Employee Attrition

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1/28/2021

This General Linear Model will predict the employees that will leave the company and the what causes the employees to leave. Our measure of a successful model is that the accuracy of th model is within the 70% range and to have enough information to develop an employee retention plan.

## Step 1:Import the data

library(readxl)  
library(caret)

## Loading required package: lattice

## Loading required package: ggplot2

library(MKmisc)  
library(pROC)

## Type 'citation("pROC")' for a citation.

##   
## Attaching package: 'pROC'

## The following objects are masked from 'package:stats':  
##   
## cov, smooth, var

library(Metrics)

##   
## Attaching package: 'Metrics'

## The following object is masked from 'package:pROC':  
##   
## auc

## The following objects are masked from 'package:caret':  
##   
## precision, recall

library(ggplot2)  
library(ROCR)  
library(InformationValue)

##   
## Attaching package: 'InformationValue'

## The following object is masked from 'package:Metrics':  
##   
## precision

## The following objects are masked from 'package:caret':  
##   
## confusionMatrix, precision, sensitivity, specificity

library(cvms)  
EmployeeData<-read\_excel("C:/Users/Hi/Desktop/Southern New Hampshire University/DAT 690 - Capstone Course/EmployeeData.xlsx")  
head(EmployeeData)

## # A tibble: 6 x 35  
## Attrition BusinessTravel DailyRate Department DistanceFromHome Education  
## <chr> <chr> <dbl> <chr> <dbl> <dbl>  
## 1 Yes Travel\_Rarely 1102 Sales 1 2  
## 2 No Travel\_Freque~ 279 Research ~ 8 1  
## 3 Yes Travel\_Rarely 1373 Research ~ 2 2  
## 4 No Travel\_Freque~ 1392 Research ~ 3 4  
## 5 No Travel\_Rarely 591 Research ~ 2 1  
## 6 No Travel\_Freque~ 1005 Research ~ 2 2  
## # ... with 29 more variables: EducationField <chr>, EmployeeCount <dbl>,  
## # EmployeeNumber <dbl>, EnvironmentSatisfaction <dbl>, Gender <chr>,  
## # HourlyRate <dbl>, JobInvolvement <dbl>, JobLevel <dbl>, JobRole <chr>,  
## # JobSatisfaction <dbl>, MaritalStatus <chr>, MonthlyIncome <dbl>,  
## # MonthlyRate <dbl>, NumCompaniesWorked <dbl>, Over18 <chr>, OverTime <chr>,  
## # PercentSalaryHike <dbl>, PerformanceRating <dbl>,  
## # RelationshipSatisfaction <dbl>, StandardHours <dbl>,  
## # StockOptionLevel <dbl>, TotalWorkingYears <dbl>,  
## # TrainingTimesLastYear <dbl>, WorkLifeBalance <dbl>, YearsAtCompany <dbl>,  
## # YearsInCurrentRole <dbl>, YearsSinceLastPromotion <dbl>,  
## # YearsWithCurrManager <dbl>, Age <dbl>

summary(EmployeeData)

## Attrition BusinessTravel DailyRate Department   
## Length:1270 Length:1270 Min. : 102.0 Length:1270   
## Class :character Class :character 1st Qu.: 458.2 Class :character   
## Mode :character Mode :character Median : 792.5 Mode :character   
## Mean : 797.1   
## 3rd Qu.:1153.0   
## Max. :1499.0   
## DistanceFromHome Education EducationField EmployeeCount  
## Min. : 1.000 Min. :1.000 Length:1270 Min. :1   
## 1st Qu.: 2.000 1st Qu.:2.000 Class :character 1st Qu.:1   
## Median : 7.000 Median :3.000 Mode :character Median :1   
## Mean : 9.135 Mean :2.925 Mean :1   
## 3rd Qu.:13.000 3rd Qu.:4.000 3rd Qu.:1   
## Max. :29.000 Max. :5.000 Max. :1   
## EmployeeNumber EnvironmentSatisfaction Gender HourlyRate   
## Min. : 1.0 Min. :1.000 Length:1270 Min. : 30.00   
## 1st Qu.: 707.5 1st Qu.:2.000 Class :character 1st Qu.: 48.00   
## Median :1163.5 Median :3.000 Mode :character Median : 66.00   
## Mean :1143.5 Mean :2.713 Mean : 65.87   
## 3rd Qu.:1622.8 3rd Qu.:4.000 3rd Qu.: 83.00   
## Max. :2068.0 Max. :4.000 Max. :100.00   
## JobInvolvement JobLevel JobRole JobSatisfaction  
## Min. :1.000 Min. :1.000 Length:1270 Min. :1.000   
## 1st Qu.:2.000 1st Qu.:1.000 Class :character 1st Qu.:2.000   
## Median :3.000 Median :2.000 Mode :character Median :3.000   
## Mean :2.728 Mean :2.061 Mean :2.714   
## 3rd Qu.:3.000 3rd Qu.:3.000 3rd Qu.:4.000   
## Max. :4.000 Max. :5.000 Max. :4.000   
## MaritalStatus MonthlyIncome MonthlyRate NumCompaniesWorked  
## Length:1270 Min. : 1009 Min. : 2094 Min. :0.000   
## Class :character 1st Qu.: 2936 1st Qu.: 8004 1st Qu.:1.000   
## Mode :character Median : 4946 Median :14220 Median :2.000   
## Mean : 6480 Mean :14264 Mean :2.691   
## 3rd Qu.: 8260 3rd Qu.:20428 3rd Qu.:4.000   
## Max. :19973 Max. :26999 Max. :9.000   
## Over18 OverTime PercentSalaryHike PerformanceRating  
## Length:1270 Length:1270 Min. :11.00 Min. :3.00   
## Class :character Class :character 1st Qu.:12.00 1st Qu.:3.00   
## Mode :character Mode :character Median :14.00 Median :3.00   
## Mean :15.15 Mean :3.15   
## 3rd Qu.:18.00 3rd Qu.:3.00   
## Max. :25.00 Max. :4.00   
## RelationshipSatisfaction StandardHours StockOptionLevel TotalWorkingYears  
## Min. :1.000 Min. :80 Min. :0.0000 Min. : 0.00   
## 1st Qu.:2.000 1st Qu.:80 1st Qu.:0.0000 1st Qu.: 6.00   
## Median :3.000 Median :80 Median :1.0000 Median :10.00   
## Mean :2.689 Mean :80 Mean :0.7984 Mean :11.22   
## 3rd Qu.:4.000 3rd Qu.:80 3rd Qu.:1.0000 3rd Qu.:15.00   
## Max. :4.000 Max. :80 Max. :3.0000 Max. :40.00   
## TrainingTimesLastYear WorkLifeBalance YearsAtCompany YearsInCurrentRole  
## Min. :0.000 Min. :1.000 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2.000 1st Qu.:2.000 1st Qu.: 3.000 1st Qu.: 2.000   
## Median :3.000 Median :3.000 Median : 5.000 Median : 3.000   
## Mean :2.806 Mean :2.766 Mean : 6.914 Mean : 4.179   
## 3rd Qu.:3.000 3rd Qu.:3.000 3rd Qu.: 9.000 3rd Qu.: 7.000   
## Max. :6.000 Max. :4.000 Max. :36.000 Max. :17.000   
## YearsSinceLastPromotion YearsWithCurrManager Age   
## Min. : 0.000 Min. : 0.000 Min. :18.00   
## 1st Qu.: 0.000 1st Qu.: 2.000 1st Qu.:30.00   
## Median : 1.000 Median : 3.000 Median :35.00   
## Mean : 2.154 Mean : 4.068 Mean :36.86   
## 3rd Qu.: 2.000 3rd Qu.: 7.000 3rd Qu.:43.00   
## Max. :15.000 Max. :17.000 Max. :60.00

### Step 1a: Check for missing values

## Step 2: Feature Engineering

The next step is to change the data types from character to factors and changing the Target Variable(Attrition) from Yes - employee left the company/ No - employee did not leave the company to (1-Yes/0-No).

