

assignment4-part1

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1.split the data into Train and Holdout

```
knitr::opts_chunk$set(cache=FALSE)
set.seed(600)
library(caret)

## Warning: package 'caret' was built under R version 3.4.3

## Loading required package: lattice

## Loading required package: ggplot2

## Warning in as.POSIXlt.POSIXct(Sys.time()): unknown timezone
'zone/tz/2018c.
## 1.0/zoneinfo/America/Chicago'

data("GermanCredit")
mydata <- GermanCredit
mydata.split <- sample(1:nrow(mydata), size = 0.7 * nrow(mydata))
Train <- mydata[mydata.split,]
Holdout <- mydata[-mydata.split,]
```

2.Build a Logistic Regression model for Train for predicting the “Class” variable, using the other variables. Try to build the model with the lowest “AIC” that you can achieve. Use function glm() in R for this. Examples of the R scripts for glm() are available in the Class Lecture or the R scripts file for Session 5 on Canvas.

```
set.seed(600)
lr.train <- glm(Class ~ ., data = Train, family = binomial(link = logit))
#summary(lr.train)
step(lr.train,direction = "backward")

## Start:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
```

```

## Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
## Purpose.Education + Purpose.Vacation + Purpose.Retaining +
## Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
## SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
## SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
## EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
## EmploymentDuration.gt.7 + EmploymentDuration.Unemployed +
## Personal.Male.Divorced.Seperated + Personal.Female.NotSingle +
## Personal.Male.Single + Personal.Male.Married.Widowed +
Personal.Female.Single +
## OtherDebtorsGuarantors.None + OtherDebtorsGuarantors.CoApplicant +
## OtherDebtorsGuarantors.Guarantor + Property.RealEstate +
## Property.Insurance + Property.CarOther + Property.Unknown +
## OtherInstallmentPlans.Bank + OtherInstallmentPlans.Stores +
## OtherInstallmentPlans.None + Housing.Rent + Housing.Own +
## Housing.ForFree + Job.UnemployedUnskilled + Job.UnskilledResident +
## Job.SkilledEmployee + Job.Management.SelfEmp.HighlyQualified
##
##
## Step: AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
## ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
## CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
## Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
## Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
## Purpose.Education + Purpose.Vacation + Purpose.Retaining +
## Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
## SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
## SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
## EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
## EmploymentDuration.gt.7 + EmploymentDuration.Unemployed +
## Personal.Male.Divorced.Seperated + Personal.Female.NotSingle +
## Personal.Male.Single + Personal.Male.Married.Widowed +
Personal.Female.Single +
## OtherDebtorsGuarantors.None + OtherDebtorsGuarantors.CoApplicant +
## OtherDebtorsGuarantors.Guarantor + Property.RealEstate +
## Property.Insurance + Property.CarOther + Property.Unknown +
## OtherInstallmentPlans.Bank + OtherInstallmentPlans.Stores +
## OtherInstallmentPlans.None + Housing.Rent + Housing.Own +
## Housing.ForFree + Job.UnemployedUnskilled + Job.UnskilledResident +

```

```

##      Job.SkilledEmployee
##
##
## Step:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
##      Purpose.Education + Purpose.Vacation + Purpose.Retaining +
##      Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
##      EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
##      EmploymentDuration.gt.7 + EmploymentDuration.Unemployed +
##      Personal.Male.Divorced.Separated + Personal.Female.NotSingle +
##      Personal.Male.Single + Personal.Male.Married.Widowed +
Personal.Female.Single +
##      OtherDebtorsGuarantors.None + OtherDebtorsGuarantors.CoApplicant +
##      OtherDebtorsGuarantors.Guarantor + Property.RealEstate +
##      Property.Insurance + Property.CarOther + Property.Unknown +
##      OtherInstallmentPlans.Bank + OtherInstallmentPlans.Stores +
##      OtherInstallmentPlans.None + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##
## Step:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
##      Purpose.Education + Purpose.Vacation + Purpose.Retaining +
##      Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +

```

```

## SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
## EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
## EmploymentDuration.gt.7 + EmploymentDuration.Unemployed +
## Personal.Male.Divorced.Separated + Personal.Female.NotSingle +
## Personal.Male.Single + Personal.Male.Married.Widowed +
Personal.Female.Single +
## OtherDebtorsGuarantors.None + OtherDebtorsGuarantors.CoApplicant +
## OtherDebtorsGuarantors.Guarantor + Property.RealEstate +
## Property.Insurance + Property.CarOther + Property.Unknown +
## OtherInstallmentPlans.Bank + OtherInstallmentPlans.Stores +
## Housing.Rent + Housing.Own + Job.UnemployedUnskilled +
Job.UnskilledResident +
## Job.SkilledEmployee
##
##
## Step: AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
## ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
## CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
## Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
## Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
## Purpose.Education + Purpose.Vacation + Purpose.Retaining +
## Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
## SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
## SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
## EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
## EmploymentDuration.gt.7 + EmploymentDuration.Unemployed +
## Personal.Male.Divorced.Separated + Personal.Female.NotSingle +
## Personal.Male.Single + Personal.Male.Married.Widowed +
Personal.Female.Single +
## OtherDebtorsGuarantors.None + OtherDebtorsGuarantors.CoApplicant +
## OtherDebtorsGuarantors.Guarantor + Property.RealEstate +
## Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
## OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
## Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##
## Step: AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +

```

```

##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
##      Purpose.Education + Purpose.Vacation + Purpose.Retaining +
##      Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
##      EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
##      EmploymentDuration.gt.7 + EmploymentDuration.Unemployed +
##      Personal.Male.Divorced.Separated + Personal.Female.NotSingle +
##      Personal.Male.Single + Personal.Male.Married.Widowed +
Personal.Female.Single +
##      OtherDebtorsGuarantors.None + OtherDebtorsGuarantors.CoApplicant +
##      Property.RealEstate + Property.Insurance + Property.CarOther +
##      OtherInstallmentPlans.Bank + OtherInstallmentPlans.Stores +
##      Housing.Rent + Housing.Own + Job.UnemployedUnskilled +
Job.UnskilledResident +
##      Job.SkilledEmployee
##
##
## Step:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
##      Purpose.Education + Purpose.Vacation + Purpose.Retaining +
##      Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
##      EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
##      EmploymentDuration.gt.7 + EmploymentDuration.Unemployed +
##      Personal.Male.Divorced.Separated + Personal.Female.NotSingle +
##      Personal.Male.Single + Personal.Male.Married.Widowed +
OtherDebtorsGuarantors.None +

```

```

##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
## Step:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
##      Purpose.Education + Purpose.Vacation + Purpose.Retaining +
##      Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
##      EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
##      EmploymentDuration.gt.7 + EmploymentDuration.Unemployed +
##      Personal.Male.Divorced.Separated + Personal.Female.NotSingle +
##      Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
##      Property.RealEstate + Property.Insurance + Property.CarOther +
##      OtherInstallmentPlans.Bank + OtherInstallmentPlans.Stores +
##      Housing.Rent + Housing.Own + Job.UnemployedUnskilled +
Job.UnskilledResident +
##      Job.SkilledEmployee
##
##
## Step:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
##      Purpose.Education + Purpose.Vacation + Purpose.Retaining +

```

```

## Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
## SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
## SavingsAccountBonds.gt.1000 + SavingsAccountBonds.Unknown +
## EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
## EmploymentDuration.gt.7 + Personal.Male.Divorced.Seperated +
## Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
## OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
## Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
## OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
## Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##
## Step: AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
## ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
## CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
## Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
## Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
## Purpose.Education + Purpose.Vacation + Purpose.Retaining +
## Purpose.Business + Purpose.Other + SavingsAccountBonds.lt.100 +
## SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
## SavingsAccountBonds.gt.1000 + EmploymentDuration.lt.1 +
EmploymentDuration.1.to.4 +
## EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Divorced.Seperated +
## Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
## OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
## Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
## OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
## Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##
## Step: AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
## ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
## CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +

```

```

##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
##      Purpose.Education + Purpose.Vacation + Purpose.Retraining +
##      Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
##      SavingsAccountBonds.500.to.1000 + SavingsAccountBonds.gt.1000 +
##      EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
##      EmploymentDuration.gt.7 + Personal.Male.Divorced.Seperated +
##      Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##
## Step:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + CreditHistory.Critical
+
##      Purpose.NewCar + Purpose.UsedCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.DomesticAppliance + Purpose.Repairs
+
##      Purpose.Education + Purpose.Retraining + Purpose.Business +
##      SavingsAccountBonds.lt.100 + SavingsAccountBonds.100.to.500 +
##      SavingsAccountBonds.500.to.1000 + SavingsAccountBonds.gt.1000 +
##      EmploymentDuration.lt.1 + EmploymentDuration.1.to.4 +
EmploymentDuration.4.to.7 +
##      EmploymentDuration.gt.7 + Personal.Male.Divorced.Seperated +
##      Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##
## Step:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+

```



```

##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CheckingAccountStatus.none +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
##      Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
##      Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##      Purpose.Retaining + Purpose.Business + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + EmploymentDuration.lt.1 +
EmploymentDuration.1.to.4 +
##      EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Divorced.Seperated +
##      Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##
## Step:  AIC=694.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##      CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##      CreditHistory.Delay + Purpose.NewCar + Purpose.UsedCar +
##      Purpose.Furniture.Equipment + Purpose.Radio.Television +
##      Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##      Purpose.Retaining + Purpose.Business + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + EmploymentDuration.lt.1 +
EmploymentDuration.1.to.4 +
##      EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Divorced.Seperated +
##      Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##
##
##      Df Deviance    AIC
## - EmploymentDuration.lt.1      1  596.56 692.56
## - Job.SkilledEmployee           1  596.56 692.56

