

M3T2_Final.R

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## Module 3 Task 2. We load Complete responses, explore a bit the data,
# then optimize 2 models:
# 1. GBM, Automatic Tuning.
# 2. Random Forest, Manual mtry values.
# We analyze both models and use it to predict the brands in the incomplete
# survey.

#load library and set seed
library(caret)

## Loading required package: ggplot2

## Loading required package: lattice

library(gbm)

## Loaded gbm 2.1.8

set.seed(998)

CompleteResponses <- read.csv("CompleteResponses.csv")

CompleteResponses$brand=as.factor(CompleteResponses$brand)

Incomplete <- read.csv("SurveyIncomplete.csv")

summary(CompleteResponses) #Prints the min, max, mean, median, and quartiles of each attribute.

##      salary      age      elevel      car
## Min.   : 20000   Min.   :20.00   Min.    :0.000   Min.    : 1.00
## 1st Qu.: 52082   1st Qu.:35.00   1st Qu.:1.000   1st Qu.: 6.00
## Median : 84950   Median :50.00   Median :2.000   Median :11.00
## Mean   : 84871   Mean    :49.78   Mean    :1.983   Mean    :10.52
## 3rd Qu.:117162   3rd Qu.:65.00   3rd Qu.:3.000   3rd Qu.:15.75
## Max.    :150000   Max.     :80.00   Max.     :4.000   Max.     :20.00
##      zipcode      credit      brand
## Min.   :0.000   Min.    :    0   0:3744
## 1st Qu.:2.000   1st Qu.:120807  1:6154
## Median :4.000   Median :250607
## Mean   :4.041   Mean    :249176
## 3rd Qu.:6.000   3rd Qu.:374640
## Max.    :8.000   Max.     :500000

str(CompleteResponses) #Displays the structure of your data set.
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```
## 'data.frame': 9898 obs. of 7 variables:
## $ salary : num 119807 106880 78021 63690 50874 ...
## $ age : int 45 63 23 51 20 56 24 62 29 41 ...
## $ elevel : int 0 1 0 3 3 3 4 3 4 1 ...
## $ car : int 14 11 15 6 14 14 8 3 17 5 ...
## $ zipcode: int 4 6 2 5 4 3 5 0 0 4 ...
## $ credit : num 442038 45007 48795 40889 352951 ...
## $ brand : Factor w/ 2 levels "0","1": 1 2 1 2 1 2 2 2 1 2 ...

names(CompleteResponses) #Names your attributes within your data set.

## [1] "salary" "age" "elevel" "car" "zipcode" "credit" "brand"

#create a 20% sample of the data
#data <- data[sample(1:nrow(data), 7000,replace=FALSE),]

# define an 75%/25% train/test split of the dataset
inTraining <- createDataPartition(CompleteResponses$brand, p = .75, list = FALSE)
training <- CompleteResponses[inTraining,]
testing <- CompleteResponses[-inTraining,]

#10 fold cross validation
fitControl <- trainControl(method = "repeatedcv", number = 10, repeats = 1)

## Here we include the First Algorithm: Stochastic Gradient Boosting (10-fold
# cross-validation and Automatic Tuning Grid)

#train model with a tuneLength = 5 (trains with 5 mtry value for Stochastic
#Gradient Boosting)
gmbFitm0 <- train(brand~., data = training, method = "gbm", trControl=fitControl, tuneLength = 5);