EmployeeData$Attrition[EmployeeData$Attrition == "Yes"] <- 1  
EmployeeData$Attrition[EmployeeData$Attrition == "No"] <- 0  
EmployeeData$Attrition <- as.numeric(EmployeeData$Attrition)  
EmployeeData[,c(2,4,6,7,11,15,17,22)]=lapply(EmployeeData[,c(2,4,6,7,11,15,17,22)],as.factor)  
EmployeeData$Over18[EmployeeData$Over18 == "Y"] <- 1  
EmployeeData$Over18 <- as.numeric(EmployeeData$Over18)

## Step 3: Splitting the data into “training” and “testing” datasets

-With the training data set I will build up the model and test its accuracy using the Test Data set.

set.seed(1000)  
ranuni=sample(x=c("Training","Testing"),size=nrow(EmployeeData),replace=T,prob=c(0.7,0.3))  
TrainingData=EmployeeData[ranuni=="Training",]  
TestingData=EmployeeData[ranuni=="Testing",]  
nrow(TrainingData)

## [1] 886

nrow(TestingData)

## [1] 384

* The above code shows that we have successfully split the entire data set into two parts. Now we have 886 Training data and 384 Testing data.

## Step 4: Building the Model

* 4a. Identify the independent variables or the predictors
* 4b. Incorporate the dependent variables or target “Attrition” in the model
* 4c. Transform the data type of the model from character to formula
* 4d. Incorporate Training data into the formula and build the model

independentvariables=colnames(EmployeeData[,2:35])  
independentvariables

## [1] "BusinessTravel" "DailyRate"   
## [3] "Department" "DistanceFromHome"   
## [5] "Education" "EducationField"   
## [7] "EmployeeCount" "EmployeeNumber"   
## [9] "EnvironmentSatisfaction" "Gender"   
## [11] "HourlyRate" "JobInvolvement"   
## [13] "JobLevel" "JobRole"   
## [15] "JobSatisfaction" "MaritalStatus"   
## [17] "MonthlyIncome" "MonthlyRate"   
## [19] "NumCompaniesWorked" "Over18"   
## [21] "OverTime" "PercentSalaryHike"   
## [23] "PerformanceRating" "RelationshipSatisfaction"  
## [25] "StandardHours" "StockOptionLevel"   
## [27] "TotalWorkingYears" "TrainingTimesLastYear"   
## [29] "WorkLifeBalance" "YearsAtCompany"   
## [31] "YearsInCurrentRole" "YearsSinceLastPromotion"   
## [33] "YearsWithCurrManager" "Age"

Model=paste(independentvariables,collapse="+")  
Model

## [1] "BusinessTravel+DailyRate+Department+DistanceFromHome+Education+EducationField+EmployeeCount+EmployeeNumber+EnvironmentSatisfaction+Gender+HourlyRate+JobInvolvement+JobLevel+JobRole+JobSatisfaction+MaritalStatus+MonthlyIncome+MonthlyRate+NumCompaniesWorked+Over18+OverTime+PercentSalaryHike+PerformanceRating+RelationshipSatisfaction+StandardHours+StockOptionLevel+TotalWorkingYears+TrainingTimesLastYear+WorkLifeBalance+YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager+Age"

Model\_1=paste("Attrition~",Model)  
Model\_1

## [1] "Attrition~ BusinessTravel+DailyRate+Department+DistanceFromHome+Education+EducationField+EmployeeCount+EmployeeNumber+EnvironmentSatisfaction+Gender+HourlyRate+JobInvolvement+JobLevel+JobRole+JobSatisfaction+MaritalStatus+MonthlyIncome+MonthlyRate+NumCompaniesWorked+Over18+OverTime+PercentSalaryHike+PerformanceRating+RelationshipSatisfaction+StandardHours+StockOptionLevel+TotalWorkingYears+TrainingTimesLastYear+WorkLifeBalance+YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager+Age"

class(Model\_1)

## [1] "character"

formula=as.formula(Model\_1)  
formula

## Attrition ~ BusinessTravel + DailyRate + Department + DistanceFromHome +   
## Education + EducationField + EmployeeCount + EmployeeNumber +   
## EnvironmentSatisfaction + Gender + HourlyRate + JobInvolvement +   
## JobLevel + JobRole + JobSatisfaction + MaritalStatus + MonthlyIncome +   
## MonthlyRate + NumCompaniesWorked + Over18 + OverTime + PercentSalaryHike +   
## PerformanceRating + RelationshipSatisfaction + StandardHours +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +   
## YearsWithCurrManager + Age

* Now I am going to put the training data in the formula using glm() and build the logistic regression model

GLMModel=glm(formula=formula,data=TrainingData,family="binomial")

* The model will be designed using the “Stepwise selection” method to get the significant variables of the model. This will allow for a better fitting model and have the best variables to make an accurate prediction

GLMModel=step(object = GLMModel,direction = "both")