```

## - NumberExistingCredits	1	596.57	692.57
## - Property.Insurance	1	596.59	692.59
## - Personal.Male.Divorced.Seperated	1	596.72	692.72
## - EmploymentDuration.1.to.4	1	596.80	692.80
## - Job.UnskilledResident	1	596.81	692.81
## - EmploymentDuration.gt.7	1	596.88	692.88
## - Age	1	596.91	692.91
## - NumberPeopleMaintenance	1	596.93	692.93
## - Purpose.Retraining	1	596.99	692.99
## - Housing.Rent	1	597.03	693.03
## - Property.RealEstate	1	597.04	693.04
## - Personal.Female.NotSingle	1	597.07	693.07
## - Housing.Own	1	597.12	693.12
## - ResidenceDuration	1	597.15	693.15
## - OtherInstallmentPlans.Stores	1	597.26	693.26
## - Property.CarOther	1	597.32	693.32
## - SavingsAccountBonds.gt.1000	1	597.43	693.43
## - Purpose.UsedCar	1	597.57	693.57
## - CreditHistory.Delay	1	597.93	693.93
## - Telephone	1	597.93	693.93
## - Purpose.DomesticAppliance	1	598.00	694.00
## - SavingsAccountBonds.500.to.1000	1	598.36	694.36
## <none>		596.55	694.55
## - EmploymentDuration.4.to.7	1	598.56	694.56
## - Personal.Male.Single	1	598.90	694.90
## - Purpose.Radio.Television	1	599.31	695.31
## - Job.UnemployedUnskilled	1	599.57	695.57
## - Purpose.Furniture.Equipment	1	599.79	695.79
## - Purpose.Business	1	599.90	695.90
## - OtherDebtorsGuarantors.CoApplicant	1	599.94	695.94
## - SavingsAccountBonds.100.to.500	1	600.17	696.17
## - CreditHistory.NoCredit.AllPaid	1	600.50	696.50
## - Duration	1	601.03	697.03
## - CheckingAccountStatus.gt.200	1	601.42	697.42
## - OtherDebtorsGuarantors.None	1	601.45	697.45
## - ForeignWorker	1	601.76	697.76
## - Purpose.NewCar	1	602.32	698.32
## - Purpose.Repairs	1	602.54	698.54
## - CreditHistory.PaidDuly	1	602.76	698.76
## - Purpose.Education	1	602.96	698.96
## - OtherInstallmentPlans.Bank	1	603.21	699.21
## - SavingsAccountBonds.lt.100	1	603.24	699.24
## - CreditHistory.ThisBank.AllPaid	1	603.76	699.76
## - Amount	1	606.76	702.76
## - InstallmentRatePercentage	1	607.60	703.60
## - CheckingAccountStatus.0.to.200	1	618.64	714.64
## - CheckingAccountStatus.lt.0	1	635.26	731.26
##			
## Step: AIC=692.56			
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration			

```

+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##      CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##      CreditHistory.Delay + Purpose.NewCar + Purpose.UsedCar +
##      Purpose.Furniture.Equipment + Purpose.Radio.Television +
##      Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##      Purpose.Retraining + Purpose.Business + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + EmploymentDuration.1.to.4 +
##      EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Divorced.Seperated +
##      Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident + Job.SkilledEmployee
##
##                                     Df Deviance   AIC
## - Job.SkilledEmployee                1   596.56 690.56
## - NumberExistingCredits                1   596.58 690.58
## - Property.Insurance                   1   596.60 690.60
## - Personal.Male.Divorced.Seperated     1   596.73 690.73
## - Job.UnskilledResident                1   596.87 690.87
## - Age                                  1   596.91 690.91
## - NumberPeopleMaintenance              1   596.93 690.93
## - Purpose.Retraining                   1   596.99 690.99
## - Housing.Rent                         1   597.03 691.03
## - Property.RealEstate                   1   597.04 691.04
## - Personal.Female.NotSingle             1   597.07 691.07
## - EmploymentDuration.1.to.4             1   597.09 691.09
## - EmploymentDuration.gt.7              1   597.11 691.11
## - Housing.Own                          1   597.14 691.14
## - ResidenceDuration                     1   597.15 691.15
## - OtherInstallmentPlans.Stores          1   597.26 691.26
## - Property.CarOther                    1   597.32 691.32
## - SavingsAccountBonds.gt.1000           1   597.44 691.44
## - Purpose.UsedCar                      1   597.57 691.57
## - CreditHistory.Delay                   1   597.95 691.95
## - Telephone                            1   597.95 691.95
## - Purpose.DomesticAppliance             1   598.00 692.00
## - SavingsAccountBonds.500.to.1000      1   598.37 692.37
## <none>                                596.56 692.56
## - Personal.Male.Single                  1   598.90 692.90
## - Purpose.Radio.Television              1   599.31 693.31
## - Job.UnemployedUnskilled              1   599.62 693.62
## - Purpose.Furniture.Equipment           1   599.79 693.79

```

```

## - Purpose.Business          1  599.91 693.91
## - OtherDebtorsGuarantors.CoApplicant 1  599.97 693.97
## - SavingsAccountBonds.100.to.500    1  600.20 694.20
## - CreditHistory.NoCredit.AllPaid    1  600.50 694.50
## - EmploymentDuration.4.to.7         1  600.64 694.64
## - Duration                     1  601.03 695.03
## - CheckingAccountStatus.gt.200      1  601.42 695.42
## - OtherDebtorsGuarantors.None       1  601.48 695.48
## - ForeignWorker                 1  601.84 695.84
## - Purpose.NewCar                 1  602.34 696.34
## - Purpose.Repairs                1  602.54 696.54
## - CreditHistory.PaidDuly          1  602.77 696.77
## - Purpose.Education              1  603.00 697.00
## - OtherInstallmentPlans.Bank       1  603.22 697.22
## - SavingsAccountBonds.lt.100       1  603.25 697.25
## - CreditHistory.ThisBank.AllPaid    1  603.78 697.78
## - Amount                        1  606.76 700.76
## - InstallmentRatePercentage        1  607.60 701.60
## - CheckingAccountStatus.0.to.200    1  618.65 712.65
## - CheckingAccountStatus.lt.0        1  635.45 729.45
##
## Step:  AIC=690.56
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberExistingCredits + NumberPeopleMaintenance + Telephone +
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##      CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##      CreditHistory.Delay + Purpose.NewCar + Purpose.UsedCar +
##      Purpose.Furniture.Equipment + Purpose.Radio.Television +
##      Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##      Purpose.Retaining + Purpose.Business + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + EmploymentDuration.1.to.4 +
##      EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Divorced.Seperated +
##      Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident
##
##
##              Df Deviance    AIC
## - NumberExistingCredits      1  596.58 688.58
## - Property.Insurance          1  596.60 688.60
## - Personal.Male.Divorced.Seperated 1  596.73 688.73
## - Age                        1  596.93 688.93
## - NumberPeopleMaintenance    1  596.94 688.94

```

```

## - Purpose.Retraining          1  597.01 689.01
## - Housing.Rent                 1  597.04 689.04
## - Property.RealEstate         1  597.04 689.04
## - Personal.Female.NotSingle   1  597.07 689.07
## - EmploymentDuration.1.to.4   1  597.09 689.09
## - EmploymentDuration.gt.7     1  597.11 689.11
## - ResidenceDuration           1  597.15 689.15
## - Housing.Own                 1  597.15 689.15
## - OtherInstallmentPlans.Stores 1  597.27 689.27
## - Property.CarOther           1  597.32 689.32
## - Job.UnskilledResident        1  597.43 689.43
## - SavingsAccountBonds.gt.1000 1  597.45 689.45
## - Purpose.UsedCar             1  597.59 689.59
## - CreditHistory.Delay         1  597.95 689.95
## - Purpose.DomesticAppliance   1  598.04 690.04
## - Telephone                   1  598.13 690.13
## - SavingsAccountBonds.500.to.1000 1  598.37 690.37
## <none>                        596.56 690.56
## - Personal.Male.Single        1  598.90 690.90
## - Purpose.Radio.Television     1  599.38 691.38
## - Purpose.Furniture.Equipment 1  599.86 691.86
## - OtherDebtorsGuarantors.CoApplicant 1  599.97 691.97
## - Purpose.Business            1  599.98 691.98
## - Job.UnemployedUnskilled     1  600.16 692.16
## - SavingsAccountBonds.100.to.500 1  600.21 692.21
## - CreditHistory.NoCredit.AllPaid 1  600.52 692.52
## - EmploymentDuration.4.to.7   1  600.64 692.64
## - Duration                    1  601.11 693.11
## - CheckingAccountStatus.gt.200 1  601.43 693.43
## - OtherDebtorsGuarantors.None 1  601.48 693.48
## - ForeignWorker               1  601.84 693.84
## - Purpose.NewCar              1  602.43 694.43
## - Purpose.Repairs             1  602.64 694.64
## - CreditHistory.PaidDuly       1  602.77 694.77
## - Purpose.Education           1  603.09 695.09
## - OtherInstallmentPlans.Bank   1  603.22 695.22
## - SavingsAccountBonds.lt.100  1  603.26 695.26
## - CreditHistory.ThisBank.AllPaid 1  603.78 695.78
## - Amount                      1  607.24 699.24
## - InstallmentRatePercentage    1  607.76 699.76
## - CheckingAccountStatus.0.to.200 1  618.66 710.66
## - CheckingAccountStatus.lt.0   1  635.54 727.54
##
## Step:  AIC=688.58
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberPeopleMaintenance + Telephone + ForeignWorker +
##      CheckingAccountStatus.lt.0 + CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##      CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +

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```

##      CreditHistory.Delay + Purpose.NewCar + Purpose.UsedCar +
##      Purpose.Furniture.Equipment + Purpose.Radio.Television +
##      Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##      Purpose.Retraining + Purpose.Business + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + EmploymentDuration.1.to.4 +
##      EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Divorced.Seperated +
##      Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.Insurance + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident
##
##
##              Df Deviance    AIC
## - Property.Insurance           1    596.62 686.62
## - Personal.Male.Divorced.Seperated 1    596.75 686.75
## - Age                           1    596.94 686.94
## - NumberPeopleMaintenance       1    597.00 687.00
## - Purpose.Retraining             1    597.03 687.03
## - Property.RealEstate           1    597.05 687.05
## - Housing.Rent                  1    597.06 687.06
## - Personal.Female.NotSingle     1    597.09 687.09
## - EmploymentDuration.1.to.4     1    597.12 687.12
## - EmploymentDuration.gt.7       1    597.12 687.12
## - ResidenceDuration             1    597.16 687.16
## - Housing.Own                   1    597.18 687.18
## - Property.CarOther             1    597.32 687.32
## - OtherInstallmentPlans.Stores   1    597.33 687.33
## - Job.UnskilledResident         1    597.47 687.47
## - SavingsAccountBonds.gt.1000   1    597.47 687.47
## - Purpose.UsedCar               1    597.62 687.62
## - CreditHistory.Delay           1    597.95 687.95
## - Purpose.DomesticAppliance     1    598.06 688.06
## - Telephone                     1    598.14 688.14
## - SavingsAccountBonds.500.to.1000 1    598.38 688.38
## <none>                          596.58 688.58
## - Personal.Male.Single          1    598.94 688.94
## - Purpose.Radio.Television      1    599.42 689.42
## - Purpose.Furniture.Equipment   1    599.90 689.90
## - OtherDebtorsGuarantors.CoApplicant 1    600.00 690.00
## - Purpose.Business              1    600.03 690.03
## - Job.UnemployedUnskilled       1    600.16 690.16
## - SavingsAccountBonds.100.to.500 1    600.25 690.25
## - CreditHistory.NoCredit.AllPaid 1    600.52 690.52
## - EmploymentDuration.4.to.7     1    600.65 690.65
## - Duration                      1    601.11 691.11
## - CheckingAccountStatus.gt.200  1    601.43 691.43
## - OtherDebtorsGuarantors.None   1    601.51 691.51

```

```

## - ForeignWorker          1    601.91 691.91
## - Purpose.NewCar         1    602.48 692.48
## - Purpose.Repairs        1    602.77 692.77
## - Purpose.Education      1    603.15 693.15
## - SavingsAccountBonds.lt.100 1    603.29 693.29
## - OtherInstallmentPlans.Bank 1    603.35 693.35
## - CreditHistory.ThisBank.AllPaid 1    604.50 694.50
## - CreditHistory.PaidDuly  1    605.08 695.08
## - Amount                 1    607.32 697.32
## - InstallmentRatePercentage 1    607.82 697.82
## - CheckingAccountStatus.0.to.200 1    618.68 708.68
## - CheckingAccountStatus.lt.0 1    635.65 725.65
##
## Step:  AIC=686.62
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##   Age + NumberPeopleMaintenance + Telephone + ForeignWorker +
##   CheckingAccountStatus.lt.0 + CheckingAccountStatus.0.to.200 +
##   CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##   CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##   CreditHistory.Delay + Purpose.NewCar + Purpose.UsedCar +
##   Purpose.Furniture.Equipment + Purpose.Radio.Television +
##   Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##   Purpose.Retaining + Purpose.Business + SavingsAccountBonds.lt.100 +
##   SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##   SavingsAccountBonds.gt.1000 + EmploymentDuration.1.to.4 +
##   EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Divorced.Seperated +
##   Personal.Female.NotSingle + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##   OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##   Property.CarOther + OtherInstallmentPlans.Bank +
OtherInstallmentPlans.Stores +
##   Housing.Rent + Housing.Own + Job.UnemployedUnskilled +
Job.UnskilledResident
##
##
##      Df Deviance    AIC
## - Personal.Male.Divorced.Seperated  1    596.79 684.79
## - Age                               1    596.98 684.98
## - NumberPeopleMaintenance           1    597.01 685.01
## - Purpose.Retaining                  1    597.06 685.06
## - Personal.Female.NotSingle          1    597.13 685.13
## - EmploymentDuration.gt.7            1    597.14 685.14
## - EmploymentDuration.1.to.4          1    597.15 685.15
## - Housing.Rent                       1    597.18 685.18
## - ResidenceDuration                  1    597.20 685.20
## - OtherInstallmentPlans.Stores        1    597.35 685.35
## - SavingsAccountBonds.gt.1000        1    597.50 685.50
## - Job.UnskilledResident              1    597.50 685.50
## - Property.RealEstate                 1    597.52 685.52