## Iter TrainDeviance ValidDeviance StepSize Improve
## 1 1.3001 nan 0.1000 0.0129
## 2 1.2781 nan 0.1000 0.0107
## 3 1.2598 nan 0.1000 0.0090
## 4 1.2438 nan 0.1000 0.0082
## 5 1.2299 nan 0.1000 0.0064
## 6 1.2188 nan 0.1000 0.0050
## 7 1.2071 nan 0.1000 0.0056
## 8 1.1988 nan 0.1000 0.0038
## 9 1.1918 nan 0.1000 0.0034
## 10 1.1825 nan 0.1000 0.0045
## 20 1.1252 nan 0.1000 0.0029
## 40 1.0709 nan 0.1000 0.0006
## 60 1.0457 nan 0.1000 0.0001
## 80 1.0332 nan 0.1000 0.0002
## 100 1.0279 nan 0.1000 0.0000
## 120 1.0245 nan 0.1000 -0.0001
## 140 1.0224 nan 0.1000 -0.0001
## 160 1.0207 nan 0.1000 -0.0002
## 180 1.0190 nan 0.1000 -0.0001
## 200 1.0182 nan 0.1000 -0.0001
## 220 1.0174 nan 0.1000 -0.0001
```

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##      240      1.0167      nan      0.1000     -0.0000
##      250      1.0164      nan      0.1000     -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      1.2907      nan      0.1000      0.0176
##      2      1.2597      nan      0.1000      0.0145
##      3      1.2328      nan      0.1000      0.0131
##      4      1.2073      nan      0.1000      0.0123
##      5      1.1860      nan      0.1000      0.0100
##      6      1.1684      nan      0.1000      0.0084
##      7      1.1530      nan      0.1000      0.0073
##      8      1.1402      nan      0.1000      0.0056
##      9      1.1280      nan      0.1000      0.0054
##     10      1.1181      nan      0.1000      0.0043
##     20      1.0378      nan      0.1000      0.0041
##     40      0.9189      nan      0.1000      0.0030
##     60      0.7722      nan      0.1000      0.0075
##     80      0.6922      nan      0.1000      0.0000
##    100      0.6293      nan      0.1000      0.0005
##    120      0.5713      nan      0.1000      0.0001
##    140      0.5351      nan      0.1000      0.0010
##    160      0.5171      nan      0.1000      0.0009
##    180      0.4954      nan      0.1000      0.0008
##    200      0.4743      nan      0.1000      0.0015
##    220      0.4599      nan      0.1000      0.0001
##    240      0.4508      nan      0.1000     -0.0001
##    250      0.4472      nan      0.1000     -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      1.2729      nan      0.1000      0.0275
##      2      1.2212      nan      0.1000      0.0249
##      3      1.1794      nan      0.1000      0.0203
##      4      1.1417      nan      0.1000      0.0178
##      5      1.1125      nan      0.1000      0.0144
##      6      1.0881      nan      0.1000      0.0116
##      7      1.0594      nan      0.1000      0.0138
##      8      1.0344      nan      0.1000      0.0123
##      9      1.0204      nan      0.1000      0.0070
##     10      1.0085      nan      0.1000      0.0057
##     20      0.8738      nan      0.1000      0.0058
##     40      0.7408      nan      0.1000      0.0038
##     60      0.6402      nan      0.1000      0.0059
##     80      0.5765      nan      0.1000     -0.0001
##    100      0.5185      nan      0.1000      0.0016
##    120      0.4728      nan      0.1000      0.0024
##    140      0.4355      nan      0.1000      0.0001
##    160      0.4032      nan      0.1000      0.0010
##    180      0.3914      nan      0.1000     -0.0001
##    200      0.3803      nan      0.1000      0.0006
##    220      0.3726      nan      0.1000     -0.0000
##    240      0.3606      nan      0.1000     -0.0001
##    250      0.3567      nan      0.1000      0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve

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##	1	1.2575	nan	0.1000	0.0328
##	2	1.2031	nan	0.1000	0.0270
##	3	1.1655	nan	0.1000	0.0186
##	4	1.1274	nan	0.1000	0.0194
##	5	1.0897	nan	0.1000	0.0185
##	6	1.0507	nan	0.1000	0.0185
##	7	1.0185	nan	0.1000	0.0153
##	8	0.9922	nan	0.1000	0.0120
##	9	0.9670	nan	0.1000	0.0119
##	10	0.9481	nan	0.1000	0.0092
##	20	0.7605	nan	0.1000	0.0057
##	40	0.5774	nan	0.1000	0.0092
##	60	0.5187	nan	0.1000	0.0020
##	80	0.4843	nan	0.1000	-0.0002
##	100	0.4700	nan	0.1000	-0.0000
##	120	0.4412	nan	0.1000	0.0006
##	140	0.4119	nan	0.1000	-0.0002
##	160	0.3817	nan	0.1000	0.0007
##	180	0.3687	nan	0.1000	-0.0002
##	200	0.3542	nan	0.1000	-0.0002
##	220	0.3445	nan	0.1000	-0.0001
##	240	0.3388	nan	0.1000	-0.0002
##	250	0.3332	nan	0.1000	0.0000

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2350	nan	0.1000	0.0452
##	2	1.1599	nan	0.1000	0.0370
##	3	1.1024	nan	0.1000	0.0291
##	4	1.0640	nan	0.1000	0.0189
##	5	1.0093	nan	0.1000	0.0267
##	6	0.9710	nan	0.1000	0.0190
##	7	0.9402	nan	0.1000	0.0149
##	8	0.9115	nan	0.1000	0.0142
##	9	0.8882	nan	0.1000	0.0112
##	10	0.8667	nan	0.1000	0.0102
##	20	0.6779	nan	0.1000	0.0062
##	40	0.5150	nan	0.1000	0.0001
##	60	0.4519	nan	0.1000	0.0030
##	80	0.4281	nan	0.1000	0.0002
##	100	0.4113	nan	0.1000	0.0000
##	120	0.3921	nan	0.1000	-0.0002
##	140	0.3751	nan	0.1000	-0.0001
##	160	0.3477	nan	0.1000	-0.0001
##	180	0.3323	nan	0.1000	0.0011
##	200	0.3197	nan	0.1000	-0.0000
##	220	0.3079	nan	0.1000	-0.0001
##	240	0.2957	nan	0.1000	0.0002
##	250	0.2893	nan	0.1000	-0.0002

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2991	nan	0.1000	0.0128
##	2	1.2772	nan	0.1000	0.0113
##	3	1.2590	nan	0.1000	0.0084
##	4	1.2419	nan	0.1000	0.0085

##	5	1.2283	nan	0.1000	0.0066
##	6	1.2166	nan	0.1000	0.0054
##	7	1.2066	nan	0.1000	0.0045
##	8	1.1955	nan	0.1000	0.0050
##	9	1.1879	nan	0.1000	0.0033
##	10	1.1803	nan	0.1000	0.0032
##	20	1.1241	nan	0.1000	0.0013
##	40	1.0625	nan	0.1000	0.0005
##	60	1.0373	nan	0.1000	0.0002
##	80	1.0260	nan	0.1000	0.0000
##	100	1.0212	nan	0.1000	-0.0001
##	120	1.0179	nan	0.1000	-0.0001
##	140	1.0151	nan	0.1000	-0.0001
##	160	1.0136	nan	0.1000	-0.0001
##	180	1.0128	nan	0.1000	-0.0001
##	200	1.0120	nan	0.1000	-0.0001
##	220	1.0107	nan	0.1000	-0.0001
##	240	1.0102	nan	0.1000	-0.0001
##	250	1.0100	nan	0.1000	-0.0001

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2893	nan	0.1000	0.0185
##	2	1.2580	nan	0.1000	0.0153
##	3	1.2294	nan	0.1000	0.0133
##	4	1.2041	nan	0.1000	0.0124
##	5	1.1821	nan	0.1000	0.0105
##	6	1.1629	nan	0.1000	0.0084
##	7	1.1460	nan	0.1000	0.0075
##	8	1.1322	nan	0.1000	0.0069
##	9	1.1206	nan	0.1000	0.0059
##	10	1.1098	nan	0.1000	0.0047
##	20	1.0328	nan	0.1000	0.0027
##	40	0.9020	nan	0.1000	0.0122
##	60	0.7186	nan	0.1000	0.0034
##	80	0.6434	nan	0.1000	0.0025
##	100	0.5865	nan	0.1000	0.0020
##	120	0.5422	nan	0.1000	-0.0000
##	140	0.5268	nan	0.1000	-0.0000
##	160	0.5175	nan	0.1000	-0.0001
##	180	0.4997	nan	0.1000	-0.0002
##	200	0.4839	nan	0.1000	-0.0000
##	220	0.4717	nan	0.1000	-0.0001
##	240	0.4577	nan	0.1000	-0.0001
##	250	0.4499	nan	0.1000	0.0000

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2686	nan	0.1000	0.0290
##	2	1.2216	nan	0.1000	0.0228
##	3	1.1745	nan	0.1000	0.0229
##	4	1.1467	nan	0.1000	0.0140
##	5	1.1162	nan	0.1000	0.0145
##	6	1.0841	nan	0.1000	0.0156
##	7	1.0593	nan	0.1000	0.0125
##	8	1.0361	nan	0.1000	0.0112

##	9	1.0169	nan	0.1000	0.0094
##	10	1.0038	nan	0.1000	0.0065
##	20	0.8540	nan	0.1000	0.0026
##	40	0.7200	nan	0.1000	0.0016
##	60	0.6162	nan	0.1000	0.0071
##	80	0.5463	nan	0.1000	0.0023
##	100	0.4930	nan	0.1000	-0.0000
##	120	0.4468	nan	0.1000	0.0016
##	140	0.4291	nan	0.1000	-0.0001
##	160	0.4009	nan	0.1000	0.0002
##	180	0.3881	nan	0.1000	-0.0002
##	200	0.3759	nan	0.1000	-0.0000
##	220	0.3661	nan	0.1000	-0.0000
##	240	0.3557	nan	0.1000	0.0003
##	250	0.3529	nan	0.1000	-0.0001

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2588	nan	0.1000	0.0325