## Start: AIC=623.47  
## Attrition ~ BusinessTravel + DailyRate + Department + DistanceFromHome +   
## Education + EducationField + EmployeeCount + EmployeeNumber +   
## EnvironmentSatisfaction + Gender + HourlyRate + JobInvolvement +   
## JobLevel + JobRole + JobSatisfaction + MaritalStatus + MonthlyIncome +   
## MonthlyRate + NumCompaniesWorked + Over18 + OverTime + PercentSalaryHike +   
## PerformanceRating + RelationshipSatisfaction + StandardHours +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +   
## YearsWithCurrManager + Age  
##   
##   
## Step: AIC=623.47  
## Attrition ~ BusinessTravel + DailyRate + Department + DistanceFromHome +   
## Education + EducationField + EmployeeCount + EmployeeNumber +   
## EnvironmentSatisfaction + Gender + HourlyRate + JobInvolvement +   
## JobLevel + JobRole + JobSatisfaction + MaritalStatus + MonthlyIncome +   
## MonthlyRate + NumCompaniesWorked + Over18 + OverTime + PercentSalaryHike +   
## PerformanceRating + RelationshipSatisfaction + StockOptionLevel +   
## TotalWorkingYears + TrainingTimesLastYear + WorkLifeBalance +   
## YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +   
## YearsWithCurrManager + Age  
##   
##   
## Step: AIC=623.47  
## Attrition ~ BusinessTravel + DailyRate + Department + DistanceFromHome +   
## Education + EducationField + EmployeeCount + EmployeeNumber +   
## EnvironmentSatisfaction + Gender + HourlyRate + JobInvolvement +   
## JobLevel + JobRole + JobSatisfaction + MaritalStatus + MonthlyIncome +   
## MonthlyRate + NumCompaniesWorked + OverTime + PercentSalaryHike +   
## PerformanceRating + RelationshipSatisfaction + StockOptionLevel +   
## TotalWorkingYears + TrainingTimesLastYear + WorkLifeBalance +   
## YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +   
## YearsWithCurrManager + Age  
##   
##   
## Step: AIC=623.47  
## Attrition ~ BusinessTravel + DailyRate + Department + DistanceFromHome +   
## Education + EducationField + EmployeeNumber + EnvironmentSatisfaction +   
## Gender + HourlyRate + JobInvolvement + JobLevel + JobRole +   
## JobSatisfaction + MaritalStatus + MonthlyIncome + MonthlyRate +   
## NumCompaniesWorked + OverTime + PercentSalaryHike + PerformanceRating +   
## RelationshipSatisfaction + StockOptionLevel + TotalWorkingYears +   
## TrainingTimesLastYear + WorkLifeBalance + YearsAtCompany +   
## YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager +   
## Age  
##   
## Df Deviance AIC  
## - Education 4 526.88 616.88  
## - Department 2 526.59 620.59  
## - MonthlyIncome 1 525.47 621.47  
## - JobLevel 1 525.52 621.52  
## - HourlyRate 1 525.52 621.52  
## - YearsAtCompany 1 525.81 621.81  
## - PercentSalaryHike 1 525.85 621.85  
## - EmployeeNumber 1 526.05 622.05  
## - EducationField 5 534.09 622.09  
## - MonthlyRate 1 526.20 622.20  
## - PerformanceRating 1 526.34 622.34  
## - DailyRate 1 526.45 622.45  
## - YearsInCurrentRole 1 526.58 622.58  
## - Age 1 526.87 622.87  
## - YearsWithCurrManager 1 527.09 623.09  
## - MaritalStatus 2 529.35 623.35  
## <none> 525.47 623.47  
## - Gender 1 528.51 624.51  
## - StockOptionLevel 1 529.15 625.15  
## - WorkLifeBalance 1 530.05 626.05  
## - TrainingTimesLastYear 1 530.46 626.46  
## - JobRole 8 545.69 627.69  
## - TotalWorkingYears 1 532.38 628.38  
## - RelationshipSatisfaction 1 532.73 628.73  
## - JobInvolvement 1 535.00 631.00  
## - DistanceFromHome 1 537.75 633.75  
## - YearsSinceLastPromotion 1 537.99 633.99  
## - NumCompaniesWorked 1 539.46 635.46  
## - EnvironmentSatisfaction 1 542.78 638.78  
## - JobSatisfaction 1 543.49 639.49  
## - BusinessTravel 2 547.48 641.48  
## - OverTime 1 599.84 695.84  
##   
## Step: AIC=616.88  
## Attrition ~ BusinessTravel + DailyRate + Department + DistanceFromHome +   
## EducationField + EmployeeNumber + EnvironmentSatisfaction +   
## Gender + HourlyRate + JobInvolvement + JobLevel + JobRole +   
## JobSatisfaction + MaritalStatus + MonthlyIncome + MonthlyRate +   
## NumCompaniesWorked + OverTime + PercentSalaryHike + PerformanceRating +   
## RelationshipSatisfaction + StockOptionLevel + TotalWorkingYears +   
## TrainingTimesLastYear + WorkLifeBalance + YearsAtCompany +   
## YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager +   
## Age  
##   
## Df Deviance AIC  
## - Department 2 528.01 614.01  
## - MonthlyIncome 1 526.89 614.89  
## - JobLevel 1 526.92 614.92  
## - HourlyRate 1 526.94 614.94  
## - YearsAtCompany 1 527.16 615.16  
## - PercentSalaryHike 1 527.19 615.19  
## - EmployeeNumber 1 527.40 615.40  
## - EducationField 5 535.56 615.56  
## - MonthlyRate 1 527.61 615.61  
## - PerformanceRating 1 527.65 615.65  
## - DailyRate 1 527.93 615.93  
## - YearsInCurrentRole 1 528.12 616.12  
## - YearsWithCurrManager 1 528.38 616.38  
## - Age 1 528.47 616.47  
## - MaritalStatus 2 530.76 616.76  
## <none> 526.88 616.88  
## - Gender 1 529.98 617.98  
## - StockOptionLevel 1 530.60 618.60  
## - WorkLifeBalance 1 531.35 619.35  
## - TrainingTimesLastYear 1 531.72 619.72  
## - JobRole 8 547.25 621.25  
## - TotalWorkingYears 1 533.56 621.56  
## - RelationshipSatisfaction 1 534.42 622.42  
## + Education 4 525.47 623.47  
## - JobInvolvement 1 536.87 624.87  
## - DistanceFromHome 1 538.61 626.61  
## - YearsSinceLastPromotion 1 539.35 627.35  
## - NumCompaniesWorked 1 540.25 628.25  
## - EnvironmentSatisfaction 1 544.01 632.01  
## - JobSatisfaction 1 545.03 633.03  
## - BusinessTravel 2 547.86 633.86  
## - OverTime 1 601.59 689.59  
##   
## Step: AIC=614.01  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EducationField +   
## EmployeeNumber + EnvironmentSatisfaction + Gender + HourlyRate +   
## JobInvolvement + JobLevel + JobRole + JobSatisfaction + MaritalStatus +   
## MonthlyIncome + MonthlyRate + NumCompaniesWorked + OverTime +   
## PercentSalaryHike + PerformanceRating + RelationshipSatisfaction +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +   
## YearsWithCurrManager + Age  
##   
## Df Deviance AIC  
## - MonthlyIncome 1 528.02 612.02  
## - JobLevel 1 528.05 612.05  
## - HourlyRate 1 528.06 612.06  
## - YearsAtCompany 1 528.24 612.24  
## - PercentSalaryHike 1 528.32 612.32  
## - EmployeeNumber 1 528.59 612.59  
## - EducationField 5 536.62 612.62  
## - PerformanceRating 1 528.75 612.75  
## - MonthlyRate 1 528.76 612.76  
## - DailyRate 1 529.03 613.03  
## - YearsInCurrentRole 1 529.10 613.10  
## - YearsWithCurrManager 1 529.41 613.41  
## - Age 1 529.58 613.58  
## - MaritalStatus 2 531.94 613.94  
## <none> 528.01 614.01  
## - Gender 1 531.02 615.02  
## - StockOptionLevel 1 531.94 615.94  
## - WorkLifeBalance 1 532.66 616.66  
## - TrainingTimesLastYear 1 532.69 616.69  
## + Department 2 526.88 616.88  
## - TotalWorkingYears 1 534.98 618.98  
## - RelationshipSatisfaction 1 535.56 619.56  
## + Education 