Regression

Team3

2021/3/1

Using Smote to eliminate the imbalance of the original dataset

```
library(data.table)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.0 --

## v ggplot2 3.3.3     v purrr   0.3.4
## v tibble  3.0.5     v dplyr   1.0.4
## v tidyr   1.1.2     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::between()   masks data.table::between()
## x dplyr::filter()    masks stats::filter()
## x dplyr::first()     masks data.table::first()
## x dplyr::lag()       masks stats::lag()
## x dplyr::last()      masks data.table::last()
## x purrr::transpose() masks data.table::transpose()
```

```
library(caret)
```

```
## Loading required package: lattice

##
## Attaching package: 'caret'

## The following object is masked from 'package:purrr':
##
##     lift
```

```
library(glmnet)
```

```
## Loading required package: Matrix

##
## Attaching package: 'Matrix'
```

```
## The following objects are masked from 'package:tidyr':
##
##     expand, pack, unpack

## Loaded glmnet 4.1
```

```
library(DMwR)
```

```
## Loading required package: grid

## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
library(rpart)
library(ROSE)
```

```
## Loaded ROSE 0.0-3
```

```
library(ggplot2)
library(ggthemes)
```

```
cv <- read.csv("train.csv", header = TRUE, sep = ",")
cv <- (subset(cv, select=-id))
head(cv)
```

```
##   Gender Age Driving_License Region_Code Previously_Insured Vehicle_Age
## 1   Male  44               1          28                  0   > 2 Years
## 2   Male  76               1           3                  0    1-2 Year
## 3   Male  47               1          28                  0   > 2 Years
## 4   Male  21               1          11                  1    < 1 Year
## 5 Female  29               1          41                  1    < 1 Year
## 6 Female  24               1          33                  0    < 1 Year
##   Vehicle_Damage Annual_Premium Policy_Sales_Channel Vintage Response
## 1            Yes          40454                  26     217        1
## 2             No          33536                  26     183        0
## 3            Yes          38294                  26      27        1
## 4             No          28619                 152     203        0
## 5             No          27496                 152      39        0
## 6            Yes           2630                 160     176        0
```

```
str(cv)
```

```
## 'data.frame':    381109 obs. of  11 variables:
##  $ Gender              : chr  "Male" "Male" "Male" "Male" ...
##  $ Age                 : int  44 76 47 21 29 24 23 56 24 32 ...
##  $ Driving_License     : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ Region_Code         : num  28 3 28 11 41 33 11 28 3 6 ...
##  $ Previously_Insured  : int  0 0 0 1 1 0 0 0 1 1 ...
##  $ Vehicle_Age         : chr  "> 2 Years" "1-2 Year" "> 2 Years" "< 1 Year" ...
```

```
##  $ Vehicle_Damage      : chr  "Yes" "No" "Yes" "No" ...
##  $ Annual_Premium      : num  40454 33536 38294 28619 27496 ...
##  $ Policy_Sales_Channel: num  26 26 26 152 152 160 152 26 152 152 ...
##  $ Vintage             : int  217 183 27 203 39 176 249 72 28 80 ...
##  $ Response            : int  1 0 1 0 0 0 0 1 0 0 ...
```

```
# convert Driving_License to number
cv$Driving_License = as.numeric(cv$Driving_License)
str(cv)
```