##	2	1.2048	nan	0.1000	0.0269
##	3	1.1603	nan	0.1000	0.0218
##	4	1.1181	nan	0.1000	0.0208
##	5	1.0891	nan	0.1000	0.0143
##	6	1.0596	nan	0.1000	0.0139
##	7	1.0378	nan	0.1000	0.0103
##	8	1.0067	nan	0.1000	0.0154
##	9	0.9789	nan	0.1000	0.0138
##	10	0.9546	nan	0.1000	0.0116
##	20	0.7931	nan	0.1000	0.0039
##	40	0.6285	nan	0.1000	0.0032
##	60	0.5726	nan	0.1000	0.0000
##	80	0.5198	nan	0.1000	0.0008
##	100	0.4769	nan	0.1000	0.0018
##	120	0.4184	nan	0.1000	-0.0001
##	140	0.3918	nan	0.1000	-0.0000
##	160	0.3667	nan	0.1000	-0.0001
##	180	0.3486	nan	0.1000	0.0009
##	200	0.3358	nan	0.1000	0.0007
##	220	0.3255	nan	0.1000	-0.0001
##	240	0.3157	nan	0.1000	-0.0002
##	250	0.3134	nan	0.1000	-0.0001

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2327	nan	0.1000	0.0462
##	2	1.1571	nan	0.1000	0.0371
##	3	1.1027	nan	0.1000	0.0266
##	4	1.0595	nan	0.1000	0.0205
##	5	1.0057	nan	0.1000	0.0258
##	6	0.9662	nan	0.1000	0.0192
##	7	0.9307	nan	0.1000	0.0176
##	8	0.8930	nan	0.1000	0.0181
##	9	0.8584	nan	0.1000	0.0161
##	10	0.8320	nan	0.1000	0.0129
##	20	0.6462	nan	0.1000	0.0056
##	40	0.4930	nan	0.1000	0.0014

##	60	0.4207	nan	0.1000	-0.0001
##	80	0.3923	nan	0.1000	-0.0000
##	100	0.3734	nan	0.1000	-0.0001
##	120	0.3527	nan	0.1000	0.0000
##	140	0.3356	nan	0.1000	-0.0000
##	160	0.3238	nan	0.1000	-0.0002
##	180	0.3122	nan	0.1000	-0.0001
##	200	0.3019	nan	0.1000	-0.0001
##	220	0.2918	nan	0.1000	-0.0002
##	240	0.2847	nan	0.1000	-0.0001
##	250	0.2811	nan	0.1000	-0.0001

##

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.3003	nan	0.1000	0.0134
##	2	1.2786	nan	0.1000	0.0108
##	3	1.2617	nan	0.1000	0.0084
##	4	1.2449	nan	0.1000	0.0086
##	5	1.2300	nan	0.1000	0.0073
##	6	1.2182	nan	0.1000	0.0055
##	7	1.2065	nan	0.1000	0.0057
##	8	1.1964	nan	0.1000	0.0047
##	9	1.1888	nan	0.1000	0.0035
##	10	1.1824	nan	0.1000	0.0029
##	20	1.1219	nan	0.1000	0.0020
##	40	1.0631	nan	0.1000	0.0008
##	60	1.0372	nan	0.1000	0.0009
##	80	1.0268	nan	0.1000	-0.0000
##	100	1.0197	nan	0.1000	-0.0000
##	120	1.0160	nan	0.1000	-0.0001
##	140	1.0136	nan	0.1000	-0.0001
##	160	1.0126	nan	0.1000	-0.0001
##	180	1.0116	nan	0.1000	-0.0000
##	200	1.0106	nan	0.1000	-0.0001
##	220	1.0092	nan	0.1000	-0.0001
##	240	1.0086	nan	0.1000	-0.0003
##	250	1.0083	nan	0.1000	-0.0001

##

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2894	nan	0.1000	0.0184
##	2	1.2576	nan	0.1000	0.0152
##	3	1.2293	nan	0.1000	0.0135
##	4	1.2039	nan	0.1000	0.0120
##	5	1.1838	nan	0.1000	0.0100
##	6	1.1636	nan	0.1000	0.0093
##	7	1.1480	nan	0.1000	0.0074
##	8	1.1337	nan	0.1000	0.0068
##	9	1.1215	nan	0.1000	0.0058
##	10	1.1118	nan	0.1000	0.0045
##	20	1.0349	nan	0.1000	0.0038
##	40	0.9373	nan	0.1000	0.0047
##	60	0.8024	nan	0.1000	0.0066
##	80	0.6753	nan	0.1000	0.0017
##	100	0.6266	nan	0.1000	0.0002
##	120	0.5667	nan	0.1000	0.0013

##	140	0.5283	nan	0.1000	0.0001
##	160	0.5121	nan	0.1000	-0.0001
##	180	0.4902	nan	0.1000	0.0014
##	200	0.4753	nan	0.1000	-0.0001
##	220	0.4637	nan	0.1000	0.0003
##	240	0.4538	nan	0.1000	0.0005
##	250	0.4453	nan	0.1000	0.0004
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2687	nan	0.1000	0.0285
##	2	1.2261	nan	0.1000	0.0211
##	3	1.1825	nan	0.1000	0.0217
##	4	1.1455	nan	0.1000	0.0177
##	5	1.1150	nan	0.1000	0.0147
##	6	1.0904	nan	0.1000	0.0118
##	7	1.0672	nan	0.1000	0.0113
##	8	1.0395	nan	0.1000	0.0135
##	9	1.0243	nan	0.1000	0.0075
##	10	1.0032	nan	0.1000	0.0099
##	20	0.8672	nan	0.1000	0.0021
##	40	0.7382	nan	0.1000	0.0006
##	60	0.6573	nan	0.1000	0.0087
##	80	0.5758	nan	0.1000	-0.0002
##	100	0.5197	nan	0.1000	0.0007
##	120	0.4649	nan	0.1000	0.0031
##	140	0.4358	nan	0.1000	-0.0001
##	160	0.4193	nan	0.1000	-0.0002
##	180	0.4053	nan	0.1000	-0.0001
##	200	0.3845	nan	0.1000	-0.0002
##	220	0.3726	nan	0.1000	-0.0003
##	240	0.3585	nan	0.1000	-0.0001
##	250	0.3533	nan	0.1000	-0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2628	nan	0.1000	0.0319
##	2	1.2070	nan	0.1000	0.0278
##	3	1.1600	nan	0.1000	0.0236
##	4	1.1240	nan	0.1000	0.0176
##	5	1.0884	nan	0.1000	0.0181
##	6	1.0529	nan	0.1000	0.0171
##	7	1.0195	nan	0.1000	0.0162
##	8	0.9936	nan	0.1000	0.0126
##	9	0.9733	nan	0.1000	0.0098
##	10	0.9536	nan	0.1000	0.0095
##	20	0.7821	nan	0.1000	0.0075
##	40	0.6256	nan	0.1000	0.0010
##	60	0.5482	nan	0.1000	0.0003
##	80	0.4832	nan	0.1000	-0.0001
##	100	0.4523	nan	0.1000	0.0007
##	120	0.4044	nan	0.1000	0.0002
##	140	0.3716	nan	0.1000	0.0013
##	160	0.3575	nan	0.1000	0.0004
##	180	0.3477	nan	0.1000	-0.0003
##	200	0.3366	nan	0.1000	-0.0001


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##      220      0.3272      nan      0.1000     -0.0001
##      240      0.3171      nan      0.1000     -0.0001
##      250      0.3139      nan      0.1000     -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      1.2488      nan      0.1000     0.0389
##      2      1.1659      nan      0.1000     0.0407
##      3      1.1136      nan      0.1000     0.0255
##      4      1.0532      nan      0.1000     0.0296
##      5      1.0072      nan      0.1000     0.0219
##      6      0.9748      nan      0.1000     0.0158
##      7      0.9333      nan      0.1000     0.0207
##      8      0.9122      nan      0.1000     0.0103
##      9      0.8817      nan      0.1000     0.0154
##     10      0.8594      nan      0.1000     0.0103
##     20      0.6724      nan      0.1000     0.0108
##     40      0.5107      nan      0.1000     0.0005
##     60      0.4505      nan      0.1000     0.0008
##     80      0.4307      nan      0.1000     0.0005
##    100      0.4107      nan      0.1000     0.0027
##    120      0.3897      nan      0.1000    -0.0002
##    140      0.3686      nan      0.1000     0.0000
##    160      0.3479      nan      0.1000     0.0005
##    180      0.3299      nan      0.1000    -0.0002
##    200      0.3218      nan      0.1000    -0.0003
##    220      0.3126      nan      0.1000    -0.0001
##    240      0.3014      nan      0.1000    -0.0001
##    250      0.2985      nan      0.1000    -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      1.2994      nan      0.1000     0.0129
##      2      1.2769      nan      0.1000     0.0107
##      3      1.2587      nan      0.1000     0.0091
##      4      1.2431      nan      0.1000     0.0078
##      5      1.2300      nan      0.1000     0.0059
##      6      1.2170      nan      0.1000     0.0064
##      7      1.2056      nan      0.1000     0.0057
##      8      1.1957      nan      0.1000     0.0047
##      9      1.1885      nan      0.1000     0.0033
##     10      1.1801      nan      0.1000     0.0039
##     20      1.1245      nan      0.1000     0.0014
##     40      1.0652      nan      0.1000     0.0005
##     60      1.0389      nan      0.1000     0.0002
##     80      1.0279      nan      0.1000     0.0001
##    100      1.0224      nan      0.1000    -0.0000
##    120      1.0182      nan      0.1000    -0.0000
##    140      1.0158      nan      0.1000    -0.0000
##    160      1.0148      nan      0.1000    -0.0001
##    180      1.0137      nan      0.1000    -0.0000
##    200      1.0127      nan      0.1000    -0.0001
##    220      1.0118      nan      0.1000    -0.0002
##    240      1.0109      nan      0.1000    -0.0001
##    250      1.0105      nan      0.1000    -0.0002
##

