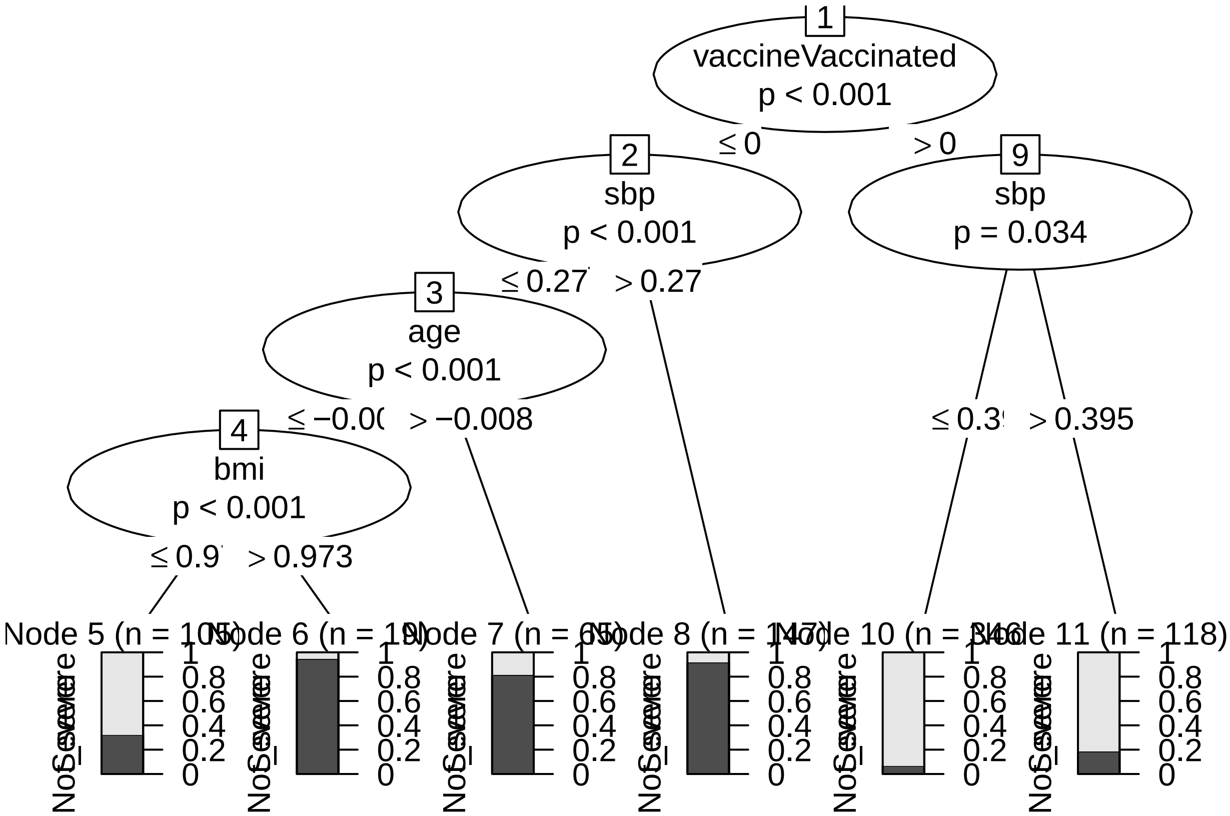

```
#CIT scaled
set.seed(2)

scaled.model.cit = train(x = x.train.scaled,
                    y = y.train.scaled,
                    method = "ctree",
                    tuneGrid = data.frame(mincriterion = 1-exp(seq(-8, -1, length = 100))),
                    trControl = ctrl)

ggplot(scaled.model.cit, highlight = TRUE)
```




```r
scaled.model.cit$bestTune
```

```
##    mincriterion
## 15    0.8632908
```

```r
plot(scaled.model.cit$finalModel)
```

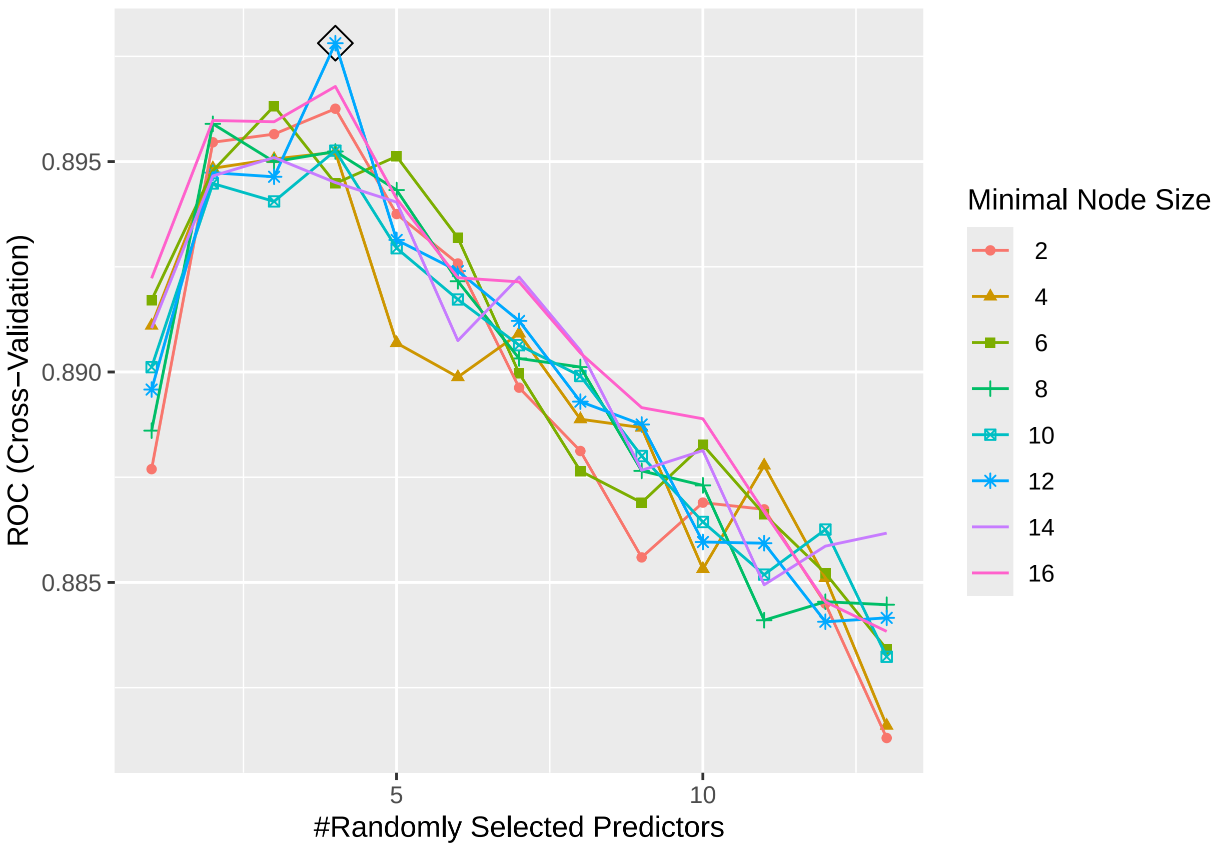

1
vaccineVaccinated
p < 0.001
≤ 0
> 0
2
sbp
p < 0.001
9
sbp
p = 0.034
≤ 0.27
> 0.27
3
age
p < 0.001
> −0.008
> 0.395
4
bmi
p < 0.001
> 0.973
Node 11 (n = 118)
1
0.8
0.6
0.4
0.2
0

Random Forest

```r
# Try more if possible
rf.grid = expand.grid(mtry = 1:13,
                      splitrule = "gini",
                      min.node.size = seq(from = 2, to = 16, by = 2))
set.seed(2)
model.rf = train(x = x.train,
                 y = y.train,
                 method = "ranger",
                 tuneGrid = rf.grid,
                 trControl = ctrl)
model.rf$bestTune
```

```
##    mtry splitrule min.node.size
## 30    4      gini            12
```

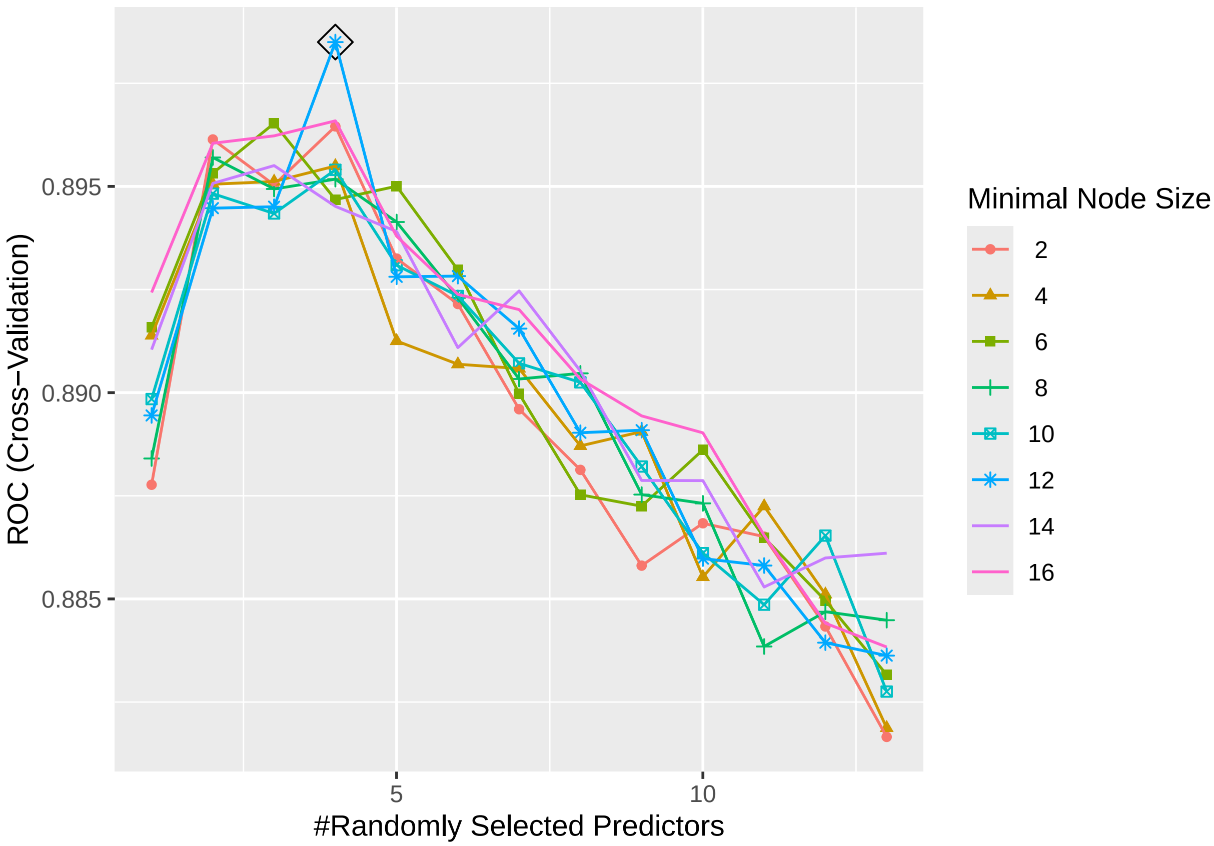
```r
ggplot(model.rf, highlight = TRUE)
```




```r
# RF scaled
set.seed(2)
scaled.model.rf = train(x = x.train.scaled,
                 y = y.train.scaled,
                 method = "ranger",
                 tuneGrid = rf.grid,
                 trControl = ctrl)
scaled.model.rf$bestTune
```

```
##    mtry splitrule min.node.size
```

```
## 30    4      gini             12
ggplot(scaled.model.rf, highlight = TRUE)
```