4 526.59 620.59  
## - JobInvolvement 1 538.25 622.25  
## - JobRole 8 553.54 623.54  
## - DistanceFromHome 1 539.60 623.60  
## - YearsSinceLastPromotion 1 540.29 624.29  
## - NumCompaniesWorked 1 541.58 625.58  
## - EnvironmentSatisfaction 1 545.22 629.22  
## - JobSatisfaction 1 546.24 630.24  
## - BusinessTravel 2 548.82 630.82  
## - OverTime 1 602.75 686.75  
##   
## Step: AIC=612.02  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EducationField +   
## EmployeeNumber + EnvironmentSatisfaction + Gender + HourlyRate +   
## JobInvolvement + JobLevel + JobRole + JobSatisfaction + MaritalStatus +   
## MonthlyRate + NumCompaniesWorked + OverTime + PercentSalaryHike +   
## PerformanceRating + RelationshipSatisfaction + StockOptionLevel +   
## TotalWorkingYears + TrainingTimesLastYear + WorkLifeBalance +   
## YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +   
## YearsWithCurrManager + Age  
##   
## Df Deviance AIC  
## - HourlyRate 1 528.07 610.07  
## - JobLevel 1 528.14 610.14  
## - YearsAtCompany 1 528.24 610.24  
## - PercentSalaryHike 1 528.33 610.33  
## - EmployeeNumber 1 528.59 610.59  
## - EducationField 5 536.65 610.65  
## - PerformanceRating 1 528.75 610.75  
## - MonthlyRate 1 528.77 610.77  
## - DailyRate 1 529.04 611.04  
## - YearsInCurrentRole 1 529.11 611.11  
## - YearsWithCurrManager 1 529.41 611.41  
## - Age 1 529.58 611.58  
## - MaritalStatus 2 531.96 611.96  
## <none> 528.02 612.02  
## - Gender 1 531.02 613.02  
## - StockOptionLevel 1 531.95 613.95  
## + MonthlyIncome 1 528.01 614.01  
## - WorkLifeBalance 1 532.66 614.66  
## - TrainingTimesLastYear 1 532.69 614.69  
## + Department 2 526.89 614.89  
## - TotalWorkingYears 1 535.20 617.20  
## - RelationshipSatisfaction 1 535.60 617.60  
## + Education 4 526.59 618.59  
## - JobInvolvement 1 538.26 620.26  
## - JobRole 8 553.73 621.73  
## - DistanceFromHome 1 539.75 621.75  
## - YearsSinceLastPromotion 1 540.31 622.31  
## - NumCompaniesWorked 1 541.58 623.58  
## - EnvironmentSatisfaction 1 545.23 627.23  
## - JobSatisfaction 1 546.24 628.24  
## - BusinessTravel 2 548.95 628.95  
## - OverTime 1 602.84 684.84  
##   
## Step: AIC=610.07  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EducationField +   
## EmployeeNumber + EnvironmentSatisfaction + Gender + JobInvolvement +   
## JobLevel + JobRole + JobSatisfaction + MaritalStatus + MonthlyRate +   
## NumCompaniesWorked + OverTime + PercentSalaryHike + PerformanceRating +   
## RelationshipSatisfaction + StockOptionLevel + TotalWorkingYears +   
## TrainingTimesLastYear + WorkLifeBalance + YearsAtCompany +   
## YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager +   
## Age  
##   
## Df Deviance AIC  
## - JobLevel 1 528.20 608.20  
## - YearsAtCompany 1 528.30 608.30  
## - PercentSalaryHike 1 528.38 608.38  
## - EmployeeNumber 1 528.64 608.64  
## - EducationField 5 536.71 608.71  
## - MonthlyRate 1 528.81 608.81  
## - PerformanceRating 1 528.81 608.81  
## - DailyRate 1 529.09 609.09  
## - YearsInCurrentRole 1 529.14 609.14  
## - YearsWithCurrManager 1 529.47 609.47  
## - Age 1 529.60 609.60  
## - MaritalStatus 2 532.02 610.02  
## <none> 528.07 610.07  
## - Gender 1 531.05 611.05  
## - StockOptionLevel 1 531.97 611.97  
## + HourlyRate 1 528.02 612.02  
## + MonthlyIncome 1 528.06 612.06  
## - TrainingTimesLastYear 1 532.75 612.75  
## - WorkLifeBalance 1 532.75 612.75  
## + Department 2 526.95 612.95  
## - TotalWorkingYears 1 535.27 615.27  
## - RelationshipSatisfaction 1 535.68 615.68  
## + Education 4 526.63 616.63  
## - JobInvolvement 1 538.26 618.26  
## - JobRole 8 553.75 619.75  
## - DistanceFromHome 1 539.82 619.82  
## - YearsSinceLastPromotion 1 540.31 620.31  
## - NumCompaniesWorked 1 541.60 621.60  
## - EnvironmentSatisfaction 1 545.40 625.40  
## - JobSatisfaction 1 546.89 626.89  
## - BusinessTravel 2 548.96 626.96  
## - OverTime 1 602.98 682.98  
##   
## Step: AIC=608.2  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EducationField +   
## EmployeeNumber + EnvironmentSatisfaction + Gender + JobInvolvement +   
## JobRole + JobSatisfaction + MaritalStatus + MonthlyRate +   
## NumCompaniesWorked + OverTime + PercentSalaryHike + PerformanceRating +   
## RelationshipSatisfaction + StockOptionLevel + TotalWorkingYears +   
## TrainingTimesLastYear + WorkLifeBalance + YearsAtCompany +   
## YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager +   
## Age  
##   
## Df Deviance AIC  
## - YearsAtCompany 1 528.37 606.37  
## - PercentSalaryHike 1 528.50 606.50  
## - EmployeeNumber 1 528.75 606.75  
## - EducationField 5 536.86 606.86  
## - PerformanceRating 1 528.92 606.92  
## - MonthlyRate 1 528.94 606.94  
## - YearsInCurrentRole 1 529.21 607.21  
## - DailyRate 1 529.23 607.23  
## - YearsWithCurrManager 1 529.55 607.55  
## - Age 1 529.72 607.72  
## - MaritalStatus 2 532.08 608.08  
## <none> 528.20 608.20  
## - Gender 1 531.11 609.11  
## + JobLevel 1 528.07 610.07  
## + MonthlyIncome 1 528.10 610.10  
## - StockOptionLevel 1 532.11 610.11  
## + HourlyRate 1 528.14 610.14  
## - TrainingTimesLastYear 1 532.81 610.81  
## - WorkLifeBalance 1 532.93 610.93  
## + Department 2 527.08 611.08  
## - RelationshipSatisfaction 1 535.72 613.72  
## + Education 4 526.74 614.74  
## - TotalWorkingYears 1 537.44 615.44  
## - JobInvolvement 1 538.39 616.39  
## - DistanceFromHome 1 539.84 617.84  
## - YearsSinceLastPromotion 1 540.43 618.43  
## - JobRole 8 555.71 619.71  
## - NumCompaniesWorked 1 541.88 619.88  
## - EnvironmentSatisfaction 1 545.61 623.61  
## - JobSatisfaction 1 547.04 625.04  
## - BusinessTravel 2 549.10 625.10  
## - OverTime 1 603.19 681.19  
##   
## Step: AIC=606.37  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EducationField +   
## EmployeeNumber + EnvironmentSatisfaction + Gender + JobInvolvement +   
## JobRole + JobSatisfaction + MaritalStatus + MonthlyRate +   
## NumCompaniesWorked + OverTime + PercentSalaryHike + PerformanceRating +   
## RelationshipSatisfaction + StockOptionLevel + TotalWorkingYears +   
## TrainingTimesLastYear + WorkLifeBalance + YearsInCurrentRole +   
## YearsSinceLastPromotion + YearsWithCurrManager + Age  
##   
## Df Deviance AIC  
## - PercentSalaryHike 1 528.68 604.68  
## - EducationField 5 536.90 604.90  
## - EmployeeNumber 1 528.95 604.95  
## - PerformanceRating 1 529.15 605.15  
## - MonthlyRate 1 529.15 605.15  
## - YearsInCurrentRole 1 529.21 605.21  
## - DailyRate 1 529.38 605.38  
## - YearsWithCurrManager 1 529.58 605.58  
## - Age 1 529.95 605.95  
## - MaritalStatus 2 532.25 606.25  
## <none> 528.37 606.37  
## - Gender 1 531.31 607.31  
## + YearsAtCompany 1 528.20 608.20  
## + JobLevel 1 528.30 608.30  
## + MonthlyIncome 1 528.31 608.31  
## + HourlyRate 1 528.32 608.32  
## - StockOptionLevel 1 532.35 608.35  