```

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2885	nan	0.1000	0.0180
##	2	1.2586	nan	0.1000	0.0151
##	3	1.2291	nan	0.1000	0.0143
##	4	1.2065	nan	0.1000	0.0109
##	5	1.1859	nan	0.1000	0.0100
##	6	1.1670	nan	0.1000	0.0093
##	7	1.1512	nan	0.1000	0.0076
##	8	1.1374	nan	0.1000	0.0068
##	9	1.1256	nan	0.1000	0.0058
##	10	1.1143	nan	0.1000	0.0052
##	20	1.0375	nan	0.1000	0.0021
##	40	0.8870	nan	0.1000	0.0010
##	60	0.7436	nan	0.1000	0.0044
##	80	0.6945	nan	0.1000	0.0002
##	100	0.6343	nan	0.1000	0.0044
##	120	0.5841	nan	0.1000	0.0009
##	140	0.5501	nan	0.1000	-0.0001
##	160	0.5300	nan	0.1000	-0.0001
##	180	0.5124	nan	0.1000	0.0002
##	200	0.4880	nan	0.1000	-0.0002
##	220	0.4636	nan	0.1000	-0.0000
##	240	0.4505	nan	0.1000	0.0007
##	250	0.4476	nan	0.1000	-0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2705	nan	0.1000	0.0273
##	2	1.2226	nan	0.1000	0.0231
##	3	1.1797	nan	0.1000	0.0217
##	4	1.1443	nan	0.1000	0.0172
##	5	1.1144	nan	0.1000	0.0144
##	6	1.0860	nan	0.1000	0.0143
##	7	1.0577	nan	0.1000	0.0135
##	8	1.0400	nan	0.1000	0.0083
##	9	1.0252	nan	0.1000	0.0073
##	10	1.0082	nan	0.1000	0.0080
##	20	0.8859	nan	0.1000	0.0024
##	40	0.7339	nan	0.1000	0.0008
##	60	0.6280	nan	0.1000	-0.0000
##	80	0.5732	nan	0.1000	0.0025
##	100	0.5525	nan	0.1000	-0.0001
##	120	0.5004	nan	0.1000	-0.0001
##	140	0.4678	nan	0.1000	0.0001
##	160	0.4344	nan	0.1000	0.0015
##	180	0.4109	nan	0.1000	0.0015
##	200	0.3976	nan	0.1000	-0.0001
##	220	0.3864	nan	0.1000	-0.0001
##	240	0.3764	nan	0.1000	-0.0001
##	250	0.3724	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2678	nan	0.1000	0.0286
##	2	1.2090	nan	0.1000	0.0290
##	3	1.1649	nan	0.1000	0.0215