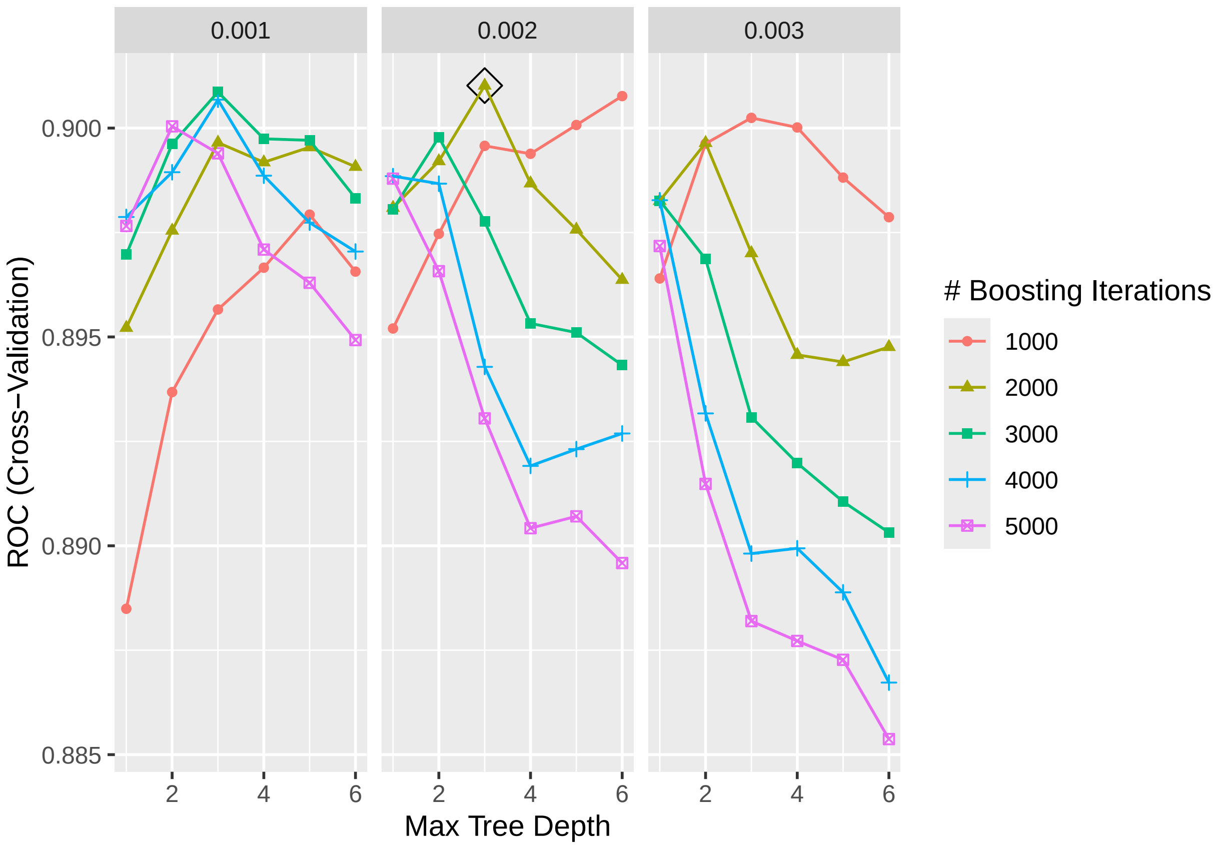


AdaBoost

```
# Try more
gbmA.grid = expand.grid(n.trees = c(1000,2000,3000,4000,5000),
                        interaction.depth = 1:6,
                        shrinkage = c(0.001, 0.002, 0.003),
                        n.minobsinnode = 1)

set.seed(2)

model.gbmA = train(x = x.train,
                   y = y.train,
                   tuneGrid = gbmA.grid,
                   trControl = ctrl,
                   method = "gbm",
                   distribution = "adaboost",
                   metric = "ROC",
                   verbose = FALSE)
model.gbmA$bestTune
```

```
##    n.trees interaction.depth shrinkage n.minobsinnode
## 42    2000                 3     0.002              1
```

```
ggplot(model.gbmA, highlight = TRUE)
```

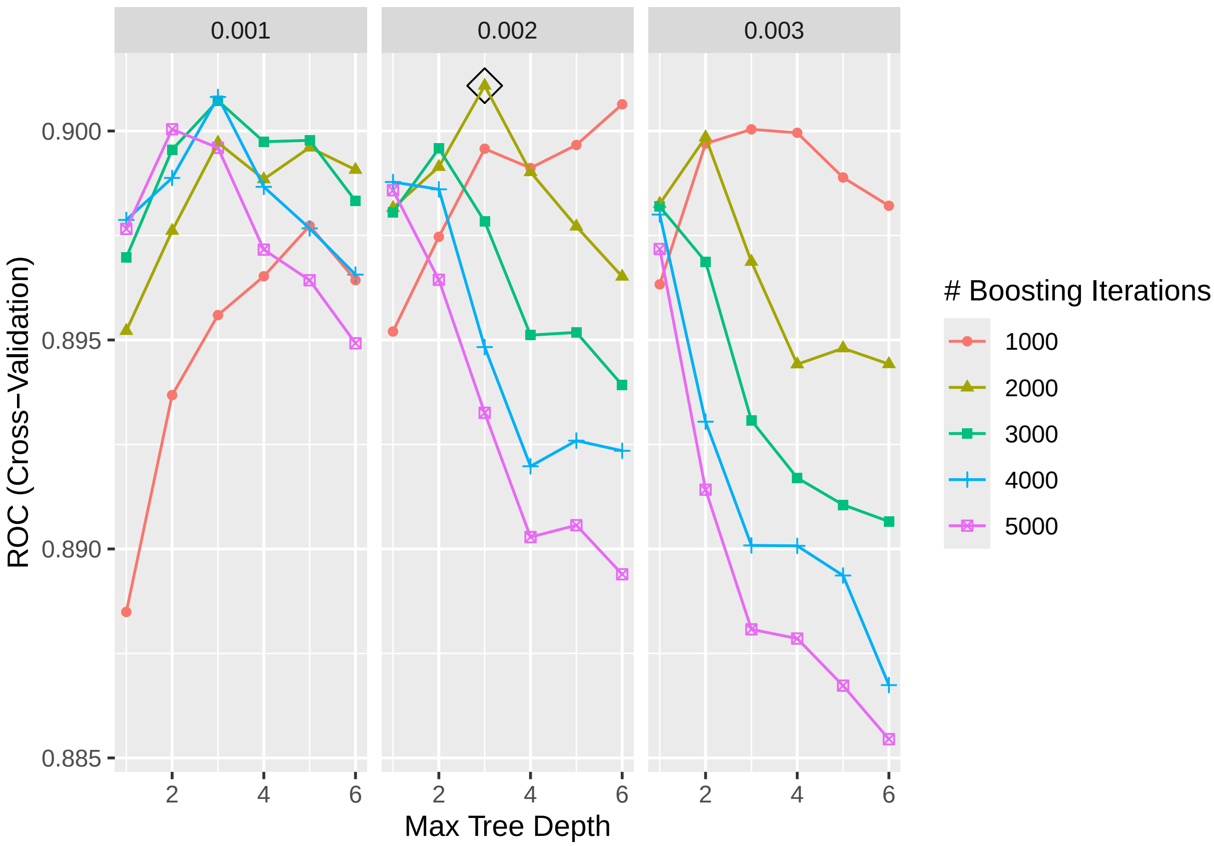



```
# boosted rf scaled
set.seed(2)
```

```r
scaled.model.gbmA = train(x = x.train.scaled,
                  y = y.train.scaled,
                  tuneGrid = gbmA.grid,
                  trControl = ctrl,
                  method = "gbm",
                  distribution = "adaboost",
                  metric = "ROC",
                  verbose = FALSE)
scaled.model.gbmA$bestTune
```

```
##    n.trees interaction.depth shrinkage n.minobsinnode
## 42    2000                 3     0.002              1
```

```r
ggplot(scaled.model.gbmA, highlight = TRUE)
```