## - TrainingTimesLastYear 1 532.94 608.94  
## - WorkLifeBalance 1 533.29 609.29  
## + Department 2 527.30 609.30  
## - RelationshipSatisfaction 1 535.96 611.96  
## + Education 4 526.98 612.98  
## - TotalWorkingYears 1 537.77 613.77  
## - JobInvolvement 1 538.70 614.70  
## - DistanceFromHome 1 539.89 615.89  
## - YearsSinceLastPromotion 1 541.73 617.73  
## - NumCompaniesWorked 1 542.06 618.06  
## - JobRole 8 556.21 618.21  
## - EnvironmentSatisfaction 1 545.94 621.94  
## - JobSatisfaction 1 547.11 623.11  
## - BusinessTravel 2 549.28 623.28  
## - OverTime 1 603.26 679.26  
##   
## Step: AIC=604.68  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EducationField +   
## EmployeeNumber + EnvironmentSatisfaction + Gender + JobInvolvement +   
## JobRole + JobSatisfaction + MaritalStatus + MonthlyRate +   
## NumCompaniesWorked + OverTime + PerformanceRating + RelationshipSatisfaction +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsInCurrentRole + YearsSinceLastPromotion +   
## YearsWithCurrManager + Age  
##   
## Df Deviance AIC  
## - EducationField 5 537.10 603.10  
## - PerformanceRating 1 529.18 603.18  
## - EmployeeNumber 1 529.24 603.24  
## - MonthlyRate 1 529.43 603.43  
## - YearsInCurrentRole 1 529.51 603.51  
## - DailyRate 1 529.68 603.68  
## - YearsWithCurrManager 1 529.88 603.88  
## - Age 1 530.14 604.14  
## - MaritalStatus 2 532.66 604.66  
## <none> 528.68 604.68  
## - Gender 1 531.56 605.56  
## + PercentSalaryHike 1 528.37 606.37  
## + YearsAtCompany 1 528.50 606.50  
## - StockOptionLevel 1 532.53 606.53  
## + JobLevel 1 528.60 606.60  
## + MonthlyIncome 1 528.62 606.62  
## + HourlyRate 1 528.62 606.62  
## - TrainingTimesLastYear 1 533.28 607.28  
## + Department 2 527.60 607.60  
## - WorkLifeBalance 1 533.63 607.63  
## - RelationshipSatisfaction 1 536.31 610.31  
## + Education 4 527.35 611.35  
## - TotalWorkingYears 1 538.21 612.21  
## - JobInvolvement 1 539.03 613.03  
## - DistanceFromHome 1 540.37 614.37  
## - YearsSinceLastPromotion 1 541.89 615.89  
## - NumCompaniesWorked 1 542.28 616.28  
## - JobRole 8 556.55 616.55  
## - EnvironmentSatisfaction 1 546.22 620.22  
## - BusinessTravel 2 549.28 621.28  
## - JobSatisfaction 1 547.46 621.46  
## - OverTime 1 603.33 677.33  
##   
## Step: AIC=603.1  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EmployeeNumber +   
## EnvironmentSatisfaction + Gender + JobInvolvement + JobRole +   
## JobSatisfaction + MaritalStatus + MonthlyRate + NumCompaniesWorked +   
## OverTime + PerformanceRating + RelationshipSatisfaction +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsInCurrentRole + YearsSinceLastPromotion +   
## YearsWithCurrManager + Age  
##   
## Df Deviance AIC  
## - PerformanceRating 1 537.54 601.54  
## - YearsInCurrentRole 1 537.60 601.60  
## - EmployeeNumber 1 537.70 601.70  
## - DailyRate 1 537.86 601.86  
## - MonthlyRate 1 537.95 601.95  
## - YearsWithCurrManager 1 538.49 602.49  
## - Age 1 538.69 602.69  
## <none> 537.10 603.10  
## - MaritalStatus 2 541.35 603.35  
## - Gender 1 540.59 604.59  
## + EducationField 5 528.68 604.68  
## + PercentSalaryHike 1 536.90 604.90  
## + JobLevel 1 536.98 604.98  
## + HourlyRate 1 537.03 605.03  
## + YearsAtCompany 1 537.06 605.06  
## + MonthlyIncome 1 537.09 605.09  
## - StockOptionLevel 1 541.24 605.24  
## - TrainingTimesLastYear 1 541.73 605.73  
## - WorkLifeBalance 1 541.91 605.91  
## + Department 2 536.06 606.06  
## + Education 4 535.72 609.72  
## - RelationshipSatisfaction 1 545.82 609.82  
## - TotalWorkingYears 1 547.12 611.12  
## - DistanceFromHome 1 548.01 612.01  
## - JobInvolvement 1 548.02 612.02  
## - YearsSinceLastPromotion 1 550.84 614.84  
## - NumCompaniesWorked 1 551.24 615.24  
## - EnvironmentSatisfaction 1 554.74 618.74  
## - JobRole 8 569.05 619.05  
## - BusinessTravel 2 558.13 620.13  
## - JobSatisfaction 1 557.67 621.67  
## - OverTime 1 612.59 676.59  
##   
## Step: AIC=601.54  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EmployeeNumber +   
## EnvironmentSatisfaction + Gender + JobInvolvement + JobRole +   
## JobSatisfaction + MaritalStatus + MonthlyRate + NumCompaniesWorked +   
## OverTime + RelationshipSatisfaction + StockOptionLevel +   
## TotalWorkingYears + TrainingTimesLastYear + WorkLifeBalance +   
## YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager +   
## Age  
##   
## Df Deviance AIC  
## - YearsInCurrentRole 1 538.07 600.07  
## - EmployeeNumber 1 538.18 600.18  
## - MonthlyRate 1 538.27 600.27  
## - DailyRate 1 538.34 600.34  
## - YearsWithCurrManager 1 538.89 600.89  
## - Age 1 539.12 601.12  
## <none> 537.54 601.54  
## - MaritalStatus 2 541.86 601.86  
## - Gender 1 541.00 603.00  
## + PerformanceRating 1 537.10 603.10  
## + EducationField 5 529.18 603.18  
## + JobLevel 1 537.43 603.43  
## + HourlyRate 1 537.46 603.46  
## + YearsAtCompany 1 537.47 603.47  
## + PercentSalaryHike 1 537.50 603.50  
## + MonthlyIncome 1 537.54 603.54  
## - StockOptionLevel 1 541.58 603.58  
## - TrainingTimesLastYear 1 542.15 604.15  
## - WorkLifeBalance 1 542.38 604.38  
## + Department 2 536.55 604.55  
## - RelationshipSatisfaction 1 545.96 607.96  
## + Education 4 536.21 608.21  
## - TotalWorkingYears 1 547.60 609.60  
## - JobInvolvement 1 548.41 610.41  
## - DistanceFromHome 1 548.43 610.43  
## - YearsSinceLastPromotion 1 551.29 613.29  
## - NumCompaniesWorked 1 551.93 613.93  
## - EnvironmentSatisfaction 1 555.17 617.17  
## - JobRole 8 569.31 617.31  
## - BusinessTravel 2 558.55 618.55  
## - JobSatisfaction 1 558.01 620.01  
## - OverTime 1 612.64 674.64  
##   
## Step: AIC=600.07  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EmployeeNumber +   
## EnvironmentSatisfaction + Gender + JobInvolvement + JobRole +   
## JobSatisfaction + MaritalStatus + MonthlyRate + NumCompaniesWorked +   
## OverTime + RelationshipSatisfaction + StockOptionLevel +   
## TotalWorkingYears + TrainingTimesLastYear + WorkLifeBalance +   
## YearsSinceLastPromotion + YearsWithCurrManager + Age  
##   
## Df Deviance AIC  
## - EmployeeNumber 1 538.79 598.79  
## - MonthlyRate 1 538.85 598.85  
## - DailyRate 1 538.95 598.95  
## - Age 1 539.49 599.49  
## <none> 538.07 600.07  
## - YearsWithCurrManager 1 540.53 600.53  
## - MaritalStatus 2 542.76 600.76  
## - Gender 1 541.54 601.54  
## + YearsInCurrentRole 1 537.54 601.54  
## + PerformanceRating 1 537.60 601.60  
## + JobLevel 1 537.97 601.97  
## + HourlyRate 1 538.01 602.01  
## + PercentSalaryHike 1 538.02 602.02  
## - StockOptionLevel 1 542.02 602.02  
## + EducationField 5 530.06 602.06  
## + MonthlyIncome 1 538.06 602.06  
## + YearsAtCompany 1 538.07 602.07  
## - TrainingTimesLastYear 1 542.60 602.60  
## + Department 2 537.18 603.18  
## - WorkLifeBalance 1 543.30 603.30  
## - RelationshipSatisfaction 1 