```
## 'data.frame':    381109 obs. of  11 variables:
##  $ Gender              : chr  "Male" "Male" "Male" "Male" ...
##  $ Age                 : int  44 76 47 21 29 24 23 56 24 32 ...
##  $ Driving_License     : num  1 1 1 1 1 1 1 1 1 1 ...
##  $ Region_Code         : num  28 3 28 11 41 33 11 28 3 6 ...
##  $ Previously_Insured  : int  0 0 0 1 1 0 0 0 1 1 ...
##  $ Vehicle_Age         : chr  "> 2 Years" "1-2 Year" "> 2 Years" "< 1 Year" ...
##  $ Vehicle_Damage      : chr  "Yes" "No" "Yes" "No" ...
##  $ Annual_Premium      : num  40454 33536 38294 28619 27496 ...
##  $ Policy_Sales_Channel: num  26 26 26 152 152 160 152 26 152 152 ...
##  $ Vintage             : int  217 183 27 203 39 176 249 72 28 80 ...
##  $ Response            : int  1 0 1 0 0 0 0 1 0 0 ...
```

```
# Checking the proportion of 1 and 0 in the target variable
prop.table(table(cv$Response))
```

```
##
##         0         1
## 0.8774366 0.1225634
```

```
# Adding index to split data
cv[,'index'] <- ifelse(runif(nrow(cv)) < 0.8,1,0)
head(cv)
```

```
##   Gender Age Driving_License Region_Code Previously_Insured Vehicle_Age
## 1   Male  44               1          28                  0   > 2 Years
## 2   Male  76               1           3                  0    1-2 Year
## 3   Male  47               1          28                  0   > 2 Years
## 4   Male  21               1          11                  1    < 1 Year
## 5 Female  29               1          41                  1    < 1 Year
## 6 Female  24               1          33                  0    < 1 Year
##   Vehicle_Damage Annual_Premium Policy_Sales_Channel Vintage Response index
## 1            Yes          40454                  26     217        1     1
## 2             No          33536                  26     183        0     1
## 3            Yes          38294                  26      27        1     1
## 4             No          28619                 152     203        0     1
## 5             No          27496                 152      39        0     1
## 6            Yes           2630                 160     176        0     0
```

```
# Function to convert variables to categorical
to.factors <- function(df, variables){
  for (variable in variables){
```

```
    df[[variable]] <- as.factor(df[[variable]])
  }
  return(df)
}
# names of categorical columns
categorical.vars <- c("Gender", "Driving_License", "Region_Code", "Previously_Insured", "Vehicle_Age",
# Converting them to factors
cv <- to.factors(df = cv, variables = categorical.vars)
str(cv)
```

```
## 'data.frame':    381109 obs. of  12 variables:
##  $ Gender              : Factor w/ 2 levels "Female","Male": 2 2 2 2 1 1 2 1 1 1 ...
##  $ Age                 : int  44 76 47 21 29 24 23 56 24 32 ...
##  $ Driving_License     : Factor w/ 2 levels "0","1": 2 2 2 2 2 2 2 2 2 2 ...
##  $ Region_Code         : Factor w/ 53 levels "0","1","2","3",..: 29 4 29 12 42 34 12 29 4 7 ...
##  $ Previously_Insured  : Factor w/ 2 levels "0","1": 1 1 1 2 2 1 1 1 2 2 ...
##  $ Vehicle_Age         : Factor w/ 3 levels "< 1 Year","> 2 Years",..: 2 3 2 1 1 1 1 3 1 1 ...
##  $ Vehicle_Damage      : Factor w/ 2 levels "No","Yes": 2 1 2 1 1 2 2 2 1 1 ...
##  $ Annual_Premium      : num  40454 33536 38294 28619 27496 ...
##  $ Policy_Sales_Channel: Factor w/ 155 levels "1","2","3","4",..: 25 25 25 146 146 154 146 25 146 14
##  $ Vintage             : int  217 183 27 203 39 176 249 72 28 80 ...
##  $ Response            : Factor w/ 2 levels "0","1": 2 1 2 1 1 1 1 2 1 1 ...
##  $ index               : num  1 1 1 1 1 0 1 0 1 1 ...
```