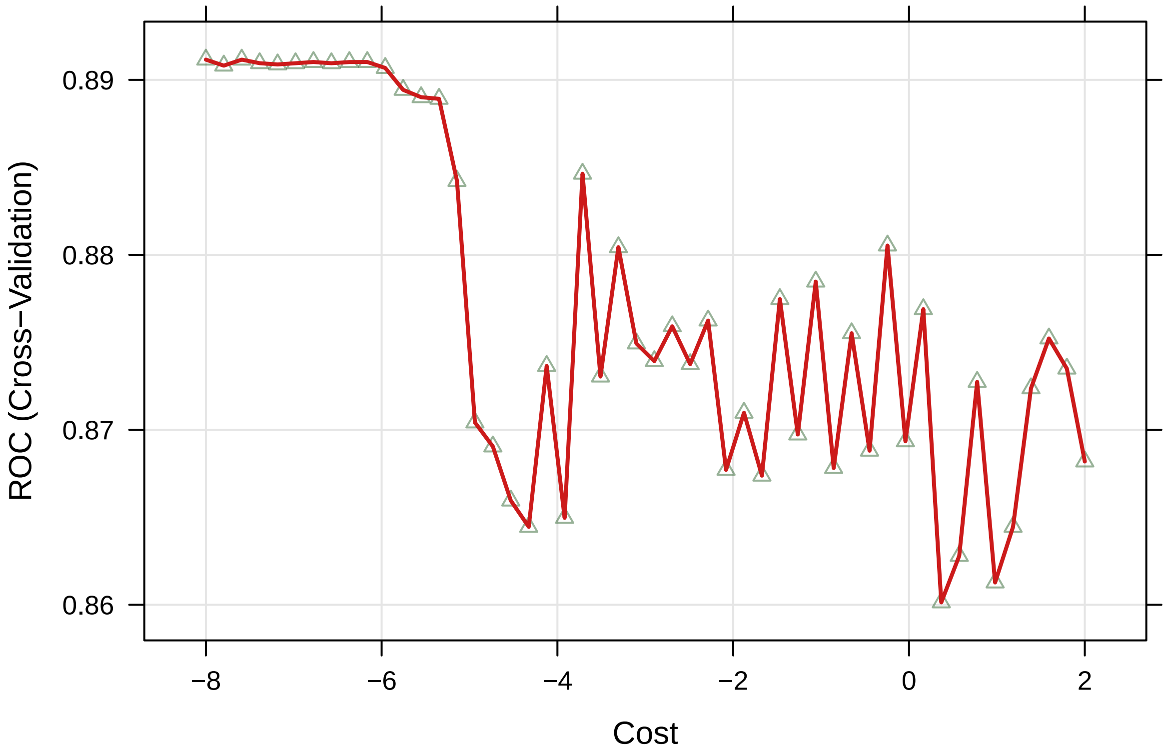


Support Vector Machine: linear

```
set.seed(2)

model.svml = train(x = x.train,
                   y = y.train,
                   method = "svmLinear",
                   tuneGrid = data.frame(C = exp(seq(-8, 2, len = 50))),
                   trControl = ctrl)

model.svml$bestTune
```

```
##              C
## 1 0.0003354626
```

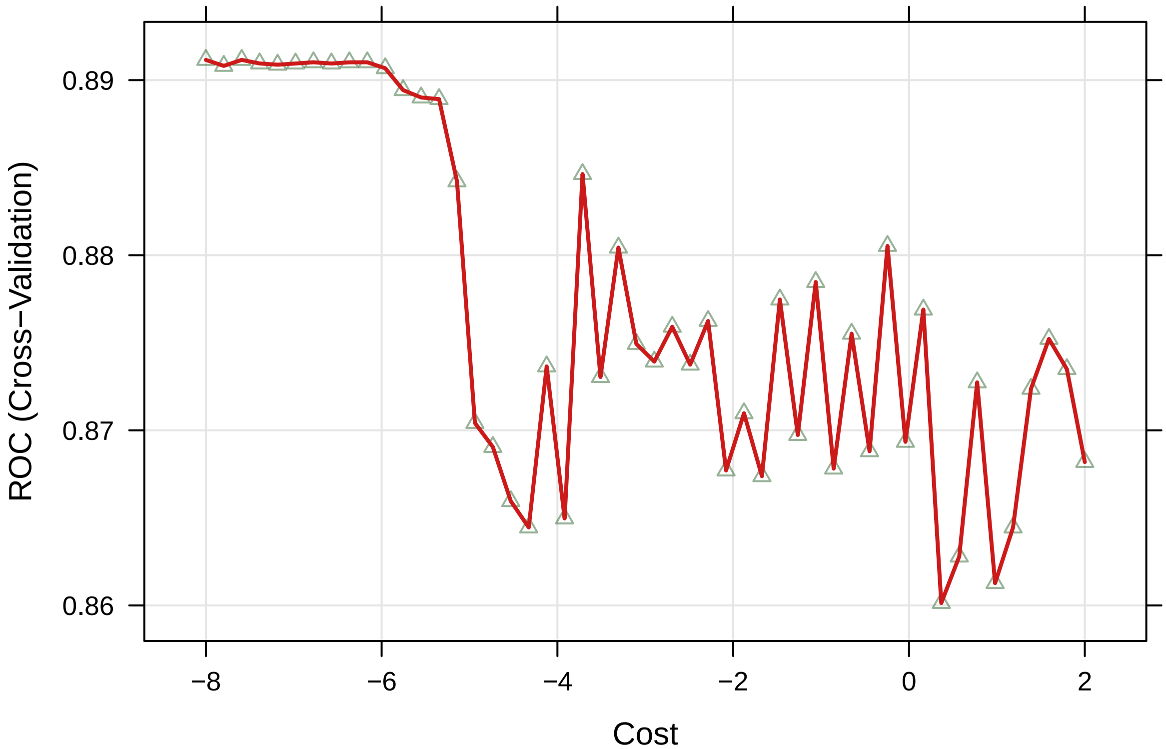
```
plot(model.svml, highlight = TRUE, xTrans = log)
```




```
# SVM linear scaled
set.seed(2)

scaled.model.svml = train(x = x.train.scaled,
                   y = y.train.scaled,
                   method = "svmLinear",
                   tuneGrid = data.frame(C = exp(seq(-8, 2, len = 50))),
                   trControl = ctrl)

scaled.model.svml$bestTune
```

```
##              C
## 1 0.0003354626
```

```
plot(scaled.model.svml, highlight = TRUE, xTrans = log)
```

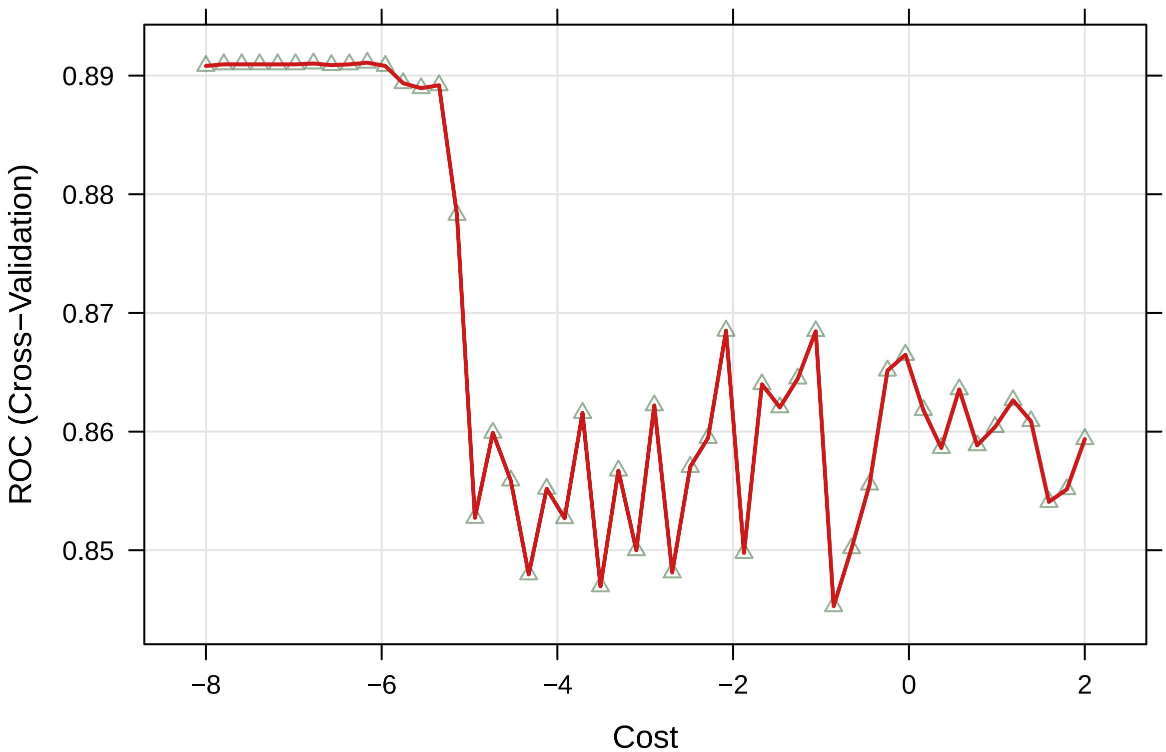


SVML: e1071

```
set.seed(2)

model.svml2 = train(x = x.train,
                    y = y.train,
                   method = "svmLinear2",
                   tuneGrid = data.frame(cost = exp(seq(-8, 2, len = 50))),
                   trControl = ctrl)

model.svml2$bestTune
```

```
##            cost
## 10 0.002105367
```