546.30 606.30  
## + Education 4 536.61 606.61  
## - JobInvolvement 1 548.73 608.73  
## - DistanceFromHome 1 549.14 609.14  
## - TotalWorkingYears 1 549.84 609.84  
## - YearsSinceLastPromotion 1 551.32 611.32  
## - NumCompaniesWorked 1 553.16 613.16  
## - EnvironmentSatisfaction 1 555.85 615.85  
## - JobRole 8 570.20 616.20  
## - BusinessTravel 2 559.10 617.10  
## - JobSatisfaction 1 558.67 618.67  
## - OverTime 1 613.05 673.05  
##   
## Step: AIC=598.79  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EnvironmentSatisfaction +   
## Gender + JobInvolvement + JobRole + JobSatisfaction + MaritalStatus +   
## MonthlyRate + NumCompaniesWorked + OverTime + RelationshipSatisfaction +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsSinceLastPromotion + YearsWithCurrManager +   
## Age  
##   
## Df Deviance AIC  
## - MonthlyRate 1 539.44 597.44  
## - DailyRate 1 539.81 597.81  
## - Age 1 540.24 598.24  
## <none> 538.79 598.79  
## - YearsWithCurrManager 1 541.22 599.22  
## - MaritalStatus 2 543.49 599.49  
## + EmployeeNumber 1 538.07 600.07  
## + YearsInCurrentRole 1 538.18 600.18  
## - Gender 1 542.24 600.24  
## + PerformanceRating 1 538.28 600.28  
## - StockOptionLevel 1 542.54 600.54  
## + JobLevel 1 538.71 600.71  
## + PercentSalaryHike 1 538.73 600.73  
## + HourlyRate 1 538.73 600.73  
## + EducationField 5 530.76 600.76  
## + YearsAtCompany 1 538.79 600.79  
## + MonthlyIncome 1 538.79 600.79  
## - TrainingTimesLastYear 1 543.17 601.17  
## + Department 2 537.88 601.88  
## - WorkLifeBalance 1 544.04 602.04  
## - RelationshipSatisfaction 1 547.31 605.31  
## + Education 4 537.45 605.45  
## - JobInvolvement 1 549.57 607.57  
## - TotalWorkingYears 1 550.10 608.10  
## - DistanceFromHome 1 550.29 608.29  
## - YearsSinceLastPromotion 1 551.76 609.76  
## - NumCompaniesWorked 1 553.59 611.59  
## - EnvironmentSatisfaction 1 556.24 614.24  
## - JobRole 8 571.36 615.36  
## - BusinessTravel 2 559.71 615.71  
## - JobSatisfaction 1 559.61 617.61  
## - OverTime 1 613.65 671.65  
##   
## Step: AIC=597.44  
## Attrition ~ BusinessTravel + DailyRate + DistanceFromHome + EnvironmentSatisfaction +   
## Gender + JobInvolvement + JobRole + JobSatisfaction + MaritalStatus +   
## NumCompaniesWorked + OverTime + RelationshipSatisfaction +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsSinceLastPromotion + YearsWithCurrManager +   
## Age  
##   
## Df Deviance AIC  
## - DailyRate 1 540.39 596.39  
## - Age 1 540.88 596.88  
## <none> 539.44 597.44  
## - YearsWithCurrManager 1 541.82 597.82  
## - MaritalStatus 2 544.17 598.17  
## + YearsInCurrentRole 1 538.79 598.79  
## + MonthlyRate 1 538.79 598.79  
## + EmployeeNumber 1 538.85 598.85  
## - StockOptionLevel 1 543.03 599.03  
## + PerformanceRating 1 539.06 599.06  
## - Gender 1 543.11 599.11  
## + EducationField 5 531.32 599.32  
## + JobLevel 1 539.37 599.37  
## + HourlyRate 1 539.39 599.39  
## + PercentSalaryHike 1 539.40 599.40  
## + YearsAtCompany 1 539.44 599.44  
## + MonthlyIncome 1 539.44 599.44  
## - TrainingTimesLastYear 1 543.63 599.63  
## + Department 2 538.51 600.51  
## - WorkLifeBalance 1 544.91 600.91  
## - RelationshipSatisfaction 1 547.81 603.81  
## + Education 4 538.09 604.09  
## - JobInvolvement 1 550.60 606.60  
## - DistanceFromHome 1 550.62 606.62  
## - TotalWorkingYears 1 550.65 606.65  
## - YearsSinceLastPromotion 1 552.43 608.43  
## - NumCompaniesWorked 1 553.90 609.90  
## - EnvironmentSatisfaction 1 557.39 613.39  
## - BusinessTravel 2 560.03 614.03  
## - JobRole 8 572.21 614.21  
## - JobSatisfaction 1 560.43 616.43  
## - OverTime 1 614.29 670.29  
##   
## Step: AIC=596.39  
## Attrition ~ BusinessTravel + DistanceFromHome + EnvironmentSatisfaction +   
## Gender + JobInvolvement + JobRole + JobSatisfaction + MaritalStatus +   
## NumCompaniesWorked + OverTime + RelationshipSatisfaction +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsSinceLastPromotion + YearsWithCurrManager +   
## Age  
##   
## Df Deviance AIC  
## - Age 1 541.87 595.87  
## <none> 540.39 596.39  
## - YearsWithCurrManager 1 542.99 596.99  
## - MaritalStatus 2 545.42 597.42  
## + DailyRate 1 539.44 597.44  
## + YearsInCurrentRole 1 539.63 597.63  
## + EmployeeNumber 1 539.68 597.68  
## + MonthlyRate 1 539.81 597.81  
## - Gender 1 543.85 597.85  
## + PerformanceRating 1 539.96 597.96  
## - StockOptionLevel 1 543.97 597.97  
## + JobLevel 1 540.32 598.32  
## + PercentSalaryHike 1 540.34 598.34  
## + HourlyRate 1 540.34 598.34  
## + YearsAtCompany 1 540.39 598.39  
## + MonthlyIncome 1 540.39 598.39  
## - TrainingTimesLastYear 1 544.50 598.50  
## + EducationField 5 532.52 598.52  
## + Department 2 539.52 599.52  
## - WorkLifeBalance 1 545.91 599.91  
## - RelationshipSatisfaction 1 548.87 602.87  
## + Education 4 538.99 602.99  
## - TotalWorkingYears 1 551.40 605.40  
## - JobInvolvement 1 551.59 605.59  
## - DistanceFromHome 1 551.87 605.87  
## - YearsSinceLastPromotion 1 554.03 608.03  
## - NumCompaniesWorked 1 554.48 608.48  
## - EnvironmentSatisfaction 1 558.52 612.52  
## - JobRole 8 572.85 612.85  
## - BusinessTravel 2 561.34 613.34  
## - JobSatisfaction 1 561.65 615.65  
## - OverTime 1 614.41 668.41  
##   
## Step: AIC=595.87  
## Attrition ~ BusinessTravel + DistanceFromHome + EnvironmentSatisfaction +   
## Gender + JobInvolvement + JobRole + JobSatisfaction + MaritalStatus +   
## NumCompaniesWorked + OverTime + RelationshipSatisfaction +   
## StockOptionLevel + TotalWorkingYears + TrainingTimesLastYear +   
## WorkLifeBalance + YearsSinceLastPromotion + YearsWithCurrManager  
##   
## Df Deviance AIC  
## <none> 541.87 595.87  
## - YearsWithCurrManager 1 543.95 595.95  
## + Age 1 540.39 596.39  
## + DailyRate 1 540.88 596.88  
## + EmployeeNumber 1 541.13 597.13  
## + MonthlyRate 1 541.29 597.29  
## - MaritalStatus 2 547.30 597.30  
## + YearsInCurrentRole 1 541.31 597.31  
## - StockOptionLevel 1 545.35 597.35  
## - Gender 1 545.40 597.40  
## + PerformanceRating 1 541.46 597.46  
## + PercentSalaryHike 1 541.79 597.79  
## + JobLevel 1 541.80 597.80  
## + HourlyRate 1 541.86 597.86  
## + YearsAtCompany 1 541.87 597.87  
## + MonthlyIncome 1 541.87 597.87  
## + EducationField 5 533.88 597.88  
## - TrainingTimesLastYear 1 546.10 598.10  
## + Department 2 541.04 599.04  
## - WorkLifeBalance 1 547.12 599.12  
## + Education 4 540.22 602.22  
## - RelationshipSatisfaction 1 550.98 602.98  
## - JobInvolvement 1 553.28 605.28  
## - DistanceFromHome 1 553.69 605.69  
## - NumCompaniesWorked 1 554.92 606.92  
## - YearsSinceLastPromotion 1 555.46 607.46  
## - EnvironmentSatisfaction 1 560.08 612.08  
## - BusinessTravel 2 562.27 612.27  
## - JobRole 8 574.35 612.35  
## - TotalWorkingYears 1 563.09 615.09  
## - JobSatisfaction 1 563.30 615.30  
## - OverTime 1 616.03 668.03