```
trainset <- cv[cv$index==1,]
# apply SMOTE to balance dataset on target variable (Response)
trainset <- SMOTE(Response ~ Gender + Age + Driving_License + Region_Code + Previously_Insured + Vehicl
testset <- cv[cv$index==0,]
# remove index from dataset
trainColNum <- grep('index', names(trainset))
trainset <- trainset[,-trainColNum]

testset <- testset[,-trainColNum]
# check de proportion
prop.table(table(trainset$Response))
```

```
##
##   0   1
## 0.5 0.5
```

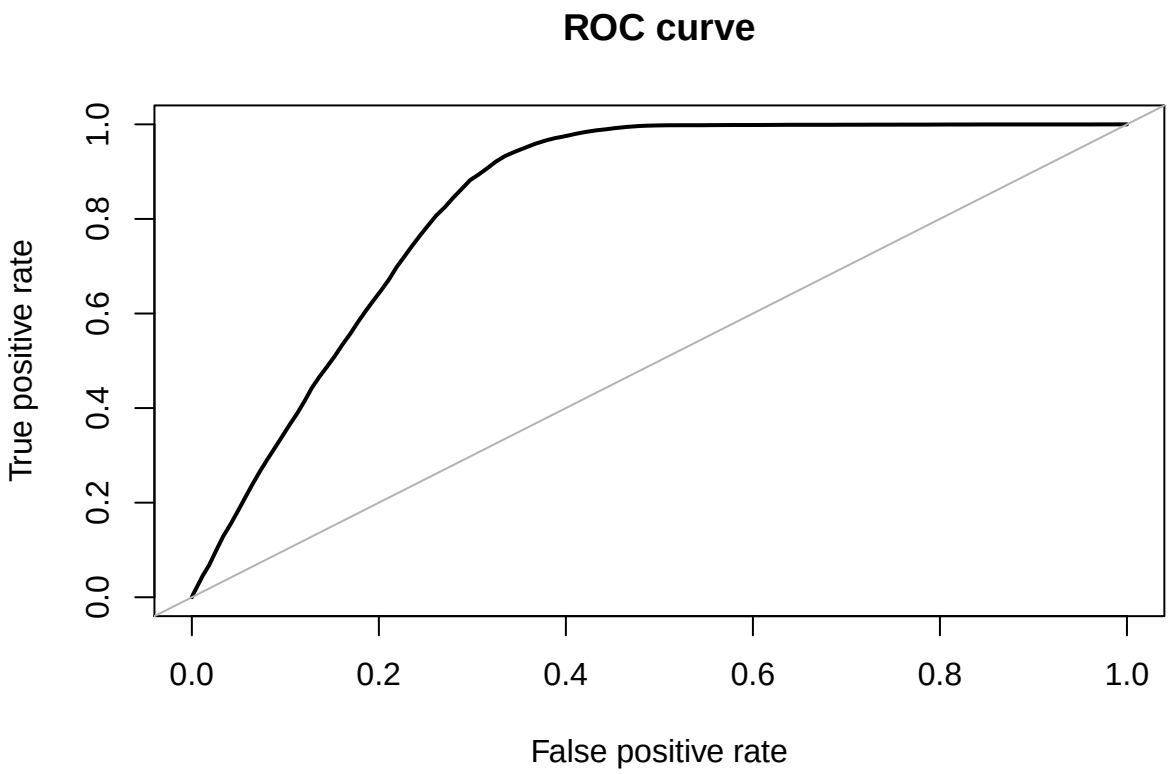
```
#set formula and matrix for lasso and ridge
formula <- as.formula(Response ~ .)
train.matrix <- model.matrix(formula,trainset)[,-1]
test.matrix <- model.matrix(formula, testset)[,-1]
```

```
##Using Lasso
lasso.fit <- cv.glmnet(train.matrix,trainset$Response, family="binomial",alpha=1, nfolds = 10)
lasso.pred <- predict(lasso.fit, test.matrix, lambda = cv.lasso.fit$lambda.min, type = "response")
lasso.yhat <- ifelse(lasso.pred > 0.5, 1, 0)
confusionMatrix(as.factor(lasso.yhat),testset$Response,positive = "1")
```

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

```
##
##           Reference
## Prediction     0     1
##          0 46212   965
##          1 20691  8390
##
##                Accuracy : 0.716
##                  95% CI : (0.7128, 0.7192)
##     No Information Rate : 0.8773
##     P-Value [Acc > NIR] : 1
##
##                   Kappa : 0.3081
##
##  Mcnemar's Test P-Value : <2e-16
##
##             Sensitivity : 0.8968
##             Specificity : 0.6907
##          Pos Pred Value : 0.2885
##          Neg Pred Value : 0.9795
##              Prevalence : 0.1227
##          Detection Rate : 0.1100
##    Detection Prevalence : 0.3814
##       Balanced Accuracy : 0.7938
##
##        'Positive' Class : 1
##
```

```
roc.curve(as.numeric(testset$Response),as.numeric(lasso.pred),plotit = TRUE)
```




```
## Area under the curve (AUC): 0.838
```

```
mse.lasso <- mean((as.numeric(testset$Response) - lasso.pred)^2)
coef(lasso.fit)
```

```
## 216 x 1 sparse Matrix of class "dgCMatrix"
##                                      1
## (Intercept)             -2.887467e+00
## GenderMale               2.957486e-02
## Age                     -9.121703e-03
## Driving_License1         1.401349e+00
## Region_Code1            -3.031293e-01
## Region_Code2            -6.003597e-02
## Region_Code3             1.122953e-01
## Region_Code4             .
## Region_Code5             .
## Region_Code6             9.784650e-02
## Region_Code7             .
## Region_Code8            -7.129080e-02
## Region_Code9            -7.537487e-02
## Region_Code10            .
## Region_Code11            1.412254e+00
## Region_Code12            .
## Region_Code13           -5.432491e-02
## Region_Code14            .
```