```

```

## - Purpose.UsedCar          1  597.66 685.66
## - CreditHistory.Delay      1  597.98 685.98
## - Purpose.DomesticAppliance 1  598.12 686.12
## - Telephone                1  598.15 686.15
## - Property.CarOther        1  598.36 686.36
## - Housing.Own              1  598.38 686.38
## - SavingsAccountBonds.500.to.1000 1  598.44 686.44
## <none>                     1  596.62 686.62
## - Personal.Male.Single     1  598.96 686.96
## - Purpose.Radio.Television 1  599.46 687.46
## - Purpose.Furniture.Equipment 1  599.93 687.93
## - Purpose.Business         1  600.07 688.07
## - OtherDebtorsGuarantors.CoApplicant 1  600.14 688.14
## - Job.UnemployedUnskilled  1  600.16 688.16
## - SavingsAccountBonds.100.to.500 1  600.31 688.31
## - CreditHistory.NoCredit.AllPaid 1  600.59 688.59
## - EmploymentDuration.4.to.7 1  600.70 688.70
## - Duration                 1  601.21 689.21
## - CheckingAccountStatus.gt.200 1  601.47 689.47
## - OtherDebtorsGuarantors.None 1  601.66 689.66
## - ForeignWorker            1  601.93 689.93
## - Purpose.NewCar           1  602.51 690.51
## - Purpose.Repairs           1  602.82 690.82
## - Purpose.Education        1  603.21 691.21
## - SavingsAccountBonds.lt.100 1  603.33 691.33
## - OtherInstallmentPlans.Bank 1  603.43 691.43
## - CreditHistory.ThisBank.AllPaid 1  604.66 692.66
## - CreditHistory.PaidDuly    1  605.13 693.13
## - Amount                   1  607.46 695.46
## - InstallmentRatePercentage 1  607.89 695.89
## - CheckingAccountStatus.0.to.200 1  618.74 706.74
## - CheckingAccountStatus.lt.0 1  635.74 723.74
##
## Step:  AIC=684.79
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Age + NumberPeopleMaintenance + Telephone + ForeignWorker +
##      CheckingAccountStatus.lt.0 + CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##      CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##      CreditHistory.Delay + Purpose.NewCar + Purpose.UsedCar +
##      Purpose.Furniture.Equipment + Purpose.Radio.Television +
##      Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##      Purpose Retraining + Purpose.Business + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + EmploymentDuration.1.to.4 +
##      EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
##      Personal.Female.NotSingle +
##      Personal.Male.Single + OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant +

```



```

##      Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident
##
##              Df Deviance      AIC
## - Age              1    597.08 683.08
## - Personal.Female.NotSingle      1    597.13 683.13
## - Purpose.Retraining              1    597.17 683.17
## - NumberPeopleMaintenance      1    597.19 683.19
## - EmploymentDuration.gt.7      1    597.28 683.28
## - EmploymentDuration.1.to.4      1    597.32 683.32
## - Housing.Rent              1    597.34 683.34
## - ResidenceDuration      1    597.40 683.40
## - OtherInstallmentPlans.Stores      1    597.49 683.49
## - Property.RealEstate      1    597.70 683.70
## - SavingsAccountBonds.gt.1000      1    597.71 683.71
## - Job.UnskilledResident      1    597.73 683.73
## - Purpose.UsedCar      1    597.78 683.78
## - CreditHistory.Delay      1    598.20 684.20
## - Purpose.DomesticAppliance      1    598.24 684.24
## - Telephone      1    598.41 684.41
## - Property.CarOther      1    598.48 684.48
## - Housing.Own      1    598.54 684.54
## - SavingsAccountBonds.500.to.1000      1    598.66 684.66
## <none>              596.79 684.79
## - Purpose.Radio.Television      1    599.55 685.55
## - Purpose.Furniture.Equipment      1    600.06 686.06
## - Purpose.Business      1    600.19 686.19
## - OtherDebtorsGuarantors.CoApplicant      1    600.27 686.27
## - Job.UnemployedUnskilled      1    600.38 686.38
## - SavingsAccountBonds.100.to.500      1    600.55 686.55
## - CreditHistory.NoCredit.AllPaid      1    600.77 686.77
## - EmploymentDuration.4.to.7      1    600.86 686.86
## - Personal.Male.Single      1    601.36 687.36
## - Duration      1    601.39 687.39
## - OtherDebtorsGuarantors.None      1    601.80 687.80
## - CheckingAccountStatus.gt.200      1    601.81 687.81
## - ForeignWorker      1    602.04 688.04
## - Purpose.NewCar      1    602.59 688.59
## - Purpose.Repairs      1    602.87 688.87
## - Purpose.Education      1    603.31 689.31
## - OtherInstallmentPlans.Bank      1    603.47 689.47
## - SavingsAccountBonds.lt.100      1    603.52 689.52
## - CreditHistory.ThisBank.AllPaid      1    604.92 690.92
## - CreditHistory.PaidDuly      1    605.29 691.29
## - Amount      1    607.73 693.73
## - InstallmentRatePercentage      1    607.97 693.97
## - CheckingAccountStatus.0.to.200      1    618.82 704.82
## - CheckingAccountStatus.lt.0      1    636.25 722.25
##

```

```

## Step: AIC=683.08
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## NumberPeopleMaintenance + Telephone + ForeignWorker +
CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
## Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
## Purpose.Retaining + Purpose.Business + SavingsAccountBonds.lt.100 +
## SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
## SavingsAccountBonds.gt.1000 + EmploymentDuration.1.to.4 +
## EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Female.NotSingle +
## Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
## Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
## OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
## Job.UnemployedUnskilled + Job.UnskilledResident
##
##
## Df Deviance AIC
## - Personal.Female.NotSingle 1 597.43 681.43
## - NumberPeopleMaintenance 1 597.48 681.48
## - Purpose.Retaining 1 597.49 681.49
## - EmploymentDuration.1.to.4 1 597.59 681.59
## - OtherInstallmentPlans.Stores 1 597.76 681.76
## - EmploymentDuration.gt.7 1 597.78 681.78
## - ResidenceDuration 1 597.84 681.84
## - Housing.Rent 1 597.88 681.88
## - SavingsAccountBonds.gt.1000 1 598.00 682.00
## - Property.RealEstate 1 598.01 682.01
## - Job.UnskilledResident 1 598.05 682.05
## - Purpose.UsedCar 1 598.10 682.10
## - CreditHistory.Delay 1 598.46 682.46
## - Purpose.DomesticAppliance 1 598.60 682.60
## - Housing.Own 1 598.70 682.70
## - Property.CarOther 1 598.71 682.71
## - Telephone 1 598.92 682.92
## - SavingsAccountBonds.500.to.1000 1 598.96 682.96
## <none> 597.08 683.08
## - Purpose.Radio.Television 1 599.92 683.92
## - Purpose.Furniture.Equipment 1 600.45 684.45
## - Purpose.Business 1 600.53 684.53
## - OtherDebtorsGuarantors.CoApplicant 1 600.57 684.57
## - Job.UnemployedUnskilled 1 600.81 684.81
## - SavingsAccountBonds.100.to.500 1 600.94 684.94
## - EmploymentDuration.4.to.7 1 601.14 685.14
## - CreditHistory.NoCredit.AllPaid 1 601.16 685.16

```

```

## - Personal.Male.Single          1   601.72  685.72
## - Duration                      1   601.89  685.89
## - CheckingAccountStatus.gt.200  1   602.01  686.01
## - OtherDebtorsGuarantors.None   1   602.24  686.24
## - ForeignWorker                 1   602.41  686.41
## - Purpose.NewCar               1   602.91  686.91
## - Purpose.Repairs              1   603.09  687.09
## - Purpose.Education            1   603.58  687.58
## - OtherInstallmentPlans.Bank    1   603.65  687.65
## - SavingsAccountBonds.lt.100    1   603.83  687.83
## - CreditHistory.ThisBank.AllPaid 1   605.13  689.13
## - CreditHistory.PaidDuly        1   605.83  689.83
## - Amount                       1   607.93  691.93
## - InstallmentRatePercentage     1   608.25  692.25
## - CheckingAccountStatus.0.to.200 1   619.52  703.52
## - CheckingAccountStatus.lt.0     1   636.91  720.91
##
## Step:  AIC=681.43
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      NumberPeopleMaintenance + Telephone + ForeignWorker +
CheckingAccountStatus.lt.0 +
##      CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
##      Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
##      Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##      Purpose.Retaining + Purpose.Business + SavingsAccountBonds.lt.100 +
##      SavingsAccountBonds.100.to.500 + SavingsAccountBonds.500.to.1000 +
##      SavingsAccountBonds.gt.1000 + EmploymentDuration.1.to.4 +
##      EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Single +
##      OtherDebtorsGuarantors.None + OtherDebtorsGuarantors.CoApplicant +
##      Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident
##
##
##      Df Deviance   AIC
## - Purpose.Retaining          1   597.80  679.80
## - NumberPeopleMaintenance    1   597.89  679.89
## - EmploymentDuration.1.to.4   1   598.02  680.02
## - ResidenceDuration           1   598.10  680.10
## - OtherInstallmentPlans.Stores 1   598.13  680.13
## - EmploymentDuration.gt.7     1   598.21  680.21
## - Housing.Rent                1   598.24  680.24
## - SavingsAccountBonds.gt.1000 1   598.37  680.37
## - Job.UnskilledResident       1   598.43  680.43
## - Property.RealEstate         1   598.45  680.45
## - Purpose.UsedCar             1   598.47  680.47