summary(GLMModel)

##   
## Call:  
## glm(formula = Attrition ~ BusinessTravel + DistanceFromHome +   
## EnvironmentSatisfaction + Gender + JobInvolvement + JobRole +   
## JobSatisfaction + MaritalStatus + NumCompaniesWorked + OverTime +   
## RelationshipSatisfaction + StockOptionLevel + TotalWorkingYears +   
## TrainingTimesLastYear + WorkLifeBalance + YearsSinceLastPromotion +   
## YearsWithCurrManager, family = "binomial", data = TrainingData)  
##   
## Deviance Residuals:   
## Min 1Q Median 3Q Max   
## -1.7542 -0.5225 -0.2572 -0.0606 3.3593   
##   
## Coefficients:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 1.22632 1.15552 1.061 0.288565   
## BusinessTravelTravel\_Frequently 1.95814 0.52449 3.733 0.000189 \*\*\*  
## BusinessTravelTravel\_Rarely 0.97376 0.48115 2.024 0.042988 \*   
## DistanceFromHome 0.04772 0.01382 3.453 0.000555 \*\*\*  
## EnvironmentSatisfaction -0.43320 0.10361 -4.181 2.90e-05 \*\*\*  
## GenderMale 0.43390 0.23374 1.856 0.063413 .   
## JobInvolvement -0.51294 0.15300 -3.352 0.000801 \*\*\*  
## JobRoleHuman Resources 1.68889 0.74705 2.261 0.023774 \*   
## JobRoleLaboratory Technician 1.57772 0.60910 2.590 0.009591 \*\*   
## JobRoleManager 1.69864 0.83199 2.042 0.041186 \*   
## JobRoleManufacturing Director 0.14326 0.77656 0.184 0.853634   
## JobRoleResearch Director -14.73316 767.68047 -0.019 0.984688   
## JobRoleResearch Scientist 0.76369 0.61090 1.250 0.211259   
## JobRoleSales Executive 1.25643 0.59520 2.111 0.034779 \*   
## JobRoleSales Representative 2.25872 0.68301 3.307 0.000943 \*\*\*  
## JobSatisfaction -0.46711 0.10344 -4.516 6.30e-06 \*\*\*  
## MaritalStatusMarried 0.02970 0.33159 0.090 0.928619   
## MaritalStatusSingle 0.72357 0.42657 1.696 0.089840 .   
## NumCompaniesWorked 0.17301 0.04748 3.643 0.000269 \*\*\*  
## OverTimeYes 1.99754 0.24519 8.147 3.73e-16 \*\*\*  
## RelationshipSatisfaction -0.31975 0.10696 -2.989 0.002794 \*\*   
## StockOptionLevel -0.34547 0.18840 -1.834 0.066701 .   
## TotalWorkingYears -0.12811 0.03025 -4.235 2.28e-05 \*\*\*  
## TrainingTimesLastYear -0.18120 0.08921 -2.031 0.042228 \*   
## WorkLifeBalance -0.36218 0.15826 -2.289 0.022108 \*   
## YearsSinceLastPromotion 0.18468 0.04959 3.724 0.000196 \*\*\*  
## YearsWithCurrManager -0.07189 0.05004 -1.437 0.150780   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## (Dispersion parameter for binomial family taken to be 1)  
##   
## Null deviance: 805.86 on 885 degrees of freedom  
## Residual deviance: 541.87 on 859 degrees of freedom  
## AIC: 595.87  
##   
## Number of Fisher Scoring iterations: 17