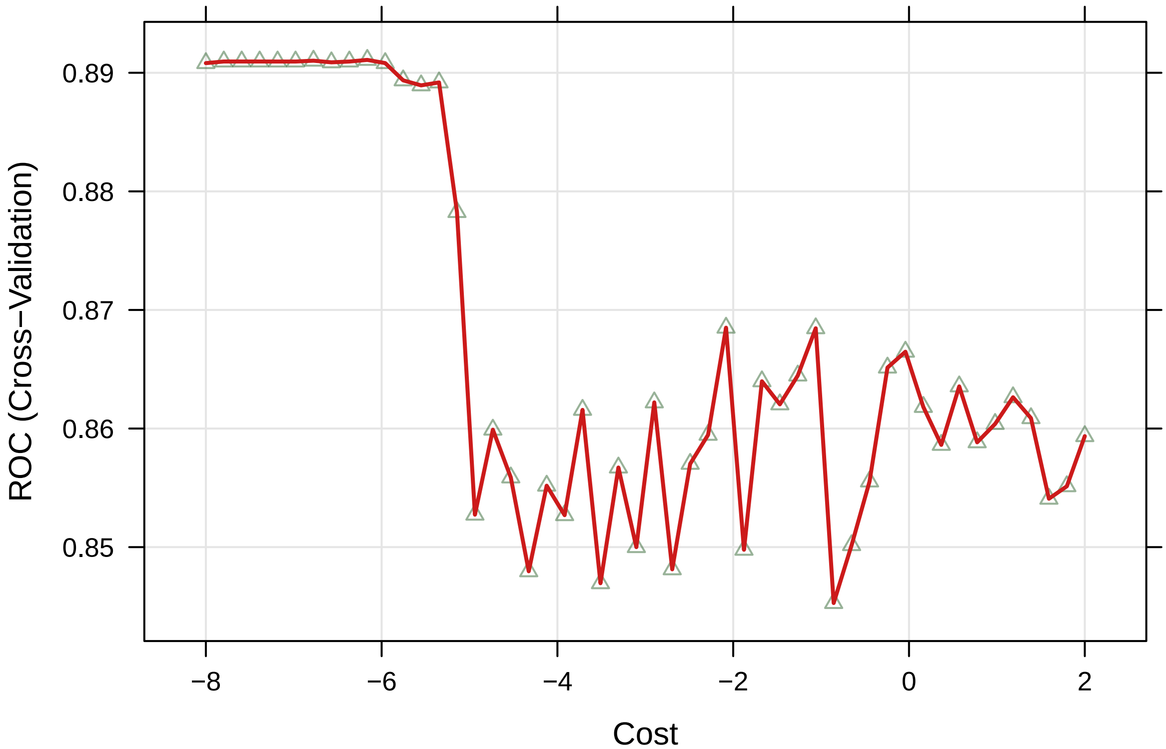
```
plot(model.svml2, highlight = TRUE, xTrans = log)
```




```
# SVML e1071 scaled
set.seed(2)

scaled.model.svml2 = train(x = x.train.scaled,
                    y = y.train.scaled,
                   method = "svmLinear2",
                   tuneGrid = data.frame(cost = exp(seq(-8, 2, len = 50))),
                   trControl = ctrl)

scaled.model.svml2$bestTune
```

```
##            cost
## 10 0.002105367
```

```r
plot(scaled.model.svml2, highlight = TRUE, xTrans = log)
```

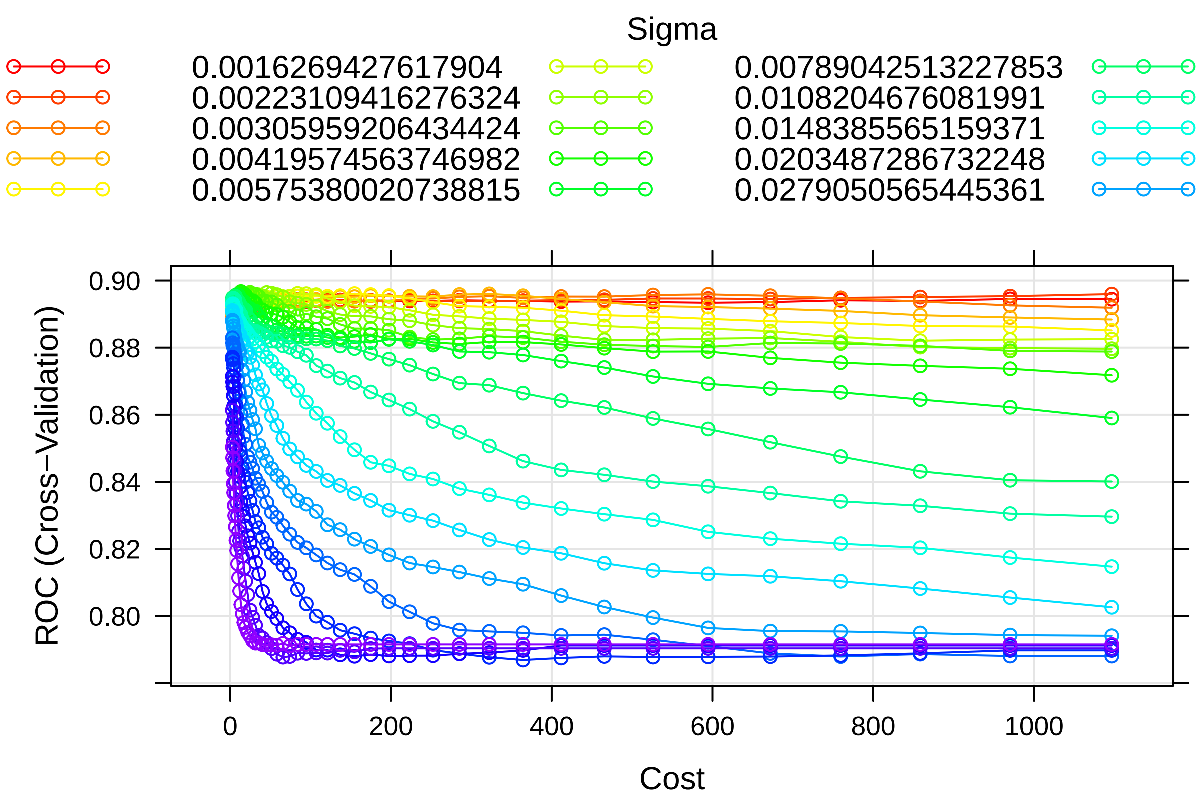


SVML: Radial Sigma

```
svmr.grid = expand.grid(C = exp(seq(1, 7, len = 50)),
                        sigma = exp(seq(-8, -2, len = 20)))

# tunes over both cost and sigma
set.seed(2)
model.svmr = train(x = x.train,
                   y = y.train,
                   method = "svmRadialSigma",
                   tuneGrid = svmr.grid,
                   trControl = ctrl)

myCol = rainbow(25)
myPar = list(superpose.symbol = list(col = myCol),
superpose.line = list(col = myCol))

model.svmr$bestTune
```

```
##           sigma        C
## 269 0.004195746 13.35428
```

```
plot(model.svmr, highlight = TRUE, par.settings = myPar)
```

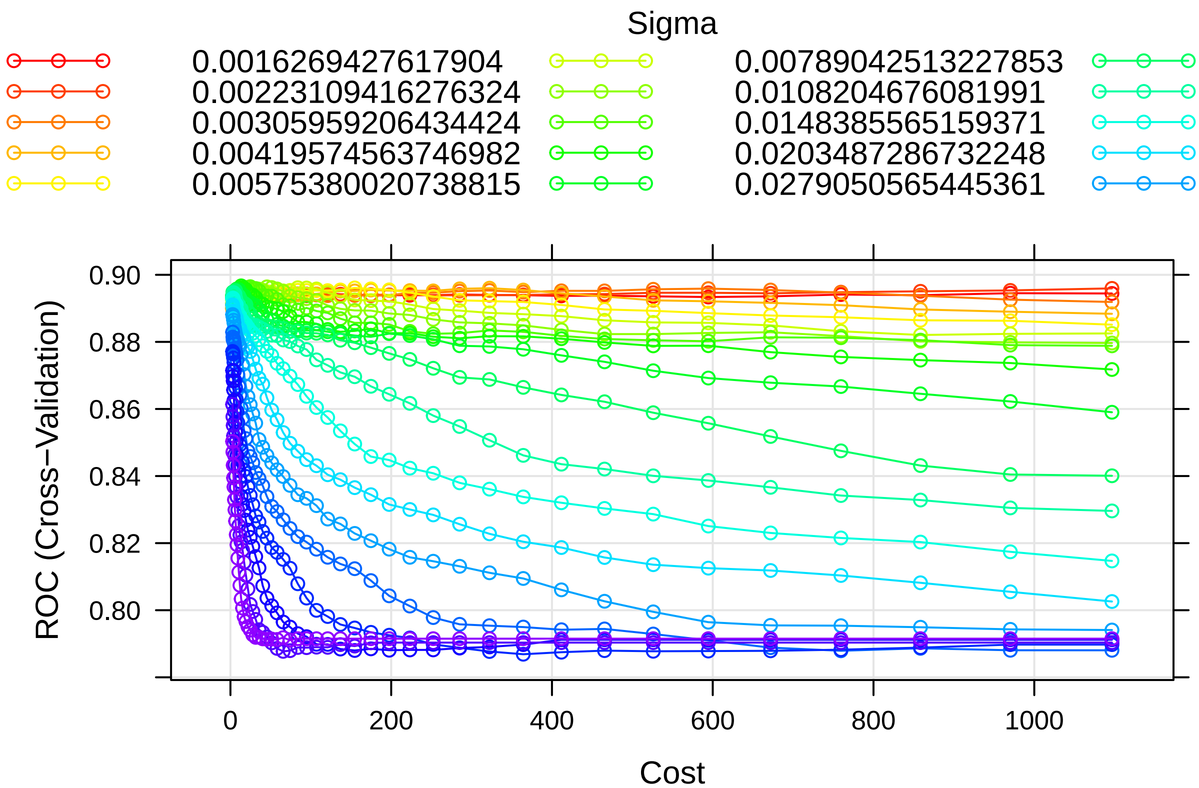



```
# scaled model
set.seed(2)
scaled.model.svmr = train(x = x.train.scaled,
                          y = y.train.scaled,
                          method = "svmRadialSigma",
                          tuneGrid = svmr.grid,
```

```
                     trControl = ctrl)

myCol = rainbow(25)
myPar = list(superpose.symbol = list(col = myCol),
superpose.line = list(col = myCol))

scaled.model.svmr$bestTune
```

```
##             sigma        C
## 269 0.004195746 13.35428
```

```
plot(scaled.model.svmr, highlight = TRUE, par.settings = myPar)
```