```

## - CreditHistory.Delay	1	598.72	680.72
## - Purpose.DomesticAppliance	1	599.02	681.02
## - Housing.Own	1	599.05	681.05
## - Property.CarOther	1	599.09	681.09
## - SavingsAccountBonds.500.to.1000	1	599.28	681.28
## - Telephone	1	599.36	681.36
## <none>		597.43	681.43
## - Purpose.Radio.Television	1	600.35	682.35
## - Purpose.Furniture.Equipment	1	600.89	682.89
## - Purpose.Business	1	600.91	682.91
## - OtherDebtorsGuarantors.CoApplicant	1	600.97	682.97
## - Job.UnemployedUnskilled	1	601.04	683.04
## - SavingsAccountBonds.100.to.500	1	601.20	683.20
## - CreditHistory.NoCredit.AllPaid	1	601.56	683.56
## - EmploymentDuration.4.to.7	1	601.64	683.64
## - Duration	1	602.18	684.18
## - CheckingAccountStatus.gt.200	1	602.25	684.25
## - OtherDebtorsGuarantors.None	1	602.64	684.64
## - ForeignWorker	1	602.71	684.71
## - Purpose.NewCar	1	603.32	685.32
## - Purpose.Repairs	1	603.44	685.44
## - OtherInstallmentPlans.Bank	1	603.99	685.99
## - Purpose.Education	1	604.07	686.07
## - SavingsAccountBonds.lt.100	1	604.18	686.18
## - CreditHistory.ThisBank.AllPaid	1	605.75	687.75
## - CreditHistory.PaidDuly	1	606.16	688.16
## - Amount	1	608.64	690.64
## - InstallmentRatePercentage	1	608.84	690.84
## - Personal.Male.Single	1	609.51	691.51
## - CheckingAccountStatus.0.to.200	1	619.53	701.53
## - CheckingAccountStatus.lt.0	1	636.92	718.92
##			
## Step: AIC=679.8			
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration			
+			
## NumberPeopleMaintenance + Telephone + ForeignWorker +			
CheckingAccountStatus.lt.0 +			
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +			
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +			
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +			
## Purpose.UsedCar + Purpose.Furniture.Equipment +			
Purpose.Radio.Television +			
## Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +			
## Purpose.Business + SavingsAccountBonds.lt.100 +			
SavingsAccountBonds.100.to.500 +			
## SavingsAccountBonds.500.to.1000 + SavingsAccountBonds.gt.1000 +			
## EmploymentDuration.1.to.4 + EmploymentDuration.4.to.7 +			
EmploymentDuration.gt.7 +			
## Personal.Male.Single + OtherDebtorsGuarantors.None +			
OtherDebtorsGuarantors.CoApplicant +			

```
##      Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
##      OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
##      Job.UnemployedUnskilled + Job.UnskilledResident
```

```
##
##              Df Deviance    AIC
## - NumberPeopleMaintenance      1   598.24 678.24
## - EmploymentDuration.1.to.4      1   598.37 678.37
## - OtherInstallmentPlans.Stores    1   598.48 678.48
## - Purpose.UsedCar                1   598.49 678.49
## - EmploymentDuration.gt.7        1   598.51 678.51
## - ResidenceDuration              1   598.53 678.53
## - Housing.Rent                   1   598.66 678.66
## - Job.UnskilledResident          1   598.73 678.73
## - SavingsAccountBonds.gt.1000    1   598.78 678.78
## - Property.RealEstate            1   598.88 678.88
## - Purpose.DomesticAppliance      1   599.04 679.04
## - CreditHistory.Delay            1   599.14 679.14
## - Housing.Own                    1   599.43 679.43
## - Property.CarOther              1   599.46 679.46
## - SavingsAccountBonds.500.to.1000 1   599.62 679.62
## - Telephone                      1   599.75 679.75
## <none>                          597.80 679.80
## - Purpose.Radio.Television       1   601.07 681.07
## - OtherDebtorsGuarantors.CoApplicant 1   601.24 681.24
## - SavingsAccountBonds.100.to.500 1   601.46 681.46
## - Job.UnemployedUnskilled        1   601.51 681.51
## - Purpose.Business               1   601.78 681.78
## - EmploymentDuration.4.to.7      1   601.83 681.83
## - CreditHistory.NoCredit.AllPaid 1   601.84 681.84
## - Purpose.Furniture.Equipment    1   601.89 681.89
## - CheckingAccountStatus.gt.200   1   602.55 682.55
## - Duration                       1   602.58 682.58
## - OtherDebtorsGuarantors.None    1   603.07 683.07
## - ForeignWorker                  1   603.48 683.48
## - OtherInstallmentPlans.Bank     1   604.16 684.16
## - SavingsAccountBonds.lt.100     1   604.43 684.43
## - Purpose.Repairs                1   604.89 684.89
## - Purpose.NewCar                 1   605.89 685.89
## - Purpose.Education              1   606.39 686.39
## - CreditHistory.ThisBank.AllPaid 1   606.49 686.49
## - CreditHistory.PaidDuly         1   606.52 686.52
## - Amount                         1   608.64 688.64
## - InstallmentRatePercentage      1   609.21 689.21
## - Personal.Male.Single           1   609.83 689.83
## - CheckingAccountStatus.0.to.200 1   619.72 699.72
## - CheckingAccountStatus.lt.0     1   637.39 717.39
```

```
## Step: AIC=678.24
```

```
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
```

```
+
```

```

## Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
## Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
## Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
## SavingsAccountBonds.500.to.1000 + SavingsAccountBonds.gt.1000 +
## EmploymentDuration.1.to.4 + EmploymentDuration.4.to.7 +
EmploymentDuration.gt.7 +
## Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
## Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
## OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
## Job.UnemployedUnskilled + Job.UnskilledResident
##
##
## Df Deviance AIC
## - EmploymentDuration.1.to.4 1 598.78 676.78
## - OtherInstallmentPlans.Stores 1 598.85 676.85
## - EmploymentDuration.gt.7 1 598.90 676.90
## - Purpose.UsedCar 1 598.96 676.96
## - Job.UnskilledResident 1 599.00 677.00
## - ResidenceDuration 1 599.00 677.00
## - Housing.Rent 1 599.01 677.01
## - SavingsAccountBonds.gt.1000 1 599.10 677.10
## - Property.RealEstate 1 599.30 677.30
## - Purpose.DomesticAppliance 1 599.44 677.44
## - CreditHistory.Delay 1 599.78 677.78
## - Property.CarOther 1 599.89 677.89
## - SavingsAccountBonds.500.to.1000 1 600.03 678.03
## - Housing.Own 1 600.11 678.11
## - Telephone 1 600.11 678.11
## <none> 598.24 678.24
## - Purpose.Radio.Television 1 601.45 679.45
## - OtherDebtorsGuarantors.CoApplicant 1 601.52 679.52
## - Job.UnemployedUnskilled 1 601.82 679.82
## - SavingsAccountBonds.100.to.500 1 601.95 679.95
## - EmploymentDuration.4.to.7 1 602.11 680.11
## - Purpose.Business 1 602.18 680.18
## - Purpose.Furniture.Equipment 1 602.22 680.22
## - CreditHistory.NoCredit.AllPaid 1 602.34 680.34
## - Duration 1 602.92 680.92
## - CheckingAccountStatus.gt.200 1 602.98 680.98
## - OtherDebtorsGuarantors.None 1 603.38 681.38
## - ForeignWorker 1 603.89 681.89
## - OtherInstallmentPlans.Bank 1 604.52 682.52
## - SavingsAccountBonds.lt.100 1 604.89 682.89
## - Purpose.Repairs 1 605.25 683.25

```

```

## - Purpose.NewCar          1    606.23 684.23
## - Purpose.Education       1    606.74 684.74
## - CreditHistory.PaidDuly   1    607.02 685.02
## - CreditHistory.ThisBank.AllPaid 1    607.09 685.09
## - Amount                  1    608.85 686.85
## - InstallmentRatePercentage 1    609.21 687.21
## - Personal.Male.Single     1    609.98 687.98
## - CheckingAccountStatus.0.to.200 1    620.11 698.11
## - CheckingAccountStatus.lt.0 1    638.77 716.77
##
## Step:  AIC=676.78
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
## Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
## Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
## SavingsAccountBonds.500.to.1000 + SavingsAccountBonds.gt.1000 +
## EmploymentDuration.4.to.7 + EmploymentDuration.gt.7 +
Personal.Male.Single +
## OtherDebtorsGuarantors.None + OtherDebtorsGuarantors.CoApplicant +
## Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
## OtherInstallmentPlans.Stores + Housing.Rent + Housing.Own +
## Job.UnemployedUnskilled + Job.UnskilledResident
##
##
## Df Deviance AIC
## - EmploymentDuration.gt.7          1    599.02 675.02
## - OtherInstallmentPlans.Stores      1    599.41 675.41
## - Purpose.UsedCar                   1    599.50 675.50
## - Job.UnskilledResident             1    599.57 675.57
## - Housing.Rent                     1    599.61 675.61
## - SavingsAccountBonds.gt.1000      1    599.66 675.66
## - ResidenceDuration                1    599.70 675.70
## - Purpose.DomesticAppliance        1    600.08 676.08
## - Property.RealEstate               1    600.12 676.12
## - CreditHistory.Delay               1    600.25 676.25
## - SavingsAccountBonds.500.to.1000  1    600.41 676.41
## - Telephone                        1    600.51 676.51
## - Property.CarOther                 1    600.58 676.58
## - Housing.Own                      1    600.63 676.63
## <none>                             598.78 676.78
## - Job.UnemployedUnskilled          1    601.94 677.94
## - Purpose.Radio.Television          1    602.00 678.00
## - OtherDebtorsGuarantors.CoApplicant 1    602.15 678.15
## - EmploymentDuration.4.to.7        1    602.24 678.24

```

```

## - SavingsAccountBonds.100.to.500      1   602.60  678.60
## - Purpose.Business                      1   602.76  678.76
## - CreditHistory.NoCredit.AllPaid        1   602.83  678.83
## - Purpose.Furniture.Equipment           1   602.84  678.84
## - Duration                             1   603.20  679.20
## - CheckingAccountStatus.gt.200          1   603.57  679.57
## - OtherDebtorsGuarantors.None           1   604.08  680.08
## - ForeignWorker                        1   604.54  680.54
## - OtherInstallmentPlans.Bank            1   605.28  681.28
## - SavingsAccountBonds.lt.100            1   605.46  681.46
## - Purpose.Repairs                      1   605.90  681.90
## - Purpose.NewCar                       1   606.85  682.85
## - Purpose.Education                    1   607.18  683.18
## - CreditHistory.PaidDuly                1   607.63  683.63
## - CreditHistory.ThisBank.AllPaid        1   607.64  683.64
## - Amount                               1   609.65  685.65
## - InstallmentRatePercentage             1   609.84  685.84
## - Personal.Male.Single                  1   611.16  687.16
## - CheckingAccountStatus.0.to.200        1   621.20  697.20
## - CheckingAccountStatus.lt.0            1   639.34  715.34
##
## Step:  AIC=675.02
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##   Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
##   CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
##   CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##   CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
##   Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
##   Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##   Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
##   SavingsAccountBonds.500.to.1000 + SavingsAccountBonds.gt.1000 +
##   EmploymentDuration.4.to.7 + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##   OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##   Property.CarOther + OtherInstallmentPlans.Bank +
OtherInstallmentPlans.Stores +
##   Housing.Rent + Housing.Own + Job.UnemployedUnskilled +
Job.UnskilledResident
##
##
##           Df Deviance    AIC
## - OtherInstallmentPlans.Stores      1   599.68  673.68
## - Job.UnskilledResident              1   599.77  673.77
## - Purpose.UsedCar                    1   599.77  673.77
## - SavingsAccountBonds.gt.1000        1   599.89  673.89
## - Housing.Rent                       1   599.98  673.98
## - ResidenceDuration                  1   600.30  674.30
## - Property.RealEstate                 1   600.31  674.31

```



```

## - Purpose.DomesticAppliance      1  600.38 674.38
## - CreditHistory.Delay              1  600.63 674.63
## - SavingsAccountBonds.500.to.1000  1  600.64 674.64
## - Housing.Own                     1  600.77 674.77
## - Property.CarOther                1  600.80 674.80
## - Telephone                        1  600.88 674.88
## <none>                             599.02 675.02
## - Job.UnemployedUnskilled          1  602.03 676.03
## - EmploymentDuration.4.to.7        1  602.24 676.24
## - Purpose.Radio.Television          1  602.33 676.33
## - OtherDebtorsGuarantors.CoApplicant 1  602.34 676.34
## - SavingsAccountBonds.100.to.500   1  602.86 676.86
## - Purpose.Business                 1  603.07 677.07
## - CreditHistory.NoCredit.AllPaid    1  603.17 677.17
## - Purpose.Furniture.Equipment       1  603.24 677.24
## - Duration                         1  603.48 677.48
## - CheckingAccountStatus.gt.200      1  603.68 677.68
## - OtherDebtorsGuarantors.None       1  604.26 678.26
## - ForeignWorker                    1  604.70 678.70
## - OtherInstallmentPlans.Bank        1  605.38 679.38
## - SavingsAccountBonds.lt.100        1  605.80 679.80
## - Purpose.Repairs                  1  606.30 680.30
## - Purpose.NewCar                    1  607.23 681.23
## - Purpose.Education                 1  607.66 681.66
## - CreditHistory.ThisBank.AllPaid    1  608.29 682.29
## - CreditHistory.PaidDuly            1  608.39 682.39
## - InstallmentRatePercentage         1  610.02 684.02
## - Amount                           1  610.06 684.06
## - Personal.Male.Single              1  612.14 686.14
## - CheckingAccountStatus.0.to.200    1  621.49 695.49
## - CheckingAccountStatus.lt.0        1  640.13 714.13
##
## Step:  AIC=673.68
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
## Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
## Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
## SavingsAccountBonds.500.to.1000 + SavingsAccountBonds.gt.1000 +
## EmploymentDuration.4.to.7 + Personal.Male.Single +
OtherDebtorsGuarantors.None +
## OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
## Property.CarOther + OtherInstallmentPlans.Bank + Housing.Rent +
## Housing.Own + Job.UnemployedUnskilled + Job.UnskilledResident