```
## Region_Code15           -9.740129e-02
## Region_Code16            .
## Region_Code17            .
## Region_Code18            2.382735e-01
## Region_Code19            .
## Region_Code20           -4.523543e-01
## Region_Code21            6.175893e-02
## Region_Code22            .
## Region_Code23            3.252205e-02
## Region_Code24            9.735992e-03
## Region_Code25           -1.696217e-01
## Region_Code26           -3.059224e-01
## Region_Code27            .
## Region_Code28            3.570797e-01
## Region_Code29            1.998503e-01
## Region_Code30            1.504034e-01
## Region_Code31           -4.090381e-01
## Region_Code32            .
## Region_Code33            1.558408e+00
## Region_Code34           -5.477677e-02
## Region_Code35            8.329979e-02
## Region_Code36            .
## Region_Code37           -9.146380e-04
## Region_Code38            4.680265e-02
## Region_Code39           -1.928201e-03
## Region_Code40            .
## Region_Code41            1.032736e+00
## Region_Code42           -9.814462e-02
## Region_Code43           -1.711514e-01
## Region_Code44            .
## Region_Code45            .
## Region_Code46            .
## Region_Code47           -1.634943e-01
## Region_Code48           -5.445979e-01
## Region_Code49           -2.914631e-04
## Region_Code50           -3.251826e-01
## Region_Code51            .
## Region_Code52            .
## Previously_Insured1     -3.498294e+00
## Vehicle_Age> 2 Years     5.969419e-01
## Vehicle_Age1-2 Year      2.973964e-01
## Vehicle_DamageYes        2.089188e+00
## Annual_Premium          -4.793564e-06
## Policy_Sales_Channel2    .
## Policy_Sales_Channel3    4.218793e-01
## Policy_Sales_Channel4    5.134758e-02
## Policy_Sales_Channel6    .
## Policy_Sales_Channel7    .
## Policy_Sales_Channel8    .
## Policy_Sales_Channel9    .
## Policy_Sales_Channel10   .
## Policy_Sales_Channel11  -1.302215e-01
## Policy_Sales_Channel12  -2.423561e-01
## Policy_Sales_Channel13   .
```

```
## Policy_Sales_Channel14   .
## Policy_Sales_Channel15   .
## Policy_Sales_Channel16   .
## Policy_Sales_Channel17   .
## Policy_Sales_Channel18   .
## Policy_Sales_Channel19   .
## Policy_Sales_Channel20   .
## Policy_Sales_Channel21   .
## Policy_Sales_Channel22   .
## Policy_Sales_Channel23   .
## Policy_Sales_Channel24  -5.092745e-02
## Policy_Sales_Channel25   .
## Policy_Sales_Channel26   6.198691e-01
## Policy_Sales_Channel27   .
## Policy_Sales_Channel28   .
## Policy_Sales_Channel29   .
## Policy_Sales_Channel30   .
## Policy_Sales_Channel31   6.649565e-02
## Policy_Sales_Channel32   .
## Policy_Sales_Channel33   .
## Policy_Sales_Channel34   .
## Policy_Sales_Channel35   .
## Policy_Sales_Channel36   .
## Policy_Sales_Channel37  -3.788480e-01
## Policy_Sales_Channel38   .
## Policy_Sales_Channel39   .
## Policy_Sales_Channel40   .
## Policy_Sales_Channel41   .
## Policy_Sales_Channel42   .
## Policy_Sales_Channel43   .
## Policy_Sales_Channel44   .
## Policy_Sales_Channel45   .
## Policy_Sales_Channel46   .
## Policy_Sales_Channel47  -3.185945e-02
## Policy_Sales_Channel48   .
## Policy_Sales_Channel49   .
## Policy_Sales_Channel50   .
## Policy_Sales_Channel51   .
## Policy_Sales_Channel52  -1.720090e-01
## Policy_Sales_Channel53   .
## Policy_Sales_Channel54   .
## Policy_Sales_Channel55  -1.358430e-01
## Policy_Sales_Channel56   .
## Policy_Sales_Channel57   .
## Policy_Sales_Channel58   .
## Policy_Sales_Channel59   .
## Policy_Sales_Channel60   .
## Policy_Sales_Channel61  -4.544091e-01
## Policy_Sales_Channel62   .
## Policy_Sales_Channel63   .
## Policy_Sales_Channel64   .
## Policy_Sales_Channel65   .
## Policy_Sales_Channel66   .
## Policy_Sales_Channel67   .
```