SVML: radial cost

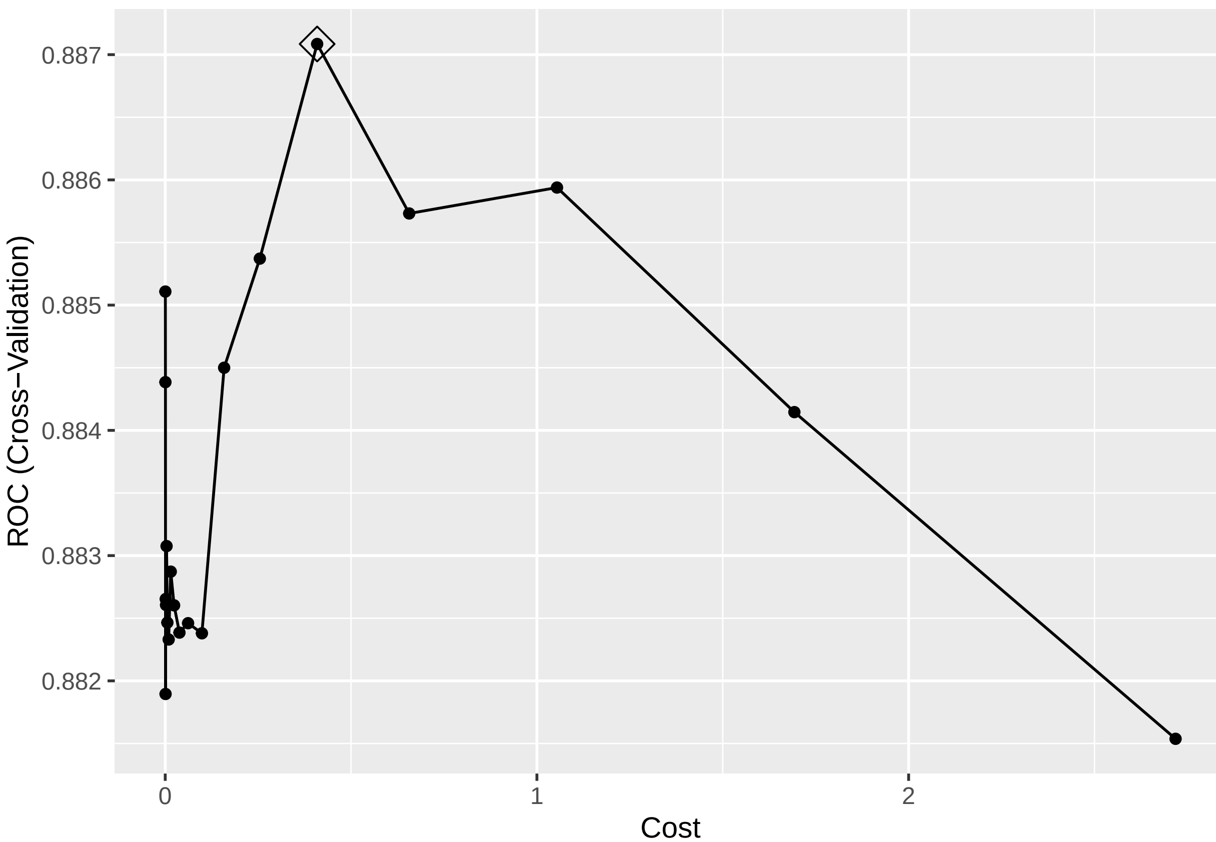
```
set.seed(2)

model.svmr2 = train(x = x.train,
                     y = y.train,
                   method = "svmRadialCost",
                   tuneGrid = data.frame(C = exp(seq(-8, 1, len = 20))),
                   trControl = ctrl)
```

```
## maximum number of iterations reached 1.184536e-05 1.182684e-05maximum number of iterations reached 1
```

```
model.svmr2$bestTune
```

```
##           C
## 16 0.4087151
```

```
ggplot(model.svmr2, highlight = TRUE, par.settings = myPar)
```



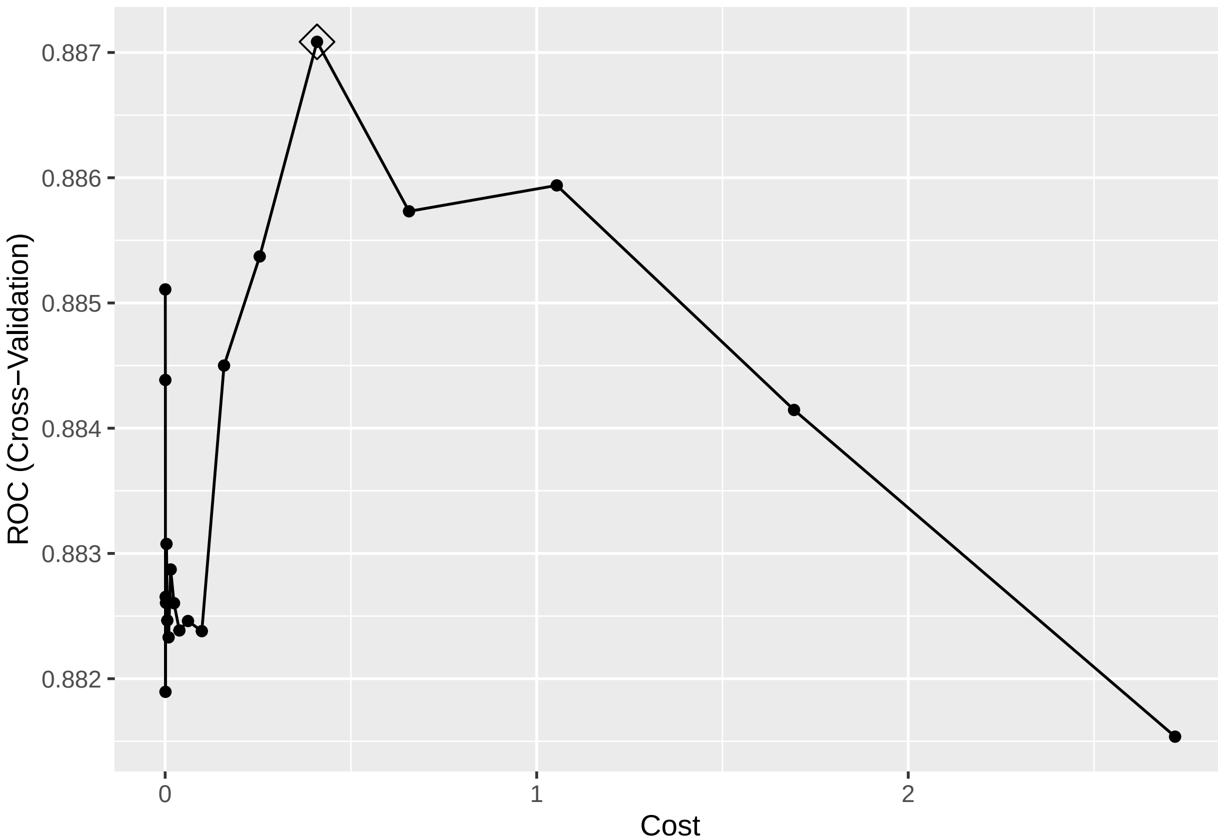

```
#  scaled model
set.seed(2)

scaled.model.svmr2 = train(x = x.train.scaled,
                     y = y.train.scaled,
                   method = "svmRadialCost",
                   tuneGrid = data.frame(C = exp(seq(-8, 1, len = 20))),
                   trControl = ctrl)
```

```
## maximum number of iterations reached 1.184536e-05 1.182684e-05maximum number of iterations reached 1
```

```r
scaled.model.svmr2$bestTune
```

```
##            C
## 16 0.4087151
```

```r
ggplot(scaled.model.svmr2, highlight = TRUE, par.settings = myPar)
```