```

```

##
##
##      Df Deviance      AIC
## - Job.UnskilledResident      1    600.35 672.35
## - SavingsAccountBonds.gt.1000      1    600.44 672.44
## - Purpose.UsedCar      1    600.47 672.47
## - Housing.Rent      1    600.63 672.63
## - Property.RealEstate      1    601.02 673.02
## - ResidenceDuration      1    601.02 673.02
## - Purpose.DomesticAppliance      1    601.03 673.03
## - Housing.Own      1    601.31 673.31
## - SavingsAccountBonds.500.to.1000      1    601.36 673.36
## - Telephone      1    601.43 673.43
## - Property.CarOther      1    601.48 673.48
## - CreditHistory.Delay      1    601.57 673.57
## <none>      599.68 673.68
## - Job.UnemployedUnskilled      1    602.79 674.79
## - EmploymentDuration.4.to.7      1    603.01 675.01
## - Purpose.Radio.Television      1    603.08 675.08
## - OtherDebtorsGuarantors.CoApplicant      1    603.08 675.08
## - SavingsAccountBonds.100.to.500      1    603.51 675.51
## - CreditHistory.NoCredit.AllPaid      1    603.91 675.91
## - Purpose.Business      1    603.94 675.94
## - Purpose.Furniture.Equipment      1    603.99 675.99
## - Duration      1    604.25 676.25
## - CheckingAccountStatus.gt.200      1    604.44 676.44
## - OtherDebtorsGuarantors.None      1    605.06 677.06
## - ForeignWorker      1    605.38 677.38
## - OtherInstallmentPlans.Bank      1    605.54 677.54
## - SavingsAccountBonds.lt.100      1    606.62 678.62
## - Purpose.Repairs      1    607.03 679.03
## - Purpose.NewCar      1    607.92 679.92
## - Purpose.Education      1    608.48 680.48
## - CreditHistory.PaidDuly      1    609.13 681.13
## - CreditHistory.ThisBank.AllPaid      1    610.14 682.14
## - Amount      1    610.61 682.61
## - InstallmentRatePercentage      1    610.61 682.61
## - Personal.Male.Single      1    612.58 684.58
## - CheckingAccountStatus.0.to.200      1    621.98 693.98
## - CheckingAccountStatus.lt.0      1    640.76 712.76
##
## Step:  AIC=672.35
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
##      CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
##      CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##      CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
##      Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
##      Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +

```

```

##      Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
##      SavingsAccountBonds.500.to.1000 + SavingsAccountBonds.gt.1000 +
##      EmploymentDuration.4.to.7 + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + Property.RealEstate +
##      Property.CarOther + OtherInstallmentPlans.Bank + Housing.Rent +
##      Housing.Own + Job.UnemployedUnskilled
##
##                                     Df Deviance      AIC
## - SavingsAccountBonds.gt.1000      1    601.01 671.01
## - Purpose.UsedCar                    1    601.22 671.22
## - Housing.Rent                       1    601.24 671.24
## - Telephone                          1    601.76 671.76
## - Purpose.DomesticAppliance          1    601.78 671.78
## - Property.RealEstate                1    601.83 671.83
## - ResidenceDuration                  1    601.88 671.88
## - SavingsAccountBonds.500.to.1000   1    601.98 671.98
## - Property.CarOther                  1    602.06 672.06
## - Housing.Own                       1    602.13 672.13
## - CreditHistory.Delay                 1    602.26 672.26
## <none>                               1    600.35 672.35
## - Job.UnemployedUnskilled            1    603.22 673.22
## - EmploymentDuration.4.to.7          1    603.61 673.61
## - Purpose.Radio.Television            1    603.90 673.90
## - OtherDebtorsGuarantors.CoApplicant 1    603.94 673.94
## - SavingsAccountBonds.100.to.500     1    603.97 673.97
## - Purpose.Business                   1    604.71 674.71
## - Purpose.Furniture.Equipment         1    604.87 674.87
## - CreditHistory.NoCredit.AllPaid      1    604.90 674.90
## - CheckingAccountStatus.gt.200        1    605.06 675.06
## - Duration                           1    605.30 675.30
## - OtherDebtorsGuarantors.None         1    605.84 675.84
## - OtherInstallmentPlans.Bank          1    605.98 675.98
## - ForeignWorker                       1    606.50 676.50
## - SavingsAccountBonds.lt.100          1    607.25 677.25
## - Purpose.Repairs                     1    607.68 677.68
## - Purpose.NewCar                      1    608.85 678.85
## - Purpose.Education                   1    609.36 679.36
## - CreditHistory.PaidDuly               1    609.72 679.72
## - CreditHistory.ThisBank.AllPaid      1    610.68 680.68
## - Amount                              1    611.28 681.28
## - InstallmentRatePercentage           1    611.37 681.37
## - Personal.Male.Single                 1    613.26 683.26
## - CheckingAccountStatus.0.to.200      1    622.52 692.52
## - CheckingAccountStatus.lt.0          1    641.18 711.18
##
## Step:  AIC=671.01
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+

```

```

## Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.UsedCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
## Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
## Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
## SavingsAccountBonds.500.to.1000 + EmploymentDuration.4.to.7 +
## Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
## Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
## Housing.Rent + Housing.Own + Job.UnemployedUnskilled
##
##
## Df Deviance AIC
## - Purpose.UsedCar 1 601.85 669.85
## - Housing.Rent 1 601.92 669.92
## - Telephone 1 602.38 670.38
## - ResidenceDuration 1 602.46 670.46
## - Purpose.DomesticAppliance 1 602.49 670.49
## - Property.RealEstate 1 602.58 670.58
## - Property.CarOther 1 602.75 670.75
## - Housing.Own 1 602.78 670.78
## - CreditHistory.Delay 1 602.90 670.90
## <none> 601.01 671.01
## - SavingsAccountBonds.500.to.1000 1 603.17 671.17
## - Job.UnemployedUnskilled 1 603.69 671.69
## - EmploymentDuration.4.to.7 1 604.14 672.14
## - Purpose.Radio.Television 1 604.54 672.54
## - OtherDebtorsGuarantors.CoApplicant 1 604.58 672.58
## - Purpose.Business 1 605.29 673.29
## - Purpose.Furniture.Equipment 1 605.46 673.46
## - CheckingAccountStatus.gt.200 1 605.57 673.57
## - CreditHistory.NoCredit.AllPaid 1 605.64 673.64
## - SavingsAccountBonds.100.to.500 1 605.95 673.95
## - Duration 1 606.16 674.16
## - OtherDebtorsGuarantors.None 1 606.43 674.43
## - OtherInstallmentPlans.Bank 1 606.66 674.66
## - ForeignWorker 1 607.12 675.12
## - Purpose.Repairs 1 608.10 676.10
## - Purpose.NewCar 1 609.45 677.45
## - Purpose.Education 1 609.97 677.97
## - CreditHistory.PaidDuly 1 610.61 678.61
## - CreditHistory.ThisBank.AllPaid 1 611.05 679.05
## - SavingsAccountBonds.lt.100 1 611.31 679.31
## - InstallmentRatePercentage 1 611.83 679.83
## - Amount 1 612.07 680.07
## - Personal.Male.Single 1 613.77 681.77
## - CheckingAccountStatus.0.to.200 1 622.73 690.73

```

```

## - CheckingAccountStatus.lt.0          1    641.48 709.48
##
## Step:  AIC=669.85
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##   Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
##   CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
##   CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
##   CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
##   Purpose.Furniture.Equipment + Purpose.Radio.Television +
##   Purpose.DomesticAppliance + Purpose.Repairs + Purpose.Education +
##   Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
##   SavingsAccountBonds.500.to.1000 + EmploymentDuration.4.to.7 +
##   Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
##   Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
##   Housing.Rent + Housing.Own + Job.UnemployedUnskilled
##
##                                     Df Deviance    AIC
## - Purpose.DomesticAppliance          1    602.55 668.55
## - Housing.Rent                        1    602.70 668.70
## - Telephone                           1    603.12 669.12
## - ResidenceDuration                   1    603.26 669.26
## - Property.RealEstate                  1    603.41 669.41
## - Property.CarOther                    1    603.56 669.56
## - CreditHistory.Delay                   1    603.65 669.65
## - Housing.Own                          1    603.84 669.84
## <none>                                601.85 669.85
## - SavingsAccountBonds.500.to.1000     1    603.87 669.87
## - Job.UnemployedUnskilled              1    604.70 670.70
## - EmploymentDuration.4.to.7            1    605.06 671.06
## - OtherDebtorsGuarantors.CoApplicant   1    605.24 671.24
## - CreditHistory.NoCredit.AllPaid       1    606.25 672.25
## - CheckingAccountStatus.gt.200         1    606.35 672.35
## - SavingsAccountBonds.100.to.500       1    606.76 672.76
## - Purpose.Radio.Television              1    606.78 672.78
## - OtherInstallmentPlans.Bank            1    607.22 673.22
## - Duration                             1    607.24 673.24
## - OtherDebtorsGuarantors.None           1    607.39 673.39
## - Purpose.Business                     1    607.74 673.74
## - ForeignWorker                         1    608.46 674.46
## - Purpose.Furniture.Equipment           1    609.09 675.09
## - Purpose.Repairs                       1    609.93 675.93
## - CreditHistory.PaidDuly                 1    611.30 677.30
## - CreditHistory.ThisBank.AllPaid        1    611.51 677.51
## - SavingsAccountBonds.lt.100           1    611.89 677.89
## - InstallmentRatePercentage             1    612.25 678.25
## - Amount                               1    612.49 678.49
## - Personal.Male.Single                  1    614.07 680.07