##	4	1.1252	nan	0.1000	0.0198
##	5	1.0914	nan	0.1000	0.0171
##	6	1.0445	nan	0.1000	0.0221
##	7	1.0092	nan	0.1000	0.0173
##	8	0.9770	nan	0.1000	0.0158
##	9	0.9482	nan	0.1000	0.0141
##	10	0.9292	nan	0.1000	0.0093
##	20	0.7812	nan	0.1000	0.0021
##	40	0.6523	nan	0.1000	0.0062
##	60	0.5738	nan	0.1000	0.0032
##	80	0.5393	nan	0.1000	-0.0001
##	100	0.4992	nan	0.1000	0.0008
##	120	0.4492	nan	0.1000	-0.0003
##	140	0.4025	nan	0.1000	0.0018
##	160	0.3891	nan	0.1000	0.0005
##	180	0.3757	nan	0.1000	-0.0001
##	200	0.3539	nan	0.1000	0.0005
##	220	0.3404	nan	0.1000	0.0006
##	240	0.3260	nan	0.1000	-0.0002
##	250	0.3236	nan	0.1000	-0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2523	nan	0.1000	0.0374
##	2	1.1896	nan	0.1000	0.0306
##	3	1.1170	nan	0.1000	0.0353
##	4	1.0570	nan	0.1000	0.0286
##	5	1.0178	nan	0.1000	0.0186
##	6	0.9722	nan	0.1000	0.0218
##	7	0.9368	nan	0.1000	0.0167
##	8	0.8991	nan	0.1000	0.0188
##	9	0.8732	nan	0.1000	0.0127
##	10	0.8449	nan	0.1000	0.0142
##	20	0.6614	nan	0.1000	0.0053
##	40	0.5053	nan	0.1000	0.0002
##	60	0.4474	nan	0.1000	-0.0001
##	80	0.4123	nan	0.1000	-0.0003
##	100	0.3873	nan	0.1000	-0.0001
##	120	0.3709	nan	0.1000	-0.0002
##	140	0.3499	nan	0.1000	0.0006
##	160	0.3394	nan	0.1000	0.0001
##	180	0.3263	nan	0.1000	-0.0001
##	200	0.3153	nan	0.1000	-0.0001
##	220	0.3072	nan	0.1000	0.0000
##	240	0.2981	nan	0.1000	-0.0001
##	250	0.2947	nan	0.1000	-0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2999	nan	0.1000	0.0133
##	2	1.2776	nan	0.1000	0.0112
##	3	1.2584	nan	0.1000	0.0092
##	4	1.2417	nan	0.1000	0.0085
##	5	1.2270	nan	0.1000	0.0072
##	6	1.2153	nan	0.1000	0.0054
##	7	1.2050	nan	0.1000	0.0048

##	8	1.1944	nan	0.1000	0.0052
##	9	1.1868	nan	0.1000	0.0035
##	10	1.1789	nan	0.1000	0.0040
##	20	1.1169	nan	0.1000	0.0018
##	40	1.0591	nan	0.1000	0.0007
##	60	1.0321	nan	0.1000	0.0002
##	80	1.0193	nan	0.1000	0.0006
##	100	1.0136	nan	0.1000	-0.0001
##	120	1.0100	nan	0.1000	-0.0001
##	140	1.0089	nan	0.1000	-0.0001
##	160	1.0067	nan	0.1000	-0.0000
##	180	1.0061	nan	0.1000	-0.0001
##	200	1.0052	nan	0.1000	-0.0001
##	220	1.0043	nan	0.1000	-0.0002
##	240	1.0033	nan	0.1000	-0.0002
##	250	1.0023	nan	0.1000	0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2880	nan	0.1000	0.0185
##	2	1.2524	nan	0.1000	0.0169
##	3	1.2256	nan	0.1000	0.0135
##	4	1.2004	nan	0.1000	0.0122
##	5	1.1798	nan	0.1000	0.0104
##	6	1.1617	nan	0.1000	0.0082
##	7	1.1461	nan	0.1000	0.0072
##	8	1.1297	nan	0.1000	0.0072
##	9	1.1170	nan	0.1000	0.0056
##	10	1.1063	nan	0.1000	0.0051
##	20	1.0320	nan	0.1000	0.0031
##	40	0.9095	nan	0.1000	0.0001
##	60	0.7417	nan	0.1000	0.0003
##	80	0.6660	nan	0.1000	0.0047
##	100	0.6055	nan	0.1000	0.0004
##	120	0.5472	nan	0.1000	0.0004
##	140	0.5249	nan	0.1000	0.0001
##	160	0.5173	nan	0.1000	-0.0001
##	180	0.5039	nan	0.1000	0.0009
##	200	0.4893	nan	0.1000	-0.0001
##	220	0.4759	nan	0.1000	0.0005
##	240	0.4611	nan	0.1000	-0.0000
##	250	0.4528	nan	0.1000	0.0003
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2686	nan	0.1000	0.0283
##	2	1.2176	nan	0.1000	0.0252
##	3	1.1743	nan	0.1000	0.0210
##	4	1.1336	nan	0.1000	0.0196
##	5	1.1047	nan	0.1000	0.0148
##	6	1.0738	nan	0.1000	0.0152
##	7	1.0492	nan	0.1000	0.0114
##	8	1.0240	nan	0.1000	0.0117
##	9	1.0045	nan	0.1000	0.0092
##	10	0.9913	nan	0.1000	0.0068
##	20	0.8535	nan	0.1000	0.0028

##	40	0.7361	nan	0.1000	0.0024
##	60	0.6167	nan	0.1000	0.0027
##	80	0.5719	nan	0.1000	-0.0001
##	100	0.5186	nan	0.1000	0.0031
##	120	0.4921	nan	0.1000	-0.0002
##	140	0.4505	nan	0.1000	0.0007
##	160	0.4241	nan	0.1000	0.0015
##	180	0.4117	nan	0.1000	-0.0001
##	200	0.3948	nan	0.1000	0.0000
##	220	0.3830	nan	0.1000	-0.0001
##	240	0.3689	nan	0.1000	0.0004
##	250	0.3665	nan	0.1000	-0.0001

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2595	nan	0.1000	0.0334
##	2	1.2061	nan	0.1000	0.0262
##	3	1.1604	nan	0.1000	0.0224
##	4	1.1173	nan	0.1000	0.0206
##	5	1.0832	nan	0.1000	0.0162
##	6	1.0546	nan	0.1000	0.0134
##	7	1.0248	nan	0.1000	0.0151
##	8	0.9957	nan	0.1000	0.0142
##	9	0.9673	nan	0.1000	0.0135
##	10	0.9425	nan	0.1000	0.0120
##	20	0.7760	nan	0.1000	0.0049
##	40	0.6183	nan	0.1000	0.0010
##	60	0.5362	nan	0.1000	0.0032
##	80	0.4693	nan	0.1000	0.0006
##	100	0.4266	nan	0.1000	-0.0002
##	120	0.3942	nan	0.1000	0.0012
##	140	0.3783	nan	0.1000	0.0000
##	160	0.3624	nan	0.1000	-0.0001
##	180	0.3527	nan	0.1000	-0.0001
##	200	0.3439	nan	0.1000	0.0003
##	220	0.3342	nan	0.1000	-0.0002
##	240	0.3224	nan	0.1000	-0.0002
##	250	0.3189	nan	0.1000	-0.0003

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2517	nan	0.1000	0.0367
##	2	1.1879	nan	0.1000	0.0312
##	3	1.1367	nan	0.1000	0.0256
##	4	1.0698	nan	0.1000	0.0330
##	5	1.0165	nan	0.1000	0.0259
##	6	0.9811	nan	0.1000	0.0178
##	7	0.9376	nan	0.1000	0.0212
##	8	0.9114	nan	0.1000	0.0129
##	9	0.8870	nan	0.1000	0.0116
##	10	0.8533	nan	0.1000	0.0166
##	20	0.6598	nan	0.1000	0.0082
##	40	0.4993	nan	0.1000	0.0016
##	60	0.4439	nan	0.1000	0.0002
##	80	0.4122	nan	0.1000	0.0019
##	100	0.3953	nan	0.1000	0.0000