Results

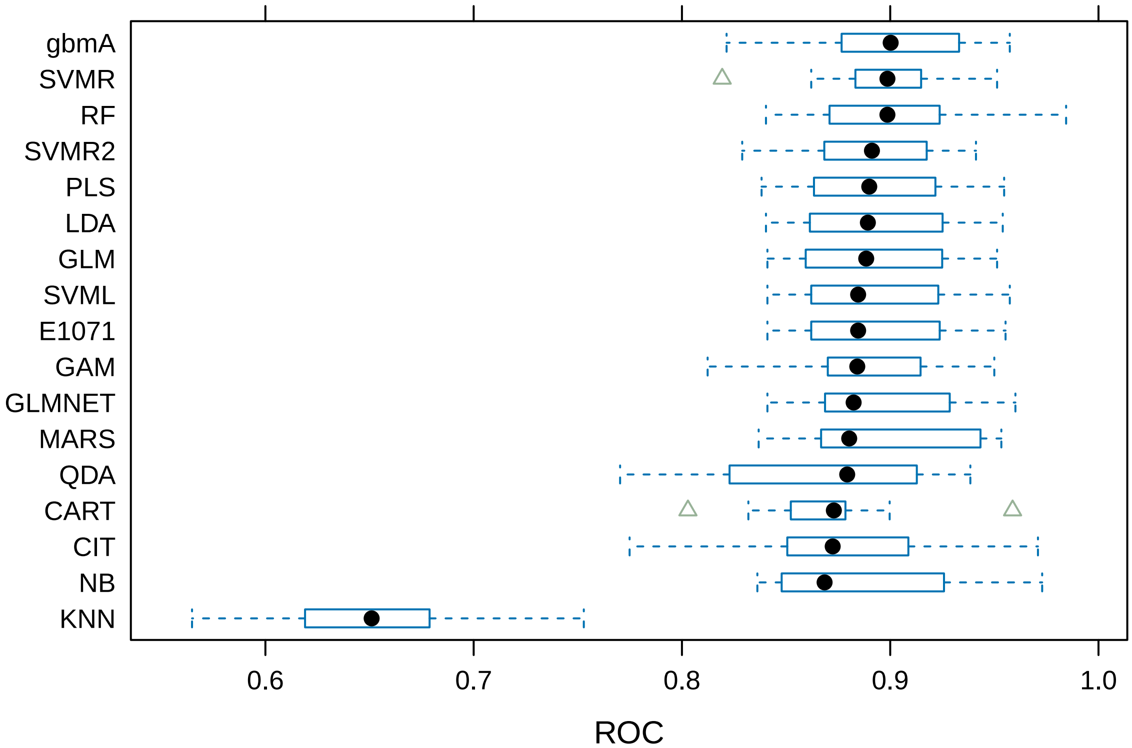
Model Comparison: Cross Validation Performance

```r
res = resamples(list(GLM = model.glm,
                     GLMNET = model.glmn,
                     KNN = model.knn,
                     PLS = model.pls,
                     GAM = model.gam,
                     MARS = model.mars,
                     LDA = model.lda,
                     QDA = model.qda,
                     NB = model.nb,
                     CART = model.cart,
                     CIT = model.cit,
                     RF = model.rf,
                     SVML = model.svml,
                     E1071 = model.svml2,
                     SVMR = model.svmr,
                     SVMR2 = model.svmr2,
                     gbmA = model.gbmA
                     ))
summary(res)
```

```
##
## Call:
## summary.resamples(object = res)
##
## Models: GLM, GLMNET, KNN, PLS, GAM, MARS, LDA, QDA, NB, CART, CIT, RF, SVML, E1071, SVMR, SVMR2, gbmA
## Number of resamples: 10
##
## ROC
##             Min.   1st Qu.    Median      Mean   3rd Qu.      Max. NA's
## GLM    0.8410364 0.8594164 0.8884762 0.8902533 0.9211279 0.9513185    0
## GLMNET 0.8410364 0.8705239 0.8824337 0.8946561 0.9271709 0.9601082    0
## KNN    0.5647759 0.6197361 0.6510080 0.6510491 0.6731696 0.7528736    0
## PLS    0.8382353 0.8653846 0.8899325 0.8927358 0.9192186 0.9546991    0
## GAM    0.8123249 0.8700265 0.8841817 0.8878412 0.9122597 0.9499662    0
## MARS   0.8368347 0.8678010 0.8803050 0.8954023 0.9367124 0.9533469    0
## LDA    0.8403361 0.8637268 0.8892694 0.8921525 0.9221443 0.9540230    0
## QDA    0.7703081 0.8323010 0.8793382 0.8685147 0.9055691 0.9384719    0
## NB     0.8362069 0.8484358 0.8684867 0.8860873 0.9237099 0.9729547    0
## CART   0.8028711 0.8556278 0.8729261 0.8711284 0.8778011 0.9587559    0
## CIT    0.7748599 0.8540285 0.8723739 0.8754698 0.9021152 0.9709263    0
## RF     0.8403361 0.8709822 0.8986526 0.8978131 0.9219717 0.9844490    0
## SVML   0.8410364 0.8627321 0.8845903 0.8911562 0.9204239 0.9574037    0
## E1071  0.8410364 0.8627321 0.8845903 0.8910873 0.9207640 0.9553753    0
## SVMR   0.8193277 0.8849469 0.8986646 0.8967070 0.9147678 0.9513185    0
## SVMR2  0.8289385 0.8689329 0.8912244 0.8870851 0.9168427 0.9411765    0
## gbmA   0.8214286 0.8774867 0.9002110 0.9010174 0.9329702 0.9574037    0
##
## Sens
##             Min.   1st Qu.    Median      Mean   3rd Qu.      Max. NA's
## GLM    0.8269231 0.8676471 0.8930995 0.8852187 0.9038462 0.9215686    0
```

```
## GLMNET 0.8846154 0.9264706 0.9607843 0.9435897 0.9615385 0.9803922    0
## KNN    0.7647059 0.8291855 0.8642534 0.8580694 0.8976244 0.9215686    0
## PLS    0.7647059 0.7901584 0.8640649 0.8461161 0.8970588 0.9038462    0
## GAM    0.8235294 0.8529412 0.8942308 0.8891026 0.9215686 0.9423077    0
## MARS   0.8235294 0.8486991 0.8738688 0.8773379 0.9171380 0.9230769    0
## LDA    0.7843137 0.7901584 0.8640649 0.8480769 0.8970588 0.9038462    0
## QDA    0.8039216 0.8438914 0.8725490 0.8715686 0.9033748 0.9230769    0
## NB     0.9038462 0.9411765 0.9607843 0.9572021 0.9615385 1.0000000    0
## CART   0.8076923 0.8627451 0.8834842 0.8872172 0.9278846 0.9607843    0
## CIT    0.8431373 0.8461538 0.9117647 0.8969080 0.9371229 0.9607843    0
## RF     0.8461538 0.9215686 0.9321267 0.9261312 0.9420249 0.9803922    0
## SVML   0.7058824 0.7730015 0.8039216 0.7974736 0.8260747 0.8461538    0
## E1071  0.8461538 0.8872549 0.9313725 0.9162519 0.9420249 0.9807692    0
## SVMR   0.8269231 0.8823529 0.8921569 0.8852187 0.9033748 0.9038462    0
## SVMR2  0.8269231 0.8725490 0.9019608 0.8891026 0.9033748 0.9230769    0
## gbmA   0.8461538 0.8829186 0.9215686 0.9144419 0.9371229 0.9803922    0
##
## Spec
##             Min.   1st Qu.    Median      Mean   3rd Qu.      Max. NA's
## GLM    0.6206897 0.6982759 0.7543103 0.7906404 0.8956281 0.9642857    0
## GLMNET 0.5172414 0.6071429 0.6483990 0.6713054 0.7241379 0.8571429    0
## KNN    0.1071429 0.2087438 0.2456897 0.2545567 0.3211207 0.4482759    0
## PLS    0.6785714 0.7672414 0.8251232 0.8289409 0.8956281 0.9642857    0
## GAM    0.5862069 0.7167488 0.7413793 0.7624384 0.8519089 0.8928571    0
## MARS   0.6206897 0.6982759 0.7370690 0.7661330 0.8497537 0.9285714    0
## LDA    0.6785714 0.7672414 0.8251232 0.8289409 0.8956281 0.9642857    0
## QDA    0.5862069 0.6958128 0.7241379 0.7626847 0.8620690 0.9285714    0
## NB     0.3928571 0.4959975 0.5615764 0.5619458 0.6120690 0.7586207    0
## CART   0.6071429 0.6610222 0.7198276 0.7237685 0.7586207 0.8620690    0
## CIT    0.6071429 0.7241379 0.7543103 0.7658867 0.8275862 0.8928571    0
## RF     0.5862069 0.6899631 0.7370690 0.7480296 0.8362069 0.8965517    0
## SVML   0.6785714 0.8017241 0.8602217 0.8428571 0.8956281 0.9642857    0
## E1071  0.5172414 0.6160714 0.7068966 0.7099754 0.8171182 0.8620690    0
## SVMR   0.6428571 0.7167488 0.7931034 0.8007389 0.8956281 0.9642857    0
## SVMR2  0.6071429 0.7047414 0.7758621 0.7832512 0.8928571 0.8965517    0
## gbmA   0.5517241 0.6958128 0.7370690 0.7413793 0.8103448 0.9285714    0
```

```r
bwplot(res, metric = "ROC") # gbMA has highest median and mean ROC
```




```r
# Cross-validation error
glm.predict = predict(model.glm, newdata = x.train)
glmnet.predict = predict(model.glmn, newdata = x.train)
knn.predict = predict(model.knn, newdata = x.train)
pls.predict = predict(model.pls, newdata = x.train)
gam.predict = predict(model.gam, newdata = x.train)
mars.predict = predict(model.mars, newdata = x.train)
lda.predict = predict(model.lda, newdata = x.train)
qda.predict = predict(model.qda, newdata = x.train)
nb.predict = predict(model.nb, newdata = x.train)
cart.predict = predict(model.cart, newdata = x.train)
cit.predict = predict(model.cit, newdata = x.train)
rf.predict = predict(model.rf, newdata = x.train)
svml.predict = predict(model.svml, newdata = x.train)
e1071.predict = predict(model.svml2, newdata = x.train)
svmr.predict = predict(model.svmr, newdata = x.train)
svmr2.predict = predict(model.svmr2, newdata = x.train)
gbmA.predict = predict(model.gbmA, newdata = x.train)

confusionMatrix(data = glm.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        457     55
##   Severe             57    231
##
##                Accuracy : 0.86
##                  95% CI : (0.834, 0.8833)
```

```
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.6957
##
##  Mcnemar's Test P-Value : 0.9247
##
##             Sensitivity : 0.8891
##             Specificity : 0.8077
##          Pos Pred Value : 0.8926
##          Neg Pred Value : 0.8021
##              Prevalence : 0.6425
##          Detection Rate : 0.5713
##    Detection Prevalence : 0.6400
##       Balanced Accuracy : 0.8484
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = glmnet.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        486     90
##   Severe             28    196
##
##                Accuracy : 0.8525
##                  95% CI : (0.826, 0.8764)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : < 2.2e-16
##
##                   Kappa : 0.6627
##
##  Mcnemar's Test P-Value : 1.96e-08
##
##             Sensitivity : 0.9455
##             Specificity : 0.6853
##          Pos Pred Value : 0.8437
##          Neg Pred Value : 0.8750
##              Prevalence : 0.6425
##          Detection Rate : 0.6075
##    Detection Prevalence : 0.7200
##       Balanced Accuracy : 0.8154
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = knn.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
```

```
##   Not_severe        453    197
##   Severe             61     89
##
##                Accuracy : 0.6775
##                  95% CI : (0.6439, 0.7098)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : 0.02065
##
##                   Kappa : 0.2152
##
##  Mcnemar's Test P-Value : < 2e-16
##
##             Sensitivity : 0.8813
##             Specificity : 0.3112
##          Pos Pred Value : 0.6969
##          Neg Pred Value : 0.5933
##              Prevalence : 0.6425
##          Detection Rate : 0.5663
##    Detection Prevalence : 0.8125
##       Balanced Accuracy : 0.5963
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = pls.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        440     47
##   Severe             74    239
##
##                Accuracy : 0.8488
##                  95% CI : (0.822, 0.8729)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.6775
##
##  Mcnemar's Test P-Value : 0.0181
##
##             Sensitivity : 0.8560
##             Specificity : 0.8357
##          Pos Pred Value : 0.9035
##          Neg Pred Value : 0.7636
##              Prevalence : 0.6425
##          Detection Rate : 0.5500
##    Detection Prevalence : 0.6088
##       Balanced Accuracy : 0.8458
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = gam.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        463     54
##   Severe             51    232
##
##                Accuracy : 0.8688
##                  95% CI : (0.8434, 0.8914)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.7136
##
##  Mcnemar's Test P-Value : 0.8453
##
##             Sensitivity : 0.9008
##             Specificity : 0.8112
##          Pos Pred Value : 0.8956
##          Neg Pred Value : 0.8198
##              Prevalence : 0.6425
##          Detection Rate : 0.5787
##    Detection Prevalence : 0.6462
##       Balanced Accuracy : 0.8560
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = mars.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        457     60