```

```

## - Purpose.Education          1    616.43 682.43
## - Purpose.NewCar              1    621.71 687.71
## - CheckingAccountStatus.0.to.200 1    623.43 689.43
## - CheckingAccountStatus.lt.0   1    641.93 707.93
##
## Step:  AIC=668.55
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.Furniture.Equipment + Purpose.Radio.Television +
## Purpose.Repairs + Purpose.Education + Purpose.Business +
## SavingsAccountBonds.lt.100 + SavingsAccountBonds.100.to.500 +
## SavingsAccountBonds.500.to.1000 + EmploymentDuration.4.to.7 +
## Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
## Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
## Housing.Rent + Housing.Own + Job.UnemployedUnskilled
##
##
## Df Deviance    AIC
## - Housing.Rent          1    603.47 667.47
## - Telephone              1    603.86 667.86
## - ResidenceDuration      1    604.03 668.03
## - Property.RealEstate    1    604.07 668.07
## - Housing.Own            1    604.34 668.34
## - Property.CarOther      1    604.39 668.39
## - CreditHistory.Delay    1    604.45 668.45
## <none>                   602.55 668.55
## - SavingsAccountBonds.500.to.1000 1    604.56 668.56
## - Job.UnemployedUnskilled 1    605.06 669.06
## - EmploymentDuration.4.to.7 1    605.74 669.74
## - OtherDebtorsGuarantors.CoApplicant 1    605.96 669.96
## - Purpose.Radio.Television 1    606.81 670.81
## - CreditHistory.NoCredit.AllPaid 1    607.00 671.00
## - CheckingAccountStatus.gt.200 1    607.02 671.02
## - SavingsAccountBonds.100.to.500 1    607.62 671.62
## - Purpose.Business       1    607.80 671.80
## - OtherInstallmentPlans.Bank 1    607.89 671.89
## - Duration               1    607.96 671.96
## - OtherDebtorsGuarantors.None 1    608.21 672.21
## - Purpose.Furniture.Equipment 1    609.09 673.09
## - ForeignWorker          1    609.24 673.24
## - Purpose.Repairs        1    610.05 674.05
## - CreditHistory.PaidDuly  1    612.29 676.29
## - CreditHistory.ThisBank.AllPaid 1    612.36 676.36
## - SavingsAccountBonds.lt.100 1    612.52 676.52
## - Amount                 1    612.84 676.84
## - InstallmentRatePercentage 1    613.21 677.21

```

```

## - Personal.Male.Single          1    615.19  679.19
## - Purpose.Education             1    616.44  680.44
## - Purpose.NewCar                 1    621.95  685.95
## - CheckingAccountStatus.0.to.200 1    624.08  688.08
## - CheckingAccountStatus.lt.0     1    643.06  707.06
##
## Step: AIC=667.47
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.Furniture.Equipment + Purpose.Radio.Television +
## Purpose.Repairs + Purpose.Education + Purpose.Business +
## SavingsAccountBonds.lt.100 + SavingsAccountBonds.100.to.500 +
## SavingsAccountBonds.500.to.1000 + EmploymentDuration.4.to.7 +
## Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
## Property.RealEstate + Property.CarOther + OtherInstallmentPlans.Bank +
## Housing.Own + Job.UnemployedUnskilled
##
##
## Df Deviance AIC
## - Property.RealEstate          1    604.46  666.46
## - Property.CarOther            1    604.68  666.68
## - Telephone                    1    604.85  666.85
## - ResidenceDuration            1    605.14  667.14
## - CreditHistory.Delay          1    605.32  667.32
## - SavingsAccountBonds.500.to.1000 1    605.46  667.46
## <none>                        603.47  667.47
## - Job.UnemployedUnskilled      1    605.98  667.98
## - EmploymentDuration.4.to.7    1    606.37  668.37
## - OtherDebtorsGuarantors.CoApplicant 1    606.83  668.83
## - CheckingAccountStatus.gt.200 1    607.69  669.69
## - CreditHistory.NoCredit.AllPaid 1    608.00  670.00
## - Purpose.Radio.Television     1    608.08  670.08
## - Duration                     1    608.50  670.50
## - SavingsAccountBonds.100.to.500 1    608.53  670.53
## - OtherInstallmentPlans.Bank   1    608.58  670.58
## - OtherDebtorsGuarantors.None  1    608.84  670.84
## - Purpose.Business             1    609.16  671.16
## - ForeignWorker                1    609.73  671.73
## - Purpose.Furniture.Equipment  1    610.79  672.79
## - Purpose.Repairs              1    611.07  673.07
## - CreditHistory.ThisBank.AllPaid 1    613.06  675.06
## - SavingsAccountBonds.lt.100   1    613.21  675.21
## - CreditHistory.PaidDuly       1    613.22  675.22
## - Amount                      1    613.58  675.58
## - Housing.Own                  1    613.68  675.68
## - InstallmentRatePercentage    1    613.82  675.82

```

```

## - Personal.Male.Single          1   617.60 679.60
## - Purpose.Education             1   617.63 679.63
## - Purpose.NewCar                1   623.36 685.36
## - CheckingAccountStatus.0.to.200 1   624.83 686.83
## - CheckingAccountStatus.lt.0     1   644.40 706.40
##
## Step: AIC=666.46
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.Furniture.Equipment + Purpose.Radio.Television +
## Purpose.Repairs + Purpose.Education + Purpose.Business +
## SavingsAccountBonds.lt.100 + SavingsAccountBonds.100.to.500 +
## SavingsAccountBonds.500.to.1000 + EmploymentDuration.4.to.7 +
## Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
## Property.CarOther + OtherInstallmentPlans.Bank + Housing.Own +
## Job.UnemployedUnskilled
##
##
## Df Deviance AIC
## - Property.CarOther          1   604.98 664.98
## - Telephone                  1   605.57 665.57
## - ResidenceDuration          1   605.99 665.99
## - CreditHistory.Delay        1   606.32 666.32
## <none>                        1   604.46 666.46
## - SavingsAccountBonds.500.to.1000 1   606.54 666.54
## - Job.UnemployedUnskilled    1   606.90 666.90
## - EmploymentDuration.4.to.7  1   607.37 667.37
## - OtherDebtorsGuarantors.CoApplicant 1   607.90 667.90
## - Purpose.Radio.Television   1   608.61 668.61
## - CheckingAccountStatus.gt.200 1   608.89 668.89
## - CreditHistory.NoCredit.AllPaid 1   609.23 669.23
## - OtherInstallmentPlans.Bank 1   609.73 669.73
## - Purpose.Business           1   609.79 669.79
## - Duration                   1   609.98 669.98
## - OtherDebtorsGuarantors.None 1   609.98 669.98
## - SavingsAccountBonds.100.to.500 1   610.15 670.15
## - ForeignWorker              1   610.66 670.66
## - Purpose.Furniture.Equipment 1   611.78 671.78
## - Purpose.Repairs            1   612.00 672.00
## - CreditHistory.ThisBank.AllPaid 1   614.02 674.02
## - SavingsAccountBonds.lt.100  1   614.19 674.19
## - CreditHistory.PaidDuly      1   614.24 674.24
## - InstallmentRatePercentage  1   614.94 674.94
## - Amount                     1   615.00 675.00
## - Housing.Own                1   615.43 675.43
## - Personal.Male.Single       1   617.93 677.93

```



```

## - Purpose.Education          1  619.44 679.44
## - Purpose.NewCar             1  623.88 683.88
## - CheckingAccountStatus.0.to.200 1  626.62 686.62
## - CheckingAccountStatus.lt.0  1  646.98 706.98
##
## Step:  AIC=664.98
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
## Telephone + ForeignWorker + CheckingAccountStatus.lt.0 +
## CheckingAccountStatus.0.to.200 + CheckingAccountStatus.gt.200 +
## CreditHistory.NoCredit.AllPaid + CreditHistory.ThisBank.AllPaid +
## CreditHistory.PaidDuly + CreditHistory.Delay + Purpose.NewCar +
## Purpose.Furniture.Equipment + Purpose.Radio.Television +
## Purpose.Repairs + Purpose.Education + Purpose.Business +
## SavingsAccountBonds.lt.100 + SavingsAccountBonds.100.to.500 +
## SavingsAccountBonds.500.to.1000 + EmploymentDuration.4.to.7 +
## Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
## OtherInstallmentPlans.Bank + Housing.Own + Job.UnemployedUnskilled
##
## Df Deviance AIC
## - Telephone          1  606.08 664.08
## - ResidenceDuration  1  606.52 664.52
## - CreditHistory.Delay 1  606.89 664.89
## - SavingsAccountBonds.500.to.1000 1  606.95 664.95
## <none>                604.98 664.98
## - Job.UnemployedUnskilled 1  607.38 665.38
## - EmploymentDuration.4.to.7 1  607.93 665.93
## - OtherDebtorsGuarantors.CoApplicant 1  608.21 666.21
## - Purpose.Radio.Television 1  608.88 666.88
## - CheckingAccountStatus.gt.200 1  609.41 667.41
## - CreditHistory.NoCredit.AllPaid 1  609.58 667.58
## - OtherInstallmentPlans.Bank 1  610.03 668.03
## - OtherDebtorsGuarantors.None 1  610.11 668.11
## - Purpose.Business 1  610.23 668.23
## - Duration 1  610.34 668.34
## - SavingsAccountBonds.100.to.500 1  610.47 668.47
## - ForeignWorker 1  610.87 668.87
## - Purpose.Furniture.Equipment 1  612.11 670.11
## - Purpose.Repairs 1  612.31 670.31
## - CreditHistory.ThisBank.AllPaid 1  614.44 672.44
## - CreditHistory.PaidDuly 1  614.51 672.51
## - SavingsAccountBonds.lt.100 1  614.56 672.56
## - Amount 1  615.26 673.26
## - InstallmentRatePercentage 1  615.52 673.52
## - Housing.Own 1  617.13 675.13
## - Personal.Male.Single 1  618.04 676.04
## - Purpose.Education 1  619.79 677.79
## - Purpose.NewCar 1  624.07 682.07
## - CheckingAccountStatus.0.to.200 1  627.17 685.17

```

```

## - CheckingAccountStatus.lt.0          1    647.81 705.81
##
## Step:  AIC=664.08
## Class ~ Duration + Amount + InstallmentRatePercentage + ResidenceDuration
+
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##      CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##      CreditHistory.Delay + Purpose.NewCar + Purpose.Furniture.Equipment +
##      Purpose.Radio.Television + Purpose.Repairs + Purpose.Education +
##      Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
##      SavingsAccountBonds.500.to.1000 + EmploymentDuration.4.to.7 +
##      Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
##      OtherInstallmentPlans.Bank + Housing.Own + Job.UnemployedUnskilled
##
##              Df Deviance    AIC
## - ResidenceDuration          1    607.92 663.92
## - CreditHistory.Delay        1    607.99 663.99
## - SavingsAccountBonds.500.to.1000 1    608.02 664.02
## <none>                        1    606.08 664.08
## - Job.UnemployedUnskilled     1    608.42 664.42
## - EmploymentDuration.4.to.7  1    609.09 665.09
## - OtherDebtorsGuarantors.CoApplicant 1    609.30 665.30
## - Purpose.Radio.Television    1    610.34 666.34
## - CheckingAccountStatus.gt.200 1    610.64 666.64
## - CreditHistory.NoCredit.AllPaid 1    610.94 666.94
## - OtherDebtorsGuarantors.None  1    611.11 667.11
## - OtherInstallmentPlans.Bank   1    611.15 667.15
## - Purpose.Business            1    611.26 667.26
## - Duration                    1    611.76 667.76
## - ForeignWorker               1    611.82 667.82
## - SavingsAccountBonds.100.to.500 1    611.82 667.82
## - Purpose.Furniture.Equipment  1    613.84 669.84
## - Purpose.Repairs             1    613.97 669.97
## - Amount                     1    615.37 671.37
## - CreditHistory.PaidDuly      1    615.62 671.62
## - SavingsAccountBonds.lt.100  1    615.66 671.66
## - CreditHistory.ThisBank.AllPaid 1    615.69 671.69
## - InstallmentRatePercentage   1    616.04 672.04
## - Housing.Own                 1    618.64 674.64
## - Personal.Male.Single        1    619.33 675.33
## - Purpose.Education           1    620.86 676.86
## - Purpose.NewCar              1    626.16 682.16
## - CheckingAccountStatus.0.to.200 1    628.32 684.32
## - CheckingAccountStatus.lt.0   1    649.81 705.81
##
## Step:  AIC=663.92