* Based on the results we can see, Business travel (Frequently), Distance from home, Environment Satisfaction, Job Involvement, Job Satisfaction, Number of Companies Worked, Job Role ( Sales Executive, Sales Representatives, & Laboratory Technicians ), Overtime, Total Working years, Years since last promotion, Relationship Satisfaction.

All these are most significant variables in determining employee attrition. These can be the areas that the company can focus on to reduce attrition.

* Need to perform a goodness fit test on the data set, to determine the accuracy of the predicted probability of the model. I am going to use the Hoshmer-Lemeshow test.
* The hypothesis is
* H0: The model is a good fit if the p-value > 0.05
* H1: The model is not a good fit if the p-value < 0.05

library(MKmisc)  
HLgof.test(fit=GLMModel$fitted.values,obs=GLMModel$y)

## $C  
##   
## Hosmer-Lemeshow C statistic  
##   
## data: GLMModel$fitted.values and GLMModel$y  
## X-squared = 13.708, df = 8, p-value = 0.08969  
##   
##   
## $H  
##   
## Hosmer-Lemeshow H statistic  
##   
## data: GLMModel$fitted.values and GLMModel$y  
## X-squared = 5.0829, df = 8, p-value = 0.7487

* Based on the results of the test the model is a good fit because the p-value = 0.7487.

## Save and Read Model to and from RDS file

#saveRDS(GLMModel, "GLMModel.rds")  
#read.GLMModel <- readRDS("GLMModel.rds")

## Model Evaluation

* Applying the model for prediction

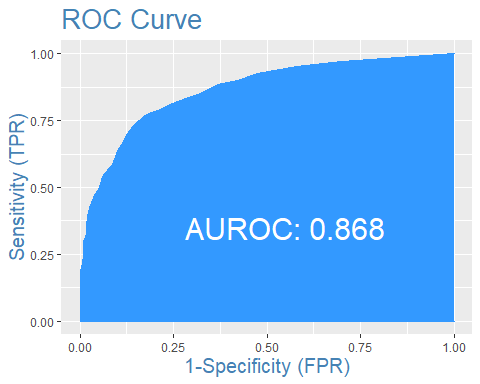
GLMModel.training <- predict(object = GLMModel, newdata = TrainingData, type = "response")  
#GLMModel.testing <- predict.glm(object = GLMModel, newdata = TestingData, type = "response")

* Model performance (Displays ROC curve and AUC score)

library(caret)  
library(pROC)

* ROC and AUC score

#GLMModel.training.roc <- roc(TrainingData$Attrition, GLMModel.training, plot = T)  
#GLMModel.training.roc$auc  
GLMModel.train.roc <- plotROC(TrainingData$Attrition,GLMModel.training,returnSensitivityMat = TRUE)



* Model performance (Displays confusion matrix)

GLMModel.training <- ifelse(test = GLMModel.training > 0.5, yes = 1, no = 0)  
table(TrainingData$Attrition, GLMModel.training) # Displays the classification table

## GLMModel.training  
## 0 1  
## 0 718 18  
## 1 86 64

GLMModel.train.CM <- confusionMatrix(TrainingData$Attrition, GLMModel.training)  
print(GLMModel.train.CM)

## 0 1  
## 0 718 86  
## 1 18 64

#GLMModel.testing <- ifelse(test = GLMModel.testing > 0.5, yes = 1, no = 0)  
#table(TestingData$Attrition, GLMModel.testing) # Displays the classification table  
#GLMModel.test.CM <- confusionMatrix(TestingData$Attrition, GLMModel.testing, threshold = optimal.GLMModel.training)  
#print(GLMModel.test.CM)

library(Metrics)

### Training Model Performance Statistics

#calculate accuracy  
GLMModel.accuracy <- accuracy(TrainingData$Attrition, GLMModel.training)  
GLMModel.accuracy

## [1] 0.8826185

#calculate sensitivity  
GLMModel.sensitivity <- sensitivity(TrainingData$Attrition, GLMModel.training)  
GLMModel.sensitivity

## [1] 0.4266667

#calculate specificity  
GLMModel.specificity <- specificity(TrainingData$Attrition, GLMModel.training)  
GLMModel.specificity

## [1] 0.9755435

# calculate precision  
GLMModel.precision <- precision(TrainingData$Attrition, GLMModel.training)  
GLMModel.precision

## [1] 0.7804878

# calculate recall  
GLMModel.recall <- recall(TrainingData$Attrition, GLMModel.training)  
GLMModel.recall

## [1] 0.4266667

#calculate total misclassification error rate  
GLMModel.misClassError <- misClassError(TrainingData$Attrition, GLMModel.training)  
GLMModel.misClassError

## [1] 0.1174

### Based on the above statistics that the error rate of the model was 12% and the accuracy is 88%