##   Severe             57    226
##
##                Accuracy : 0.8538
##                  95% CI : (0.8273, 0.8775)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.6809
##
##  Mcnemar's Test P-Value : 0.8533
##
##             Sensitivity : 0.8891
##             Specificity : 0.7902
##          Pos Pred Value : 0.8839
##          Neg Pred Value : 0.7986
##              Prevalence : 0.6425
##          Detection Rate : 0.5713
```

```
##    Detection Prevalence : 0.6462
##       Balanced Accuracy : 0.8397
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = lda.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        437     47
##   Severe             77    239
##
##                Accuracy : 0.845
##                  95% CI : (0.818, 0.8694)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : < 2.2e-16
##
##                   Kappa : 0.6703
##
##  Mcnemar's Test P-Value : 0.009207
##
##             Sensitivity : 0.8502
##             Specificity : 0.8357
##          Pos Pred Value : 0.9029
##          Neg Pred Value : 0.7563
##              Prevalence : 0.6425
##          Detection Rate : 0.5463
##    Detection Prevalence : 0.6050
##       Balanced Accuracy : 0.8429
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = qda.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        456     49
##   Severe             58    237
##
##                Accuracy : 0.8662
##                  95% CI : (0.8407, 0.8891)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.7109
##
##  Mcnemar's Test P-Value : 0.4393
##
##             Sensitivity : 0.8872
```

```
##             Specificity : 0.8287
##          Pos Pred Value : 0.9030
##          Neg Pred Value : 0.8034
##              Prevalence : 0.6425
##          Detection Rate : 0.5700
##    Detection Prevalence : 0.6312
##       Balanced Accuracy : 0.8579
##
##        'Positive' Class : Not_severe
##
```

```
confusionMatrix(data = nb.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        492    126
##   Severe             22    160
##
##                Accuracy : 0.815
##                  95% CI : (0.7863, 0.8413)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : < 2.2e-16
##
##                   Kappa : 0.562
##
##  Mcnemar's Test P-Value : < 2.2e-16
##
##             Sensitivity : 0.9572
##             Specificity : 0.5594
##          Pos Pred Value : 0.7961
##          Neg Pred Value : 0.8791
##              Prevalence : 0.6425
##          Detection Rate : 0.6150
##    Detection Prevalence : 0.7725
##       Balanced Accuracy : 0.7583
##
##        'Positive' Class : Not_severe
##
```

```
confusionMatrix(data = cart.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        474     44
##   Severe             40    242
##
##                Accuracy : 0.895
##                  95% CI : (0.8717, 0.9154)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
```

```
##                   Kappa : 0.7707
##
##  Mcnemar's Test P-Value : 0.7434
##
##             Sensitivity : 0.9222
##             Specificity : 0.8462
##          Pos Pred Value : 0.9151
##          Neg Pred Value : 0.8582
##              Prevalence : 0.6425
##          Detection Rate : 0.5925
##    Detection Prevalence : 0.6475
##       Balanced Accuracy : 0.8842
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = cit.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        489     80
##   Severe             25    206
##
##                Accuracy : 0.8688
##                  95% CI : (0.8434, 0.8914)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : < 2.2e-16
##
##                   Kappa : 0.7016
##
##  Mcnemar's Test P-Value : 1.365e-07
##
##             Sensitivity : 0.9514
##             Specificity : 0.7203
##          Pos Pred Value : 0.8594
##          Neg Pred Value : 0.8918
##              Prevalence : 0.6425
##          Detection Rate : 0.6112
##    Detection Prevalence : 0.7113
##       Balanced Accuracy : 0.8358
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = rf.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        503     37
##   Severe             11    249
##
```

```
##                Accuracy : 0.94
##                  95% CI : (0.9212, 0.9554)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : < 2.2e-16
##
##                   Kappa : 0.8667
##
##  Mcnemar's Test P-Value : 0.000308
##
##             Sensitivity : 0.9786
##             Specificity : 0.8706
##          Pos Pred Value : 0.9315
##          Neg Pred Value : 0.9577
##              Prevalence : 0.6425
##          Detection Rate : 0.6288
##    Detection Prevalence : 0.6750
##       Balanced Accuracy : 0.9246
##
##        'Positive' Class : Not_severe
##
```

```
confusionMatrix(data = svml.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        416     44
##   Severe             98    242
##
##                Accuracy : 0.8225
##                  95% CI : (0.7942, 0.8484)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : < 2.2e-16
##
##                   Kappa : 0.6291
##
##  Mcnemar's Test P-Value : 8.681e-06
##
##             Sensitivity : 0.8093
##             Specificity : 0.8462
##          Pos Pred Value : 0.9043
##          Neg Pred Value : 0.7118
##              Prevalence : 0.6425
##          Detection Rate : 0.5200
##    Detection Prevalence : 0.5750
##       Balanced Accuracy : 0.8277
##
##        'Positive' Class : Not_severe
##
```

```
confusionMatrix(data = e1071.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
```

```
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        454     51
##   Severe             60    235
##
##                Accuracy : 0.8612
##                  95% CI : (0.8353, 0.8845)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.7001
##
##  Mcnemar's Test P-Value : 0.4477
##
##             Sensitivity : 0.8833
##             Specificity : 0.8217
##          Pos Pred Value : 0.8990
##          Neg Pred Value : 0.7966
##              Prevalence : 0.6425
##          Detection Rate : 0.5675
##    Detection Prevalence : 0.6312
##       Balanced Accuracy : 0.8525
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = svmr.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        464     54
##   Severe             50    232
##
##                Accuracy : 0.87
##                  95% CI : (0.8447, 0.8925)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.7161
##
##  Mcnemar's Test P-Value : 0.7686
##
##             Sensitivity : 0.9027
##             Specificity : 0.8112
##          Pos Pred Value : 0.8958
##          Neg Pred Value : 0.8227
##              Prevalence : 0.6425
##          Detection Rate : 0.5800
##    Detection Prevalence : 0.6475
##       Balanced Accuracy : 0.8570
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = svmr2.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        467     54
##   Severe             47    232
##
##                Accuracy : 0.8738
##                  95% CI : (0.8487, 0.896)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.7237
##
##  Mcnemar's Test P-Value : 0.5505
##
##             Sensitivity : 0.9086
##             Specificity : 0.8112
##          Pos Pred Value : 0.8964
##          Neg Pred Value : 0.8315
##              Prevalence : 0.6425
##          Detection Rate : 0.5837
##    Detection Prevalence : 0.6512
##       Balanced Accuracy : 0.8599
##
##        'Positive' Class : Not_severe
##
```

```r
confusionMatrix(data = gbmA.predict, reference = y.train)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   Not_severe Severe
##   Not_severe        488     63
##   Severe             26    223
##
##                Accuracy : 0.8888
##                  95% CI : (0.8649, 0.9097)
##     No Information Rate : 0.6425
##     P-Value [Acc > NIR] : < 2.2e-16
##
##                   Kappa : 0.7507
##
##  Mcnemar's Test P-Value : 0.0001356
##
##             Sensitivity : 0.9494
##             Specificity : 0.7797
##          Pos Pred Value : 0.8857
##          Neg Pred Value : 0.8956
##              Prevalence : 0.6425
##          Detection Rate : 0.6100
```

```
##    Detection Prevalence : 0.6887
##       Balanced Accuracy : 0.8646
##
##        'Positive' Class : Not_severe
##
```

```r
# 1 - accuracy
gbm_CV_error = 1 - 0.86
glmnet_CV_error = 1 - 0.825
knn_CV_error = 1 - 0.7425
pls_CV_error = 1 - 0.8488
gam_CV_error = 1 - 0.8688
mars_CV_error = 1 - 0.8538
lda_CV_error = 1 - 0.845
qda_CV_error = 1 - 0.8662
nb_CV_error = 1 - 0.815
cart_CV_error = 1 - 0.895
cit_CV_error = 1 - 0.8688
rf_CV_error = 1 - 0.94
svml_CV_error = 1 - 0.8225
e1071_CV_error = 1 - 0.8612
svmr_CV_error = 1 - 0.87
svmr2_CV_error = 1 - 0.8712
gbMA_CV_error = 1 - 0.8888

# CV error
gbm_CV_error
```

```
## [1] 0.14
```

```r
glmnet_CV_error
```

```
## [1] 0.175
```

```r
knn_CV_error
```

```
## [1] 0.2575
```

```r
pls_CV_error
```

```
## [1] 0.1512
```

```r
gam_CV_error
```

```
## [1] 0.1312
```

```r
mars_CV_error
```

```
## [1] 0.1462
```

```r
lda_CV_error
```

```
## [1] 0.155
```

```r
qda_CV_error
```

```
## [1] 0.1338
```

```r
nb_CV_error
```

```
## [1] 0.185
```

```
cart_CV_error
```

```
## [1] 0.105
```

```
cit_CV_error
```

```
## [1] 0.1312
```

```
rf_CV_error
```

```
## [1] 0.06
```

```
svml_CV_error
```

```
## [1] 0.1775
```

```
e1071_CV_error
```

```
## [1] 0.1388
```

```
svmr_CV_error
```

```
## [1] 0.13
```

```
svmr2_CV_error
```

```
## [1] 0.1288
```

```
gbMA_CV_error
```

```
## [1] 0.1112
```