```

```

## Class ~ Duration + Amount + InstallmentRatePercentage + ForeignWorker +
##   CheckingAccountStatus.lt.0 + CheckingAccountStatus.0.to.200 +
##   CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##   CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##   CreditHistory.Delay + Purpose.NewCar + Purpose.Furniture.Equipment +
##   Purpose.Radio.Television + Purpose.Repairs + Purpose.Education +
##   Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
##   SavingsAccountBonds.500.to.1000 + EmploymentDuration.4.to.7 +
##   Personal.Male.Single + OtherDebtorsGuarantors.None +
OtherDebtorsGuarantors.CoApplicant +
##   OtherInstallmentPlans.Bank + Housing.Own + Job.UnemployedUnskilled
##
##                                     Df Deviance   AIC
## - SavingsAccountBonds.500.to.1000      1   609.83 663.83
## <none>                                     607.92 663.92
## - CreditHistory.Delay                    1   609.96 663.96
## - Job.UnemployedUnskilled                1   610.22 664.22
## - EmploymentDuration.4.to.7             1   611.15 665.15
## - OtherDebtorsGuarantors.CoApplicant     1   611.24 665.24
## - Purpose.Radio.Television               1   612.38 666.38
## - CheckingAccountStatus.gt.200           1   612.90 666.90
## - CreditHistory.NoCredit.AllPaid         1   612.95 666.95
## - OtherDebtorsGuarantors.None            1   613.15 667.15
## - ForeignWorker                         1   613.18 667.18
## - OtherInstallmentPlans.Bank             1   613.19 667.19
## - Purpose.Business                      1   613.50 667.50
## - Duration                             1   613.63 667.63
## - SavingsAccountBonds.100.to.500        1   613.81 667.81
## - Purpose.Repairs                       1   615.69 669.69
## - Purpose.Furniture.Equipment            1   616.09 670.09
## - Amount                               1   616.90 670.90
## - InstallmentRatePercentage              1   617.31 671.31
## - CreditHistory.ThisBank.AllPaid         1   618.31 672.31
## - SavingsAccountBonds.lt.100            1   618.37 672.37
## - Housing.Own                           1   618.71 672.71
## - CreditHistory.PaidDuly                 1   618.73 672.73
## - Personal.Male.Single                   1   621.08 675.08
## - Purpose.Education                     1   622.52 676.52
## - Purpose.NewCar                         1   628.31 682.31
## - CheckingAccountStatus.0.to.200        1   630.76 684.76
## - CheckingAccountStatus.lt.0            1   650.43 704.43
##
## Step:  AIC=663.83
## Class ~ Duration + Amount + InstallmentRatePercentage + ForeignWorker +
##   CheckingAccountStatus.lt.0 + CheckingAccountStatus.0.to.200 +
##   CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##   CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##   CreditHistory.Delay + Purpose.NewCar + Purpose.Furniture.Equipment +
##   Purpose.Radio.Television + Purpose.Repairs + Purpose.Education +

```

```

##      Purpose.Business + SavingsAccountBonds.lt.100 +
SavingsAccountBonds.100.to.500 +
##      EmploymentDuration.4.to.7 + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + OtherInstallmentPlans.Bank +
##      Housing.Own + Job.UnemployedUnskilled
##
##              Df Deviance    AIC
## - CreditHistory.Delay          1   611.68 663.68
## <none>                          609.83 663.83
## - Job.UnemployedUnskilled      1   612.01 664.01
## - EmploymentDuration.4.to.7    1   613.11 665.11
## - OtherDebtorsGuarantors.CoApplicant 1   613.17 665.17
## - SavingsAccountBonds.100.to.500 1   614.43 666.43
## - CheckingAccountStatus.gt.200  1   614.46 666.46
## - Purpose.Radio.Television      1   614.57 666.57
## - CreditHistory.NoCredit.AllPaid 1   614.86 666.86
## - OtherInstallmentPlans.Bank    1   614.93 666.93
## - ForeignWorker                 1   615.17 667.17
## - OtherDebtorsGuarantors.None   1   615.23 667.23
## - Purpose.Business              1   615.49 667.49
## - Duration                      1   615.57 667.57
## - Purpose.Repairs               1   617.57 669.57
## - Amount                       1   618.21 670.21
## - Purpose.Furniture.Equipment   1   618.25 670.25
## - SavingsAccountBonds.lt.100    1   618.42 670.42
## - InstallmentRatePercentage     1   618.53 670.53
## - CreditHistory.ThisBank.AllPaid 1   620.36 672.36
## - CreditHistory.PaidDuly        1   620.46 672.46
## - Housing.Own                  1   620.65 672.65
## - Personal.Male.Single          1   622.41 674.41
## - Purpose.Education             1   624.11 676.11
## - Purpose.NewCar                1   630.26 682.26
## - CheckingAccountStatus.0.to.200 1   631.52 683.52
## - CheckingAccountStatus.lt.0    1   650.94 702.94
##
## Step:  AIC=663.68
## Class ~ Duration + Amount + InstallmentRatePercentage + ForeignWorker +
##      CheckingAccountStatus.lt.0 + CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##      CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##      Purpose.NewCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
##      Purpose.Repairs + Purpose.Education + Purpose.Business +
##      SavingsAccountBonds.lt.100 + SavingsAccountBonds.100.to.500 +
##      EmploymentDuration.4.to.7 + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + OtherInstallmentPlans.Bank +
##      Housing.Own + Job.UnemployedUnskilled
##

```

```

##                                Df Deviance    AIC
## <none>                                611.68 663.68
## - Job.UnemployedUnskilled            1   614.25 664.25
## - EmploymentDuration.4.to.7          1   615.09 665.09
## - OtherDebtorsGuarantors.CoApplicant  1   615.13 665.13
## - CreditHistory.NoCredit.AllPaid     1   615.53 665.53
## - CheckingAccountStatus.gt.200       1   616.22 666.22
## - SavingsAccountBonds.100.to.500     1   616.32 666.32
## - OtherInstallmentPlans.Bank         1   616.62 666.62
## - Purpose.Radio.Television           1   616.84 666.84
## - ForeignWorker                      1   617.29 667.29
## - OtherDebtorsGuarantors.None        1   617.44 667.44
## - Duration                          1   617.88 667.88
## - Purpose.Business                   1   618.47 668.47
## - Purpose.Repairs                    1   620.00 670.00
## - InstallmentRatePercentage          1   620.13 670.13
## - Amount                            1   620.16 670.16
## - Purpose.Furniture.Equipment        1   620.23 670.23
## - SavingsAccountBonds.lt.100         1   620.40 670.40
## - CreditHistory.PaidDuly             1   620.47 670.47
## - CreditHistory.ThisBank.AllPaid     1   620.86 670.86
## - Housing.Own                       1   622.60 672.60
## - Personal.Male.Single               1   623.74 673.74
## - Purpose.Education                  1   626.35 676.35
## - Purpose.NewCar                     1   632.80 682.80
## - CheckingAccountStatus.0.to.200     1   633.94 683.94
## - CheckingAccountStatus.lt.0         1   652.48 702.48

##
## Call:  glm(formula = Class ~ Duration + Amount + InstallmentRatePercentage
+
##      ForeignWorker + CheckingAccountStatus.lt.0 +
CheckingAccountStatus.0.to.200 +
##      CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
##      CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
##      Purpose.NewCar + Purpose.Furniture.Equipment +
Purpose.Radio.Television +
##      Purpose.Repairs + Purpose.Education + Purpose.Business +
##      SavingsAccountBonds.lt.100 + SavingsAccountBonds.100.to.500 +
##      EmploymentDuration.4.to.7 + Personal.Male.Single +
OtherDebtorsGuarantors.None +
##      OtherDebtorsGuarantors.CoApplicant + OtherInstallmentPlans.Bank +
##      Housing.Own + Job.UnemployedUnskilled, family = binomial(link =
logit),
##      data = Train)
##
## Coefficients:
##                (Intercept)                Duration
##                8.162168                -0.027860
##                Amount                InstallmentRatePercentage

```

```
##           -0.000144           -0.296641
##           ForeignWorker       CheckingAccountStatus.lt.0
##           -1.731035           -1.718554
##       CheckingAccountStatus.0.to.200       CheckingAccountStatus.gt.200
##           -1.278607           -0.932652
##       CreditHistory.NoCredit.AllPaid       CreditHistory.ThisBank.AllPaid
##           -0.963063           -1.432407
##           CreditHistory.PaidDuly           Purpose.NewCar
##           -0.686729           -1.721528
##       Purpose.Furniture.Equipment           Purpose.Radio.Television
##           -1.165858           -0.903148
##           Purpose.Repairs           Purpose.Education
##           -2.029390           -2.018330
##       Purpose.Business           SavingsAccountBonds.lt.100
##           -1.182805           -0.742691
##       SavingsAccountBonds.100.to.500       EmploymentDuration.4.to.7
##           -0.808995           0.519611
##           Personal.Male.Single       OtherDebtorsGuarantors.None
##           0.740369           -1.233359
## OtherDebtorsGuarantors.CoApplicant       OtherInstallmentPlans.Bank
##           -1.302686           -0.633005
##           Housing.Own           Job.UnemployedUnskilled
##           0.725896           1.250179
##
## Degrees of Freedom: 699 Total (i.e. Null); 674 Residual
## Null Deviance:      830.1
## Residual Deviance: 611.7      AIC: 663.7
```

Among all the variables, the lowest AIC generated is 663.68.

```
lr.train.optimal <- glm(formula = Class ~ Duration + Amount +
  InstallmentRatePercentage + ForeignWorker +
    CheckingAccountStatus.lt.0 + CheckingAccountStatus.0.to.200 +
    CheckingAccountStatus.gt.200 + CreditHistory.NoCredit.AllPaid +
    CreditHistory.ThisBank.AllPaid + CreditHistory.PaidDuly +
    Purpose.NewCar + Purpose.Furniture.Equipment + Purpose.Radio.Television +
    Purpose.Repairs + Purpose.Education + Purpose.Business +
    SavingsAccountBonds.lt.100 + SavingsAccountBonds.100.to.500 +
    EmploymentDuration.4.to.7 + Personal.Male.Single +
    OtherDebtorsGuarantors.None +
    OtherDebtorsGuarantors.CoApplicant + OtherInstallmentPlans.Bank +
    Housing.Own + Job.UnemployedUnskilled, family = binomial(link = logit),
    data = Train)

#summary(lr.train.optimal)
lr.train.optimal.aic <- lr.train.optimal$aic
lr.train.optimal.aic

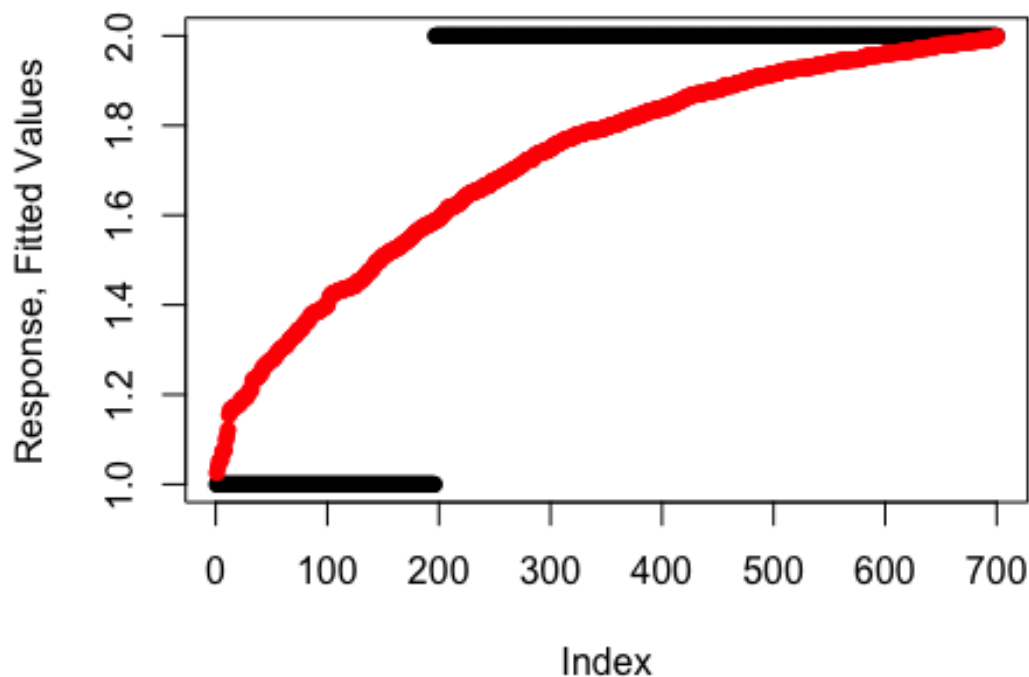
## [1] 663.6812

lr.pred.best <- lr.train.optimal$fitted.values
```