```
## Policy_Sales_Channel68   .
## Policy_Sales_Channel69   .
## Policy_Sales_Channel70   .
## Policy_Sales_Channel71   .
## Policy_Sales_Channel73   .
## Policy_Sales_Channel74   .
## Policy_Sales_Channel75   .
## Policy_Sales_Channel76   .
## Policy_Sales_Channel78   .
## Policy_Sales_Channel79   .
## Policy_Sales_Channel80   .
## Policy_Sales_Channel81   .
## Policy_Sales_Channel82   .
## Policy_Sales_Channel83   .
## Policy_Sales_Channel84   .
## Policy_Sales_Channel86   .
## Policy_Sales_Channel87   .
## Policy_Sales_Channel88   .
## Policy_Sales_Channel89   .
## Policy_Sales_Channel90   .
## Policy_Sales_Channel91   .
## Policy_Sales_Channel92   .
## Policy_Sales_Channel93   .
## Policy_Sales_Channel94   1.772818e-01
## Policy_Sales_Channel95   .
## Policy_Sales_Channel96  -5.772490e-01
## Policy_Sales_Channel97   .
## Policy_Sales_Channel98   .
## Policy_Sales_Channel99   .
## Policy_Sales_Channel100  .
## Policy_Sales_Channel101  .
## Policy_Sales_Channel102  .
## Policy_Sales_Channel103  .
## Policy_Sales_Channel104  .
## Policy_Sales_Channel105  .
## Policy_Sales_Channel106  .
## Policy_Sales_Channel107  .
## Policy_Sales_Channel108  .
## Policy_Sales_Channel109 -3.722862e-01
## Policy_Sales_Channel110  .
## Policy_Sales_Channel111  .
## Policy_Sales_Channel112  .
## Policy_Sales_Channel113  .
## Policy_Sales_Channel114  .
## Policy_Sales_Channel115  .
## Policy_Sales_Channel116  .
## Policy_Sales_Channel117  .
## Policy_Sales_Channel118  .
## Policy_Sales_Channel119  .
## Policy_Sales_Channel120 -4.777767e-01
## Policy_Sales_Channel121  .
## Policy_Sales_Channel122 -5.939049e-02
## Policy_Sales_Channel123  .
## Policy_Sales_Channel124  2.455527e-01
```

```
## Policy_Sales_Channel125 -1.551701e-01
## Policy_Sales_Channel126  .
## Policy_Sales_Channel127  .
## Policy_Sales_Channel128  .
## Policy_Sales_Channel129  .
## Policy_Sales_Channel130  .
## Policy_Sales_Channel131  .
## Policy_Sales_Channel132 -4.285061e-01
## Policy_Sales_Channel133  .
## Policy_Sales_Channel134  .
## Policy_Sales_Channel135 -2.835436e-01
## Policy_Sales_Channel136  .
## Policy_Sales_Channel137  .
## Policy_Sales_Channel138  .
## Policy_Sales_Channel139 -1.614349e-01
## Policy_Sales_Channel140  .
## Policy_Sales_Channel143  .
## Policy_Sales_Channel144  .
## Policy_Sales_Channel145  .
## Policy_Sales_Channel146  .
## Policy_Sales_Channel147  .
## Policy_Sales_Channel148  .
## Policy_Sales_Channel149  .
## Policy_Sales_Channel150  .
## Policy_Sales_Channel151 -5.844484e-01
## Policy_Sales_Channel152 -6.218377e-01
## Policy_Sales_Channel153 -1.986052e-01
## Policy_Sales_Channel154  1.603943e-01
## Policy_Sales_Channel155  3.760261e-01
## Policy_Sales_Channel156  .
## Policy_Sales_Channel157  1.025236e+00
## Policy_Sales_Channel158  .
## Policy_Sales_Channel159 -1.369515e-01
## Policy_Sales_Channel160 -1.472261e+00
## Policy_Sales_Channel163  3.723088e-01
## Vintage                 -3.446511e-05
```