The gbmA boosted model has the highest mean and median ROC value, based on the resampling summary. The random forest model, however, has the lowest cross-validation error, therefore is the model I choose.

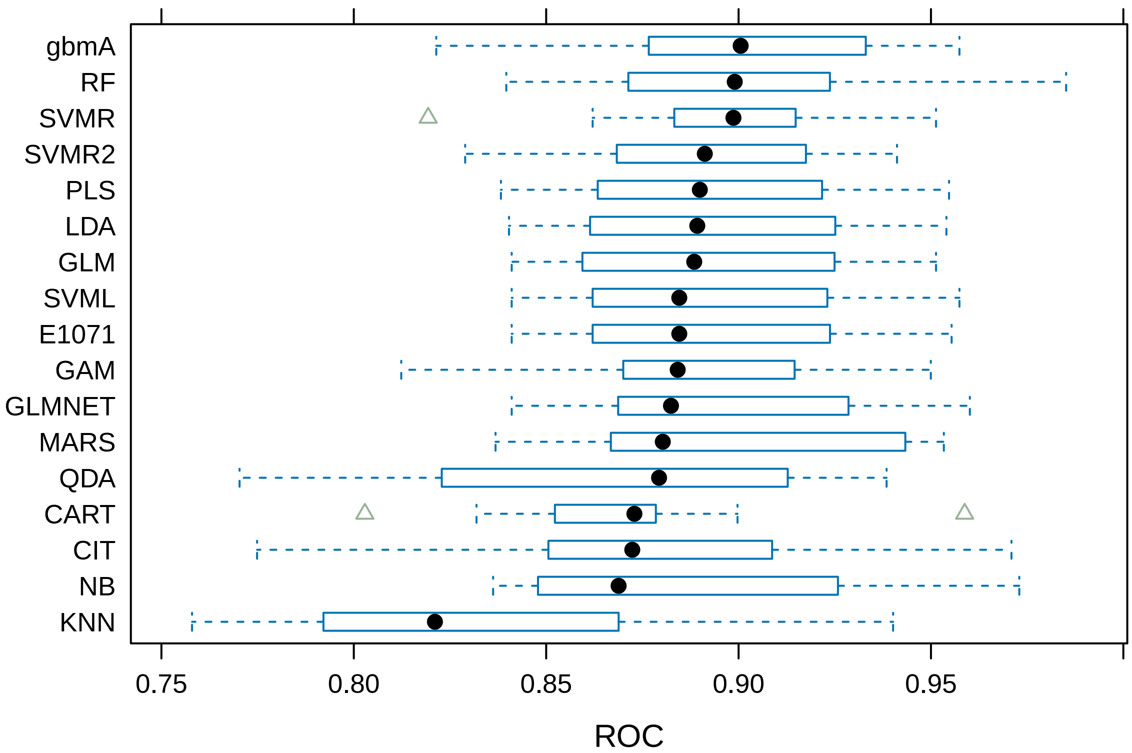
Scaled Model Performance

```
res2 = resamples(list(GLM = scaled.model.glm,
                      GLMNET = scaled.model.glmn,
                      KNN = scaled.model.knn,
                      PLS = scaled.model.pls,
                      GAM = scaled.model.gam,
                      MARS = scaled.model.mars,
                      LDA = scaled.model.lda,
                      QDA = scaled.model.qda,
                      NB = scaled.model.nb,
                      CART = scaled.model.cart,
                      CIT = scaled.model.cit,
                      RF = scaled.model.rf,
                      SVML = scaled.model.svml,
                      E1071 = scaled.model.svml2,
                      SVMR = scaled.model.svmr,
                      SVMR2 = scaled.model.svmr2,
                      gbmA = scaled.model.gbmA
                      ))
summary(res2)
```

```
##
## Call:
## summary.resamples(object = res2)
##
## Models: GLM, GLMNET, KNN, PLS, GAM, MARS, LDA, QDA, NB, CART, CIT, RF, SVML, E1071, SVMR, SVMR2, gbm
## Number of resamples: 10
##
## ROC
##             Min.   1st Qu.    Median      Mean   3rd Qu.      Max. NA's
## GLM    0.8410364 0.8594164 0.8884762 0.8902533 0.9211279 0.9513185    0
## GLMNET 0.8410364 0.8705239 0.8824337 0.8946561 0.9271709 0.9601082    0
## KNN    0.7579576 0.7927719 0.8210784 0.8300805 0.8668528 0.9401623    0
## PLS    0.8382353 0.8653846 0.8899325 0.8927358 0.9192186 0.9546991    0
## GAM    0.8123249 0.8700265 0.8841817 0.8874978 0.9122597 0.9499662    0
## MARS   0.8368347 0.8678010 0.8803050 0.8954023 0.9367124 0.9533469    0
## LDA    0.8403361 0.8637268 0.8892694 0.8921525 0.9221443 0.9540230    0
## QDA    0.7703081 0.8323010 0.8793382 0.8685147 0.9055691 0.9384719    0
## NB     0.8362069 0.8484358 0.8688182 0.8860860 0.9235348 0.9729547    0
## CART   0.8028711 0.8556278 0.8729261 0.8711284 0.8778011 0.9587559    0
## CIT    0.7748599 0.8540285 0.8723739 0.8754698 0.9021152 0.9709263    0
## RF     0.8396359 0.8715673 0.8990027 0.8984987 0.9228471 0.9851251    0
## SVML   0.8410364 0.8627321 0.8845903 0.8911562 0.9204239 0.9574037    0
## E1071  0.8410364 0.8627321 0.8845903 0.8910873 0.9207640 0.9553753    0
## SVMR   0.8193277 0.8849469 0.8986646 0.8967070 0.9147678 0.9513185    0
## SVMR2  0.8289385 0.8689329 0.8912244 0.8870851 0.9168427 0.9411765    0
## gbmA   0.8214286 0.8774867 0.9005426 0.9010838 0.9329702 0.9574037    0
##
## Sens
##             Min.   1st Qu.    Median      Mean   3rd Qu.      Max. NA's
```

```
## GLM     0.8269231 0.8676471 0.8930995 0.8852187 0.9038462 0.9215686    0
## GLMNET  0.8846154 0.9264706 0.9607843 0.9435897 0.9615385 0.9803922    0
## KNN     0.8846154 0.9038462 0.9215686 0.9242459 0.9411765 0.9803922    0
## PLS     0.7647059 0.7901584 0.8640649 0.8461161 0.8970588 0.9038462    0
## GAM     0.8235294 0.8529412 0.8942308 0.8891026 0.9215686 0.9423077    0
## MARS    0.8235294 0.8486991 0.8738688 0.8773379 0.9171380 0.9230769    0
## LDA     0.7843137 0.7901584 0.8640649 0.8480769 0.8970588 0.9038462    0
## QDA     0.8039216 0.8438914 0.8725490 0.8715686 0.9033748 0.9230769    0
## NB      0.9038462 0.9411765 0.9607843 0.9572021 0.9615385 1.0000000    0
## CART    0.8076923 0.8627451 0.8834842 0.8872172 0.9278846 0.9607843    0
## CIT     0.8431373 0.8461538 0.9117647 0.8969080 0.9371229 0.9607843    0
## RF      0.8461538 0.9215686 0.9321267 0.9261312 0.9420249 0.9803922    0
## SVML    0.7058824 0.7730015 0.8039216 0.7974736 0.8260747 0.8461538    0
## E1071   0.8461538 0.8872549 0.9313725 0.9162519 0.9420249 0.9807692    0
## SVMR    0.8269231 0.8823529 0.8921569 0.8852187 0.9033748 0.9038462    0
## SVMR2   0.8269231 0.8725490 0.9019608 0.8891026 0.9033748 0.9230769    0
## gbmA    0.8461538 0.8829186 0.9215686 0.9144419 0.9371229 0.9803922    0
##
## Spec
##              Min.   1st Qu.    Median      Mean   3rd Qu.      Max. NA's
## GLM     0.6206897 0.6982759 0.7543103 0.7906404 0.8956281 0.9642857    0
## GLMNET  0.5172414 0.6071429 0.6483990 0.6713054 0.7241379 0.8571429    0
## KNN     0.4642857 0.4959975 0.5615764 0.5522167 0.5825123 0.6551724    0
## PLS     0.6785714 0.7672414 0.8251232 0.8289409 0.8956281 0.9642857    0
## GAM     0.5862069 0.7167488 0.7413793 0.7624384 0.8519089 0.8928571    0
## MARS    0.6206897 0.6982759 0.7370690 0.7661330 0.8497537 0.9285714    0
## LDA     0.6785714 0.7672414 0.8251232 0.8289409 0.8956281 0.9642857    0
## QDA     0.5862069 0.6958128 0.7241379 0.7626847 0.8620690 0.9285714    0
## NB      0.3928571 0.4959975 0.5615764 0.5619458 0.6120690 0.7586207    0
## CART    0.6071429 0.6610222 0.7198276 0.7237685 0.7586207 0.8620690    0
## CIT     0.6071429 0.7241379 0.7543103 0.7658867 0.8275862 0.8928571    0
## RF      0.5862069 0.6899631 0.7370690 0.7480296 0.8362069 0.8965517    0
## SVML    0.6785714 0.8017241 0.8602217 0.8428571 0.8956281 0.9642857    0
## E1071   0.5172414 0.6160714 0.7068966 0.7099754 0.8171182 0.8620690    0
## SVMR    0.6428571 0.7167488 0.7931034 0.8007389 0.8956281 0.9642857    0
## SVMR2   0.6071429 0.7047414 0.7758621 0.7832512 0.8928571 0.8965517    0
## gbmA    0.5517241 0.6958128 0.7370690 0.7413793 0.8103448 0.9285714    0
```

```r
bwplot(res2, metric = "ROC")
```



Test Data Performance

```r
# test error: gbmA
gbMA.test = predict(model.gbmA, newdata = x.test)

confusionMatrix(data = gbMA.test,
                reference = y.test,
                )
```

```
## Confusion Matrix and Statistics
##
##               Reference
## Prediction    Not_severe Severe
##   Not_severe         125     17
##   Severe              10     48
##
##                Accuracy : 0.865
##                  95% CI : (0.8097, 0.9091)
##     No Information Rate : 0.675
##     P-Value [Acc > NIR] : 5.597e-10
##
##                   Kappa : 0.6835
##
##  Mcnemar's Test P-Value : 0.2482
##
##             Sensitivity : 0.9259
##             Specificity : 0.7385
##          Pos Pred Value : 0.8803
##          Neg Pred Value : 0.8276
```

```
##               Prevalence : 0.6750
##           Detection Rate : 0.6250
##     Detection Prevalence : 0.7100
##        Balanced Accuracy : 0.8322
##
##         'Positive' Class : Not_severe
##
```

```r
# 1 - accuracy
gbmA_test_error = 1 - 0.865
gbmA_test_error
```

```
## [1] 0.135
```

```r
# test error: random forest
rf.test = predict(model.rf, newdata = x.test)

confusionMatrix(data = rf.test,
                reference = y.test,
                )
```

```
## Confusion Matrix and Statistics
##
##               Reference
## Prediction   Not_severe Severe
##   Not_severe        124     18
##   Severe             11     47
##
##                 Accuracy : 0.855
##                   95% CI : (0.7984, 0.9007)
##      No Information Rate : 0.675
##      P-Value [Acc > NIR] : 4.95e-09
##
##                    Kappa : 0.66
##
##   Mcnemar's Test P-Value : 0.2652
##
##              Sensitivity : 0.9185
##              Specificity : 0.7231
##           Pos Pred Value : 0.8732
##           Neg Pred Value : 0.8103
##               Prevalence : 0.6750
##           Detection Rate : 0.6200
##     Detection Prevalence : 0.7100
##        Balanced Accuracy : 0.8208
##
##         'Positive' Class : Not_severe
##
```

```r
# 1 - accuracy
rf_test_error = 1 - 0.855
rf_test_error
```

```
## [1] 0.145
```