##	120	0.3714	nan	0.1000	0.0000
##	140	0.3544	nan	0.1000	-0.0001
##	160	0.3377	nan	0.1000	-0.0002
##	180	0.3238	nan	0.1000	-0.0001
##	200	0.3144	nan	0.1000	0.0001
##	220	0.3055	nan	0.1000	-0.0001
##	240	0.2959	nan	0.1000	-0.0001
##	250	0.2917	nan	0.1000	0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2997	nan	0.1000	0.0133
##	2	1.2763	nan	0.1000	0.0111
##	3	1.2568	nan	0.1000	0.0092
##	4	1.2411	nan	0.1000	0.0078
##	5	1.2271	nan	0.1000	0.0069
##	6	1.2152	nan	0.1000	0.0053
##	7	1.2043	nan	0.1000	0.0051
##	8	1.1939	nan	0.1000	0.0050
##	9	1.1859	nan	0.1000	0.0040
##	10	1.1764	nan	0.1000	0.0047
##	20	1.1202	nan	0.1000	0.0013
##	40	1.0583	nan	0.1000	0.0006
##	60	1.0305	nan	0.1000	0.0002
##	80	1.0199	nan	0.1000	-0.0001
##	100	1.0142	nan	0.1000	-0.0001
##	120	1.0100	nan	0.1000	-0.0001
##	140	1.0079	nan	0.1000	-0.0001
##	160	1.0070	nan	0.1000	-0.0002
##	180	1.0062	nan	0.1000	-0.0000
##	200	1.0049	nan	0.1000	-0.0001
##	220	1.0040	nan	0.1000	-0.0001
##	240	1.0028	nan	0.1000	-0.0001
##	250	1.0024	nan	0.1000	-0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2879	nan	0.1000	0.0189
##	2	1.2552	nan	0.1000	0.0159
##	3	1.2269	nan	0.1000	0.0141
##	4	1.1992	nan	0.1000	0.0127
##	5	1.1787	nan	0.1000	0.0098
##	6	1.1602	nan	0.1000	0.0091
##	7	1.1445	nan	0.1000	0.0078
##	8	1.1310	nan	0.1000	0.0064
##	9	1.1173	nan	0.1000	0.0064
##	10	1.1052	nan	0.1000	0.0052
##	20	1.0307	nan	0.1000	0.0021
##	40	0.8927	nan	0.1000	0.0081
##	60	0.7764	nan	0.1000	-0.0000
##	80	0.6821	nan	0.1000	0.0001
##	100	0.6058	nan	0.1000	0.0029
##	120	0.5611	nan	0.1000	-0.0001
##	140	0.5219	nan	0.1000	0.0001
##	160	0.4814	nan	0.1000	-0.0001
##	180	0.4583	nan	0.1000	0.0005

##	200	0.4475	nan	0.1000	0.0006
##	220	0.4339	nan	0.1000	-0.0000
##	240	0.4232	nan	0.1000	-0.0001
##	250	0.4222	nan	0.1000	-0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2682	nan	0.1000	0.0286
##	2	1.2165	nan	0.1000	0.0258
##	3	1.1748	nan	0.1000	0.0203
##	4	1.1367	nan	0.1000	0.0183
##	5	1.1071	nan	0.1000	0.0140
##	6	1.0758	nan	0.1000	0.0156
##	7	1.0564	nan	0.1000	0.0093
##	8	1.0342	nan	0.1000	0.0106
##	9	1.0197	nan	0.1000	0.0071
##	10	0.9981	nan	0.1000	0.0105
##	20	0.8772	nan	0.1000	0.0078
##	40	0.7249	nan	0.1000	0.0051
##	60	0.6365	nan	0.1000	-0.0002
##	80	0.5730	nan	0.1000	0.0076
##	100	0.4881	nan	0.1000	0.0021
##	120	0.4453	nan	0.1000	0.0025
##	140	0.4183	nan	0.1000	0.0007
##	160	0.4064	nan	0.1000	0.0001
##	180	0.3884	nan	0.1000	-0.0001
##	200	0.3810	nan	0.1000	-0.0002
##	220	0.3672	nan	0.1000	-0.0002
##	240	0.3542	nan	0.1000	-0.0000
##	250	0.3482	nan	0.1000	0.0005
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2610	nan	0.1000	0.0318
##	2	1.2109	nan	0.1000	0.0243
##	3	1.1596	nan	0.1000	0.0248
##	4	1.1147	nan	0.1000	0.0217
##	5	1.0816	nan	0.1000	0.0163
##	6	1.0428	nan	0.1000	0.0188
##	7	1.0172	nan	0.1000	0.0125
##	8	0.9885	nan	0.1000	0.0143
##	9	0.9674	nan	0.1000	0.0103
##	10	0.9476	nan	0.1000	0.0098
##	20	0.7869	nan	0.1000	0.0046
##	40	0.6401	nan	0.1000	0.0026
##	60	0.5076	nan	0.1000	0.0003
##	80	0.4406	nan	0.1000	0.0010
##	100	0.4093	nan	0.1000	0.0018
##	120	0.3887	nan	0.1000	0.0002
##	140	0.3711	nan	0.1000	0.0005
##	160	0.3551	nan	0.1000	-0.0000
##	180	0.3405	nan	0.1000	-0.0001
##	200	0.3322	nan	0.1000	-0.0001
##	220	0.3244	nan	0.1000	-0.0002
##	240	0.3160	nan	0.1000	-0.0000
##	250	0.3100	nan	0.1000	0.0000

```

##
## Iter    TrainDeviance    ValidDeviance    StepSize    Improve
##      1         1.2313           nan        0.1000     0.0467
##      2         1.1664           nan        0.1000     0.0319
##      3         1.1142           nan        0.1000     0.0252
##      4         1.0544           nan        0.1000     0.0300
##      5         1.0151           nan        0.1000     0.0187
##      6         0.9654           nan        0.1000     0.0237
##      7         0.9289           nan        0.1000     0.0175
##      8         0.8890           nan        0.1000     0.0195
##      9         0.8632           nan        0.1000     0.0132
##     10         0.8303           nan        0.1000     0.0151
##     20         0.6424           nan        0.1000     0.0045
##     40         0.4854           nan        0.1000    -0.0000
##     60         0.4248           nan        0.1000    -0.0001
##     80         0.3970           nan        0.1000    -0.0001
##    100         0.3622           nan        0.1000     0.0001
##    120         0.3444           nan        0.1000    -0.0001
##    140         0.3261           nan        0.1000     0.0001
##    160         0.3179           nan        0.1000    -0.0002
##    180         0.3100           nan        0.1000    -0.0001
##    200         0.3030           nan        0.1000     0.0001
##    220         0.2936           nan        0.1000     0.0003
##    240         0.2857           nan        0.1000    -0.0003
##    250         0.2817           nan        0.1000    -0.0002
##
## Iter    TrainDeviance    ValidDeviance    StepSize    Improve
##      1         1.3003           nan        0.1000     0.0127
##      2         1.2793           nan        0.1000     0.0109
##      3         1.2617           nan        0.1000     0.0088
##      4         1.2450           nan        0.1000     0.0080
##      5         1.2327           nan        0.1000     0.0063
##      6         1.2197           nan        0.1000     0.0065
##      7         1.2107           nan        0.1000     0.0045
##      8         1.2034           nan        0.1000     0.0034
##      9         1.1944           nan        0.1000     0.0042
##     10         1.1880           nan        0.1000     0.0029
##     20         1.1279           nan        0.1000     0.0014
##     40         1.0669           nan        0.1000     0.0005
##     60         1.0409           nan        0.1000     0.0011
##     80         1.0286           nan        0.1000    -0.0000
##    100         1.0222           nan        0.1000    -0.0001
##    120         1.0184           nan        0.1000     0.0001
##    140         1.0166           nan        0.1000    -0.0001
##    160         1.0155           nan        0.1000    -0.0001
##    180         1.0148           nan        0.1000    -0.0001
##    200         1.0133           nan        0.1000    -0.0001
##    220         1.0118           nan        0.1000    -0.0001
##    240         1.0109           nan        0.1000    -0.0000
##    250         1.0106           nan        0.1000    -0.0001
##
## Iter    TrainDeviance    ValidDeviance    StepSize    Improve
##      1         1.2904           nan        0.1000     0.0183
##      2         1.2591           nan        0.1000     0.0152