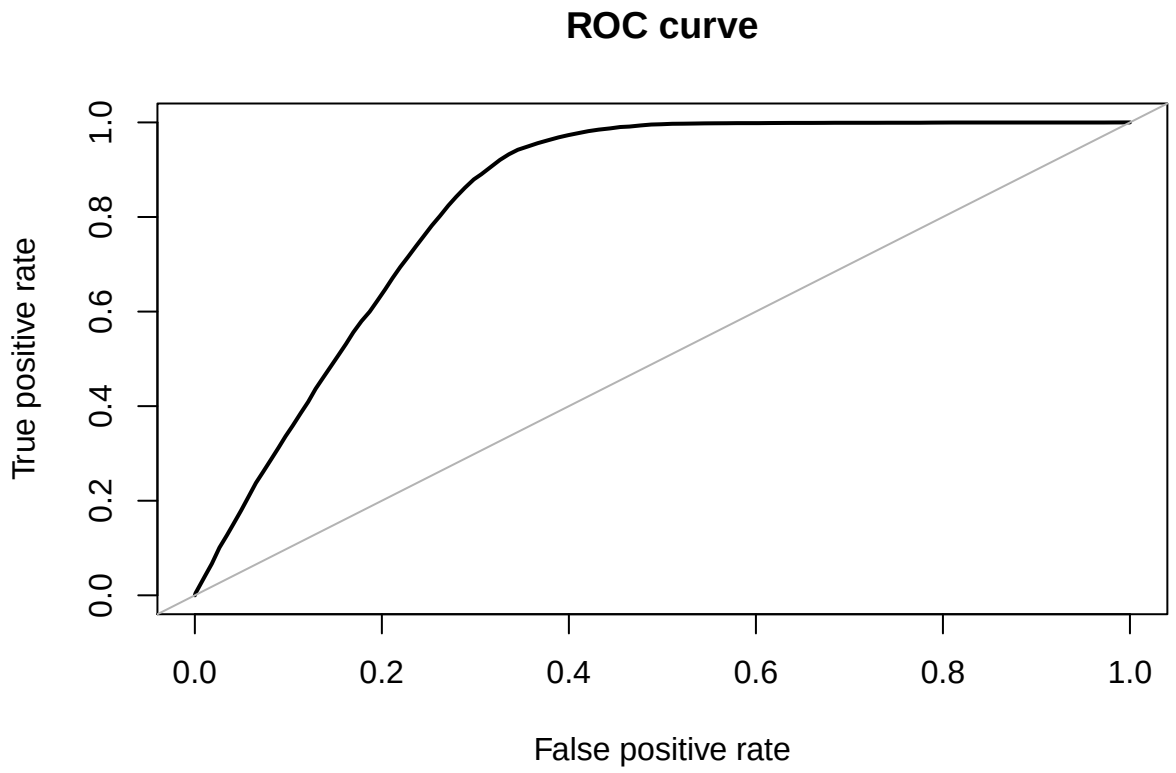
```
###using Ridge
#Model and fit
Ridge.fit <- cv.glmnet(train.matrix,trainset$Response, family="binomial",alpha=0, nfolds = 10)

#Predict
Ridge.pred <- predict(Ridge.fit, test.matrix, lambda = cv.Ridge.fit$lambda.min,type='response')
Ridge.yhat <- ifelse(Ridge.pred > 0.5, 1, 0)
confusionMatrix(as.factor(Ridge.yhat),testset$Response,positive = "1")
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction     0     1
##          0 46525  1050
##          1 20378  8305
##
##                Accuracy : 0.719
```

```
##                  95% CI : (0.7158, 0.7222)
##     No Information Rate : 0.8773
##     P-Value [Acc > NIR] : 1
##
##                   Kappa : 0.3088
##
##  Mcnemar's Test P-Value : <2e-16
##
##             Sensitivity : 0.8878
##             Specificity : 0.6954
##          Pos Pred Value : 0.2895
##          Neg Pred Value : 0.9779
##              Prevalence : 0.1227
##          Detection Rate : 0.1089
##    Detection Prevalence : 0.3761
##       Balanced Accuracy : 0.7916
##
##        'Positive' Class : 1
##
```

```
roc.curve(as.numeric(testset$Response),as.numeric(Ridge.pred),plotit = TRUE)
```




```
## Area under the curve (AUC): 0.837
```

```r
mse.Ridge <- mean((as.numeric(testset$Response) - Ridge.pred)^2)
coef(Ridge.fit)
```

```
## 216 x 1 sparse Matrix of class "dgCMatrix"
##                                       1
## (Intercept)             -2.498555e+00
## GenderMale               5.272870e-02
## Age                     -3.898601e-03
## Driving_License1         1.450572e+00
## Region_Code1            -6.511181e-01
## Region_Code2            -4.051781e-01
## Region_Code3            -4.624281e-02
## Region_Code4            -8.275976e-02
## Region_Code5            -2.932474e-01
## Region_Code6            -2.105475e-02
## Region_Code7            -1.390373e-01
## Region_Code8            -3.239352e-01
## Region_Code9            -4.117355e-01
## Region_Code10           -2.102054e-01
## Region_Code11            8.827983e-01
## Region_Code12           -2.193667e-01
## Region_Code13           -3.632995e-01
## Region_Code14           -1.440182e-01
## Region_Code15           -3.701351e-01
## Region_Code16           -3.117477e-01
## Region_Code17           -4.159063e-01
## Region_Code18            8.474398e-02
## Region_Code19           -1.441851e-01
## Region_Code20           -6.942139e-01
## Region_Code21           -3.251306e-02
## Region_Code22           -4.638331e-01
## Region_Code23           -1.633514e-02
## Region_Code24           -4.028029e-02
## Region_Code25           -5.839210e-01
## Region_Code26           -5.808420e-01
## Region_Code27           -3.128443e-01
## Region_Code28            1.442252e-01
## Region_Code29            2.176303e-02
## Region_Code30           -3.334892e-02
## Region_Code31           -6.561546e-01
## Region_Code32           -1.397655e-01
## Region_Code33            1.009847e+00
## Region_Code34           -4.348179e-01
## Region_Code35           -5.573455e-02
## Region_Code36           -2.568564e-01
## Region_Code37           -3.190546e-01
## Region_Code38           -2.646187e-02
## Region_Code39           -2.956797e-01
## Region_Code40           -2.338415e-01
## Region_Code41            6.390267e-01
## Region_Code42           -5.932324e-01
## Region_Code43           -5.036311e-01
## Region_Code44           -5.468635e-01
```

```
## Region_Code45           -2.082453e-01
## Region_Code46           -2.009799e-01
## Region_Code47           -4.067432e-01
## Region_Code48           -7.482484e-01
## Region_Code49           -3.938222e-01
## Region_Code50           -5.514431e-01
## Region_Code51           -3.595558e-01
## Region_Code52           -5.923189e-01
## Previously_Insured1     -1.811027e+00
## Vehicle_Age> 2 Years     6.020061e-01
## Vehicle_Age1-2 Year      3.041263e-01
## Vehicle_DamageYes        1.651986e+00
## Annual_Premium          -4.275394e-06
## Policy_Sales_Channel2    2.005392e+00
## Policy_Sales_Channel3    4.960851e-01
## Policy_Sales_Channel4    2.096328e-01
## Policy_Sales_Channel6   -3.030736e+00
## Policy_Sales_Channel7   -4.557481e-02
## Policy_Sales_Channel8   -1.489014e-01
## Policy_Sales_Channel9   -4.245415e-01
## Policy_Sales_Channel10   2.234798e-01
## Policy_Sales_Channel11  -4.316333e-01
## Policy_Sales_Channel12  -4.402928e-01
## Policy_Sales_Channel13  -2.222830e-01
## Policy_Sales_Channel14  -8.266792e-02
## Policy_Sales_Channel15  -1.545429e-02
## Policy_Sales_Channel16  -3.335808e-01
## Policy_Sales_Channel17   1.077198e-02
## Policy_Sales_Channel18  -9.140526e-01
## Policy_Sales_Channel19  -2.298220e-01
## Policy_Sales_Channel20  -1.201268e-02
## Policy_Sales_Channel21  -4.922443e-01
## Policy_Sales_Channel22  -3.362787e-01
## Policy_Sales_Channel23  -3.477150e-01
## Policy_Sales_Channel24  -3.698445e-01
## Policy_Sales_Channel25  -8.934006e-03
## Policy_Sales_Channel26   4.589017e-01
## Policy_Sales_Channel27  -1.660252e-01
## Policy_Sales_Channel28   .
## Policy_Sales_Channel29  -1.947246e-01
## Policy_Sales_Channel30  -3.053959e-01
## Policy_Sales_Channel31   2.282552e-01
## Policy_Sales_Channel32  -9.880546e-01
## Policy_Sales_Channel33   .
## Policy_Sales_Channel34   .
## Policy_Sales_Channel35  -3.025260e-01
## Policy_Sales_Channel36   6.566006e-01
## Policy_Sales_Channel37  -1.004424e+00
## Policy_Sales_Channel38  -1.629348e+00
## Policy_Sales_Channel39   1.924540e+00
## Policy_Sales_Channel40  -5.468553e-01
## Policy_Sales_Channel41   .
## Policy_Sales_Channel42   4.949968e-02
## Policy_Sales_Channel43   2.021038e+00
```

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## Policy_Sales_Channel44  -6.870914e-03