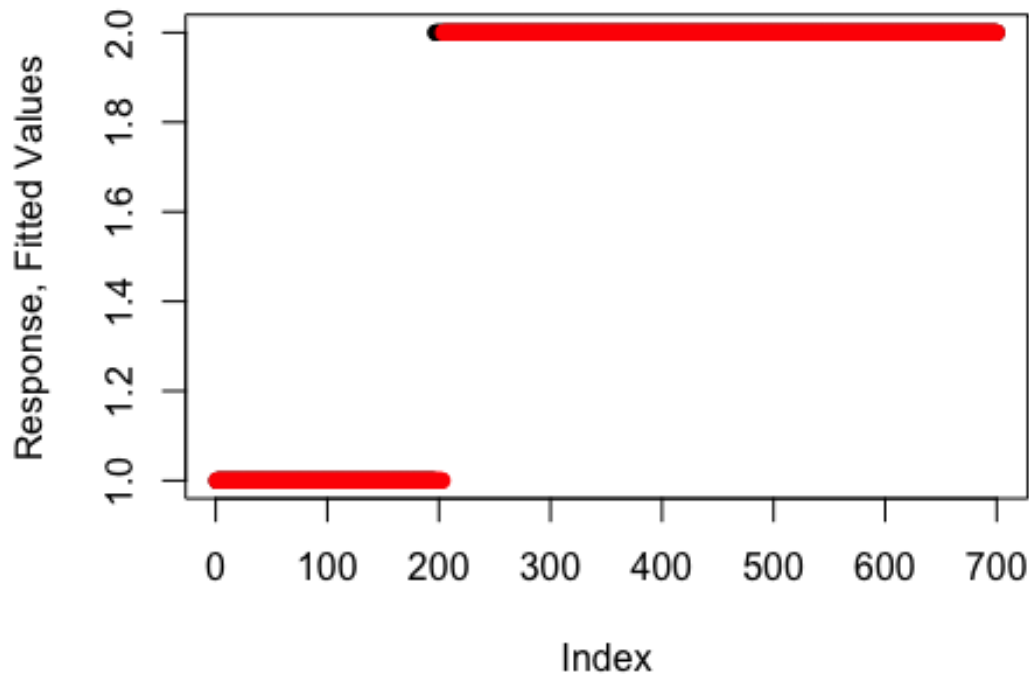
Interpretation: We can see that the optimal model we found has the lowest AIC = 663.68.

4. Generate the confusion matrix (counts and proportions of actual “Bad” and actual “Good” versus predicted “Bad” and predicted “Good”) using the lowest AIC model. Do you like the model? Why or why not.

```
par(mfrow=c(1,1))
matplot(1:length(Train$Class), cbind(sort(Train$Class), sort(lr.pred.best +
1)), pch=16, xlab="Index", ylab="Response, Fitted Values")
```



```
lr.pred.best[lr.pred.best >= 0.6] = 1
lr.pred.best[lr.pred.best < 0.6] = 0
matplot(1:length(Train$Class), cbind(sort(Train$Class), sort(lr.pred.best +
1)), pch=16, xlab="Index", ylab="Response, Fitted Values")
```



```
cm <- matrix(nrow = 2, ncol = 2)
colnames.cm <- c("Actual.Good", "Actual.Bad")
rownames.cm <- c("Pred.Good", "Pred.Bad")
true.predict <- cbind(true = as.integer(Train$Class) - 1, lr.pred.best)
cm[1,1] <- sum(true.predict[, 1] == 1 & true.predict[, 2] == 1)
cm[2,2] <- sum(true.predict[, 1] == 0 & true.predict[, 2] == 0)
cm[2,1] <- sum(true.predict[, 1] == 1 & true.predict[, 2] == 0)
cm[1,2] <- sum(true.predict[, 1] == 0 & true.predict[, 2] == 1)
```

```
cm
##      [,1] [,2]
## [1,] 422   75
## [2,]  82  121
```

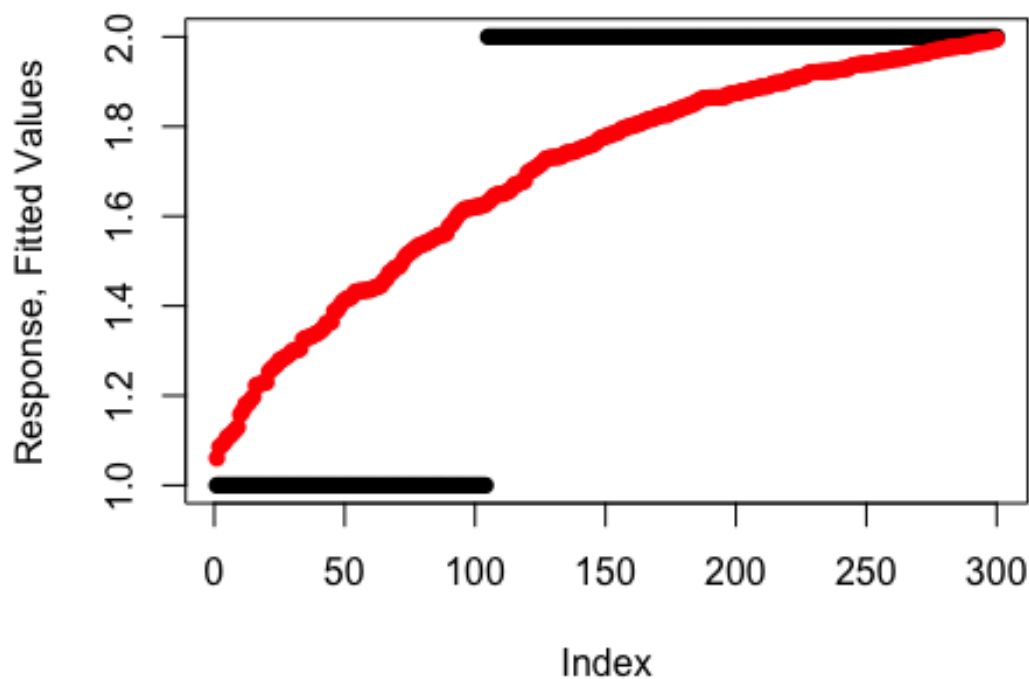
Interpretation: After trying several thresholds for classification, I found as threshold value increases, number of false positive (True.Bad.Pred.Good) decreases while number of false negative (True.Good.Pred.Bad) increases. After evaluating trade-offs, I determined threshold value as 0.6 for classification. This model correctly classify $(422+121)/700=78\%$ of observations, this result is acceptable.

5. Perform Holdout validation testing.

- Generate the Confusion matrix in the holdout sample. Do you like the results? Why or why not?
- Generate the Lift Charts and AUROC Curves.

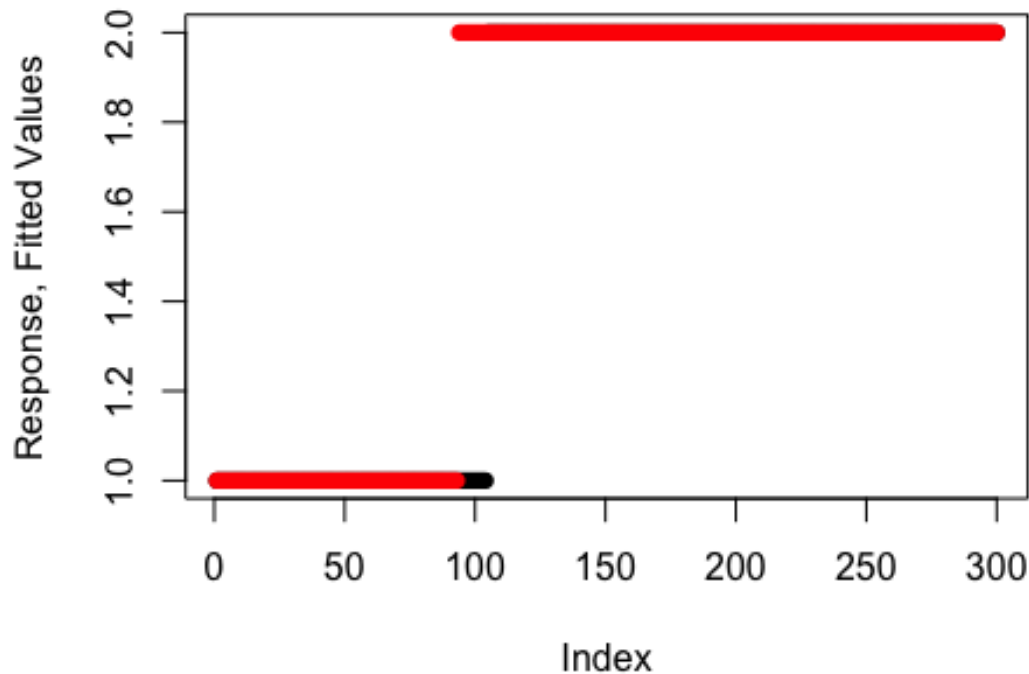
```
lr.holdout.best <- predict(lr.train.optimal, newdata = Holdout, type =
"response")
```

```
par(mfrow=c(1,1))
matplot(1:length(Holdout$Class), cbind(sort(Holdout$Class),
sort(lr.holdout.best + 1)), pch=16, xlab="Index", ylab="Response, Fitted
Values")
```



```
lr.holdout.best[lr.holdout.best >= 0.6] = 1
lr.holdout.best[lr.holdout.best < 0.6] = 0
```

```
matplot(1:length(Holdout$Class), cbind(sort(Holdout$Class),
sort(lr.holdout.best + 1)), pch=16, xlab="Index", ylab="Response, Fitted
Values")
```



```
cm.holdout <- matrix(nrow = 2, ncol = 2)
colnames(cm.holdout) <- c("True.Good", "True.Bad")
rownames(cm.holdout) <- c("Pred.Good", "Pred.Bad")

true.predict.h <- cbind(true = as.integer(Holdout$Class) - 1,
lr.holdout.best)

cm.holdout[1,1] <- sum(true.predict.h[, 1] == 1 & true.predict.h[, 2] == 1)
cm.holdout[2,2] <- sum(true.predict.h[, 1] == 0 & true.predict.h[, 2] == 0)
cm.holdout[2,1] <- sum(true.predict.h[, 1] == 1 & true.predict.h[, 2] == 0)
cm.holdout[1,2] <- sum(true.predict.h[, 1] == 0 & true.predict.h[, 2] == 1)

cm.holdout

##           True.Good True.Bad
## Pred.Good       159       48
## Pred.Bad        37       56
```

Interpretation: In the holdout set, $(159+56)/300 = 72\%$ of observations are correctly classified. As compared to the confusion matrix of train model, I concluded that holdout yields very close prediction and the train model predicts holdout dataset pretty well.