```


##	3	1.2302	nan	0.1000	0.0144
##	4	1.2067	nan	0.1000	0.0115
##	5	1.1864	nan	0.1000	0.0096
##	6	1.1703	nan	0.1000	0.0080
##	7	1.1526	nan	0.1000	0.0083
##	8	1.1384	nan	0.1000	0.0066
##	9	1.1267	nan	0.1000	0.0056
##	10	1.1151	nan	0.1000	0.0048
##	20	1.0385	nan	0.1000	0.0021
##	40	0.9129	nan	0.1000	0.0084
##	60	0.7610	nan	0.1000	0.0048
##	80	0.6846	nan	0.1000	-0.0000
##	100	0.6121	nan	0.1000	0.0015
##	120	0.5523	nan	0.1000	0.0010
##	140	0.5217	nan	0.1000	0.0010
##	160	0.5053	nan	0.1000	-0.0001
##	180	0.4842	nan	0.1000	-0.0001
##	200	0.4739	nan	0.1000	-0.0001
##	220	0.4638	nan	0.1000	0.0004
##	240	0.4521	nan	0.1000	-0.0001
##	250	0.4501	nan	0.1000	-0.0002

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2708	nan	0.1000	0.0279
##	2	1.2209	nan	0.1000	0.0241
##	3	1.1781	nan	0.1000	0.0210
##	4	1.1406	nan	0.1000	0.0181
##	5	1.1081	nan	0.1000	0.0163
##	6	1.0812	nan	0.1000	0.0125
##	7	1.0535	nan	0.1000	0.0137
##	8	1.0302	nan	0.1000	0.0112
##	9	1.0166	nan	0.1000	0.0065
##	10	0.9955	nan	0.1000	0.0098
##	20	0.8809	nan	0.1000	0.0024
##	40	0.7487	nan	0.1000	0.0047
##	60	0.6484	nan	0.1000	0.0080
##	80	0.5826	nan	0.1000	-0.0002
##	100	0.5171	nan	0.1000	-0.0001
##	120	0.4700	nan	0.1000	0.0000
##	140	0.4174	nan	0.1000	0.0001
##	160	0.3956	nan	0.1000	-0.0001
##	180	0.3776	nan	0.1000	0.0012
##	200	0.3676	nan	0.1000	-0.0001
##	220	0.3582	nan	0.1000	-0.0000
##	240	0.3499	nan	0.1000	0.0005
##	250	0.3452	nan	0.1000	-0.0001

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2624	nan	0.1000	0.0317
##	2	1.1995	nan	0.1000	0.0317
##	3	1.1516	nan	0.1000	0.0237
##	4	1.1105	nan	0.1000	0.0203
##	5	1.0739	nan	0.1000	0.0175
##	6	1.0392	nan	0.1000	0.0169

##	7	1.0145	nan	0.1000	0.0119
##	8	0.9865	nan	0.1000	0.0137
##	9	0.9665	nan	0.1000	0.0097
##	10	0.9500	nan	0.1000	0.0077
##	20	0.7976	nan	0.1000	0.0065
##	40	0.6204	nan	0.1000	0.0024
##	60	0.5640	nan	0.1000	-0.0001
##	80	0.4986	nan	0.1000	-0.0001
##	100	0.4502	nan	0.1000	-0.0001
##	120	0.4293	nan	0.1000	0.0000
##	140	0.4058	nan	0.1000	0.0002
##	160	0.3786	nan	0.1000	0.0016
##	180	0.3604	nan	0.1000	-0.0000
##	200	0.3508	nan	0.1000	0.0009
##	220	0.3340	nan	0.1000	0.0006
##	240	0.3228	nan	0.1000	-0.0000
##	250	0.3187	nan	0.1000	0.0002

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2486	nan	0.1000	0.0377
##	2	1.1865	nan	0.1000	0.0304
##	3	1.1310	nan	0.1000	0.0272
##	4	1.0915	nan	0.1000	0.0193
##	5	1.0306	nan	0.1000	0.0290
##	6	0.9788	nan	0.1000	0.0251
##	7	0.9350	nan	0.1000	0.0212
##	8	0.9010	nan	0.1000	0.0164
##	9	0.8678	nan	0.1000	0.0160
##	10	0.8373	nan	0.1000	0.0145
##	20	0.6616	nan	0.1000	0.0045
##	40	0.4975	nan	0.1000	-0.0000
##	60	0.4427	nan	0.1000	0.0005
##	80	0.4099	nan	0.1000	0.0000
##	100	0.3905	nan	0.1000	0.0019
##	120	0.3744	nan	0.1000	0.0002
##	140	0.3560	nan	0.1000	-0.0001
##	160	0.3454	nan	0.1000	0.0011
##	180	0.3298	nan	0.1000	-0.0001
##	200	0.3209	nan	0.1000	-0.0001
##	220	0.3089	nan	0.1000	-0.0001
##	240	0.2999	nan	0.1000	-0.0001
##	250	0.2959	nan	0.1000	-0.0001

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2999	nan	0.1000	0.0128
##	2	1.2783	nan	0.1000	0.0107
##	3	1.2603	nan	0.1000	0.0087
##	4	1.2435	nan	0.1000	0.0080
##	5	1.2290	nan	0.1000	0.0070
##	6	1.2175	nan	0.1000	0.0052
##	7	1.2071	nan	0.1000	0.0049
##	8	1.1997	nan	0.1000	0.0033
##	9	1.1918	nan	0.1000	0.0040
##	10	1.1825	nan	0.1000	0.0048

##	20	1.1239	nan	0.1000	0.0030
##	40	1.0646	nan	0.1000	0.0015
##	60	1.0399	nan	0.1000	0.0000
##	80	1.0281	nan	0.1000	0.0006
##	100	1.0235	nan	0.1000	-0.0002
##	120	1.0206	nan	0.1000	-0.0001
##	140	1.0179	nan	0.1000	-0.0000
##	160	1.0166	nan	0.1000	-0.0003
##	180	1.0149	nan	0.1000	-0.0002
##	200	1.0140	nan	0.1000	-0.0001
##	220	1.0134	nan	0.1000	-0.0001
##	240	1.0126	nan	0.1000	-0.0001
##	250	1.0123	nan	0.1000	-0.0002

##

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2903	nan	0.1000	0.0184
##	2	1.2593	nan	0.1000	0.0159
##	3	1.2324	nan	0.1000	0.0130
##	4	1.2079	nan	0.1000	0.0126
##	5	1.1869	nan	0.1000	0.0097
##	6	1.1676	nan	0.1000	0.0087
##	7	1.1522	nan	0.1000	0.0074
##	8	1.1389	nan	0.1000	0.0065
##	9	1.1260	nan	0.1000	0.0061
##	10	1.1164	nan	0.1000	0.0046
##	20	1.0392	nan	0.1000	0.0021
##	40	0.9396	nan	0.1000	-0.0001
##	60	0.8656	nan	0.1000	0.0027
##	80	0.8277	nan	0.1000	-0.0003
##	100	0.7610	nan	0.1000	-0.0000
##	120	0.6457	nan	0.1000	0.0027
##	140	0.5956	nan	0.1000	0.0011
##	160	0.5442	nan	0.1000	0.0012
##	180	0.5063	nan	0.1000	0.0003
##	200	0.4890	nan	0.1000	0.0007
##	220	0.4691	nan	0.1000	-0.0001
##	240	0.4517	nan	0.1000	0.0007
##	250	0.4479	nan	0.1000	0.0004

##

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2698	nan	0.1000	0.0275
##	2	1.2233	nan	0.1000	0.0224
##	3	1.1809	nan	0.1000	0.0206
##	4	1.1420	nan	0.1000	0.0193
##	5	1.1122	nan	0.1000	0.0143
##	6	1.0810	nan	0.1000	0.0162
##	7	1.0566	nan	0.1000	0.0120
##	8	1.0380	nan	0.1000	0.0087
##	9	1.0250	nan	0.1000	0.0059
##	10	1.0039	nan	0.1000	0.0104
##	20	0.8702	nan	0.1000	0.0042
##	40	0.7507	nan	0.1000	0.0055
##	60	0.6340	nan	0.1000	0.0030
##	80	0.5854	nan	0.1000	0.0027

##	100	0.5305	nan	0.1000	0.0023
##	120	0.4986	nan	0.1000	0.0002
##	140	0.4518	nan	0.1000	-0.0000
##	160	0.4239	nan	0.1000	0.0000
##	180	0.3975	nan	0.1000	0.0013
##	200	0.3844	nan	0.1000	0.0001
##	220	0.3707	nan	0.1000	0.0004
##	240	0.3630	nan	0.1000	0.0003
##	250	0.3589	nan	0.1000	-0.0002

##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2615	nan	0.1000	0.0309
##	2	1.2003	nan	0.1000	0.0295
##	3	1.1529	nan	0.1000	0.0225
##	4	1.1098	nan	0.1000	0.0208
##	5	1.0730	nan	0.1000	0.0178
##	6	1.0452	nan	0.1000	0.0138
##	7	1.0233	nan	0.1000	0.0101
##	8	0.9914	nan	0.1000	0.0150
##	9	0.9698	nan	0.1000	0.0106
##	10	0.9460	nan	0.1000	0.0115
##	20	0.7715	nan	0.1000	0.0055
##	40	0.5974	nan	0.1000	0.0023
##	60	0.5081	nan	0.1000	0.0005
##	80	0.4369	nan	0.1000	0.0001
##	100	0.4064	nan	0.1000	0.0000
##	120	0.3806	nan	0.1000	0.0007
##	140	0.3644	nan	0.1000	-0.0000
##	160	0.3518	nan	0.1000	0.0006
##	180	0.3373	nan	0.1000	-0.0002
##	200	0.3300	nan	0.1000	-0.0001
##	220	0.3212	nan	0.1000	-0.0001
##	240	0.3125	nan	0.1000	-0.0002
##	250	0.3099	nan	0.1000	-0.0001

##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2512	nan	0.1000	0.0378
##	2	1.1922	nan	0.1000	0.0297
##	3	1.1213	nan	0.1000	0.0346
##	4	1.0795	nan	0.1000	0.0206
##	5	1.0409	nan	0.1000	0.0183
##	6	0.9904	nan	0.1000	0.0237
##	7	0.9554	nan	0.1000	0.0169
##	8	0.9124	nan	0.1000	0.0208
##	9	0.8840	nan	0.1000	0.0132
##	10	0.8542	nan	0.1000	0.0147
##	20	0.6715	nan	0.1000	0.0090
##	40	0.5130	nan	0.1000	0.0001
##	60	0.4446	nan	0.1000	0.0003
##	80	0.4037	nan	0.1000	0.0023
##	100	0.3790	nan	0.1000	0.0007
##	120	0.3589	nan	0.1000	0.0009
##	140	0.3445	nan	0.1000	0.0007
##	160	0.3309	nan	0.1000	-0.0002

##	180	0.3193	nan	0.1000	-0.0001
##	200	0.3085	nan	0.1000	0.0006
##	220	0.3028	nan	0.1000	-0.0002
##	240	0.2946	nan	0.1000	-0.0002
##	250	0.2910	nan	0.1000	-0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2999	nan	0.1000	0.0131
##	2	1.2782	nan	0.1000	0.0104
##	3	1.2603	nan	0.1000	0.0084
##	4	1.2444	nan	0.1000	0.0076
##	5	1.2301	nan	0.1000	0.0069
##	6	1.2186	nan	0.1000	0.0054
##	7	1.2073	nan	0.1000	0.0053
##	8	1.1992	nan	0.1000	0.0038
##	9	1.1915	nan	0.1000	0.0037
##	10	1.1838	nan	0.1000	0.0033
##	20	1.1240	nan	0.1000	0.0020
##	40	1.0663	nan	0.1000	0.0006
##	60	1.0410	nan	0.1