## Policy_Sales_Channel45  -1.729399e-01
## Policy_Sales_Channel46  -8.138560e-01
## Policy_Sales_Channel47  -8.570396e-01
## Policy_Sales_Channel48  -1.986675e-01
## Policy_Sales_Channel49  -1.025239e+00
## Policy_Sales_Channel50   .
## Policy_Sales_Channel51  -2.806438e+00
## Policy_Sales_Channel52  -4.677019e-01
## Policy_Sales_Channel53  -2.819132e-01
## Policy_Sales_Channel54  -2.567221e-01
## Policy_Sales_Channel55  -3.748162e-01
## Policy_Sales_Channel56  -5.679392e-01
## Policy_Sales_Channel57   1.977160e+00
## Policy_Sales_Channel58  -1.073894e+00
## Policy_Sales_Channel59   4.340759e-02
## Policy_Sales_Channel60  -4.347257e-01
## Policy_Sales_Channel61  -7.522893e-01
## Policy_Sales_Channel62  -7.968711e-01
## Policy_Sales_Channel63   5.860170e-01
## Policy_Sales_Channel64  -3.818889e-01
## Policy_Sales_Channel65  -6.675993e-01
## Policy_Sales_Channel66  -5.837160e-01
## Policy_Sales_Channel67   .
## Policy_Sales_Channel68   1.650358e+00
## Policy_Sales_Channel69   1.212736e+00
## Policy_Sales_Channel70   .
## Policy_Sales_Channel71  -2.204700e+00
## Policy_Sales_Channel73  -7.927096e-01
## Policy_Sales_Channel74  -2.581066e+00
## Policy_Sales_Channel75   .
## Policy_Sales_Channel76  -1.660807e+00
## Policy_Sales_Channel78   2.577450e-01
## Policy_Sales_Channel79   .
## Policy_Sales_Channel80   3.536502e-01
## Policy_Sales_Channel81   1.661173e+00
## Policy_Sales_Channel82  -6.220559e-01
## Policy_Sales_Channel83  -2.634009e+00
## Policy_Sales_Channel84  -6.116102e-01
## Policy_Sales_Channel86  -1.421557e-01
## Policy_Sales_Channel87   5.249580e-01
## Policy_Sales_Channel88  -1.278449e+00
## Policy_Sales_Channel89   3.054397e-01
## Policy_Sales_Channel90   8.901460e-02
## Policy_Sales_Channel91   3.277923e-01
## Policy_Sales_Channel92   1.397741e-01
## Policy_Sales_Channel93   1.422256e-01
## Policy_Sales_Channel94   8.952018e-01
## Policy_Sales_Channel95  -7.449888e-01
## Policy_Sales_Channel96  -2.535758e+00
## Policy_Sales_Channel97   1.684592e+00
## Policy_Sales_Channel98  -7.103242e-01
## Policy_Sales_Channel99  -2.470967e+00
## Policy_Sales_Channel100 -9.098775e-01
```

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## Policy_Sales_Channel101  1.729866e+00
## Policy_Sales_Channel102  .
## Policy_Sales_Channel103 -1.395465e-01
## Policy_Sales_Channel104 -2.232287e+00
## Policy_Sales_Channel105 -5.722681e-01
## Policy_Sales_Channel106  1.083972e-01
## Policy_Sales_Channel107  4.259629e-01
## Policy_Sales_Channel108 -7.095875e-01
## Policy_Sales_Channel109 -8.578411e-01
## Policy_Sales_Channel110  1.601022e+00
## Policy_Sales_Channel111 -1.885871e-02
## Policy_Sales_Channel112  .
## Policy_Sales_Channel113 -5.982776e-01
## Policy_Sales_Channel114 -2.157173e-01
## Policy_Sales_Channel115  .
## Policy_Sales_Channel116 -2.487323e-01
## Policy_Sales_Channel117 -7.017488e-01
## Policy_Sales_Channel118 -8.052321e-01
## Policy_Sales_Channel119 -2.245020e-01
## Policy_Sales_Channel120 -7.490508e-01
## Policy_Sales_Channel121  6.749768e-01
## Policy_Sales_Channel122 -1.944415e-01
## Policy_Sales_Channel123  1.787826e+00
## Policy_Sales_Channel124  1.698973e-01
## Policy_Sales_Channel125 -4.122645e-01
## Policy_Sales_Channel126 -2.150613e+00
## Policy_Sales_Channel127 -3.096004e-01
## Policy_Sales_Channel128 -4.524538e-01
## Policy_Sales_Channel129 -1.032800e+00
## Policy_Sales_Channel130  7.305407e-01
## Policy_Sales_Channel131 -4.776912e-01
## Policy_Sales_Channel132 -1.287797e+00
## Policy_Sales_Channel133 -5.101280e-01
## Policy_Sales_Channel134 -2.156969e+00
## Policy_Sales_Channel135 -1.066300e+00
## Policy_Sales_Channel136 -3.780667e-01
## Policy_Sales_Channel137  .
## Policy_Sales_Channel138 -5.607175e-01
## Policy_Sales_Channel139 -7.994496e-01
## Policy_Sales_Channel140 -4.101206e-01
## Policy_Sales_Channel143  .
## Policy_Sales_Channel144  .
## Policy_Sales_Channel145 -4.264797e-01
## Policy_Sales_Channel146 -2.312308e+00
## Policy_Sales_Channel147 -2.529572e-01
## Policy_Sales_Channel148 -2.808844e-01
## Policy_Sales_Channel149  .
## Policy_Sales_Channel150 -1.784727e-01
## Policy_Sales_Channel151 -6.540003e-01
## Policy_Sales_Channel152 -5.946605e-01
## Policy_Sales_Channel153 -5.997187e-01
## Policy_Sales_Channel154  1.753746e-01
## Policy_Sales_Channel155  4.366454e-01
## Policy_Sales_Channel156  1.888900e-03
```

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## Policy_Sales_Channel157  8.596131e-01
## Policy_Sales_Channel158  1.847783e-01
## Policy_Sales_Channel159 -1.491508e+00
## Policy_Sales_Channel160 -1.156548e+00
## Policy_Sales_Channel163  3.930900e-01
## Vintage                 -2.182745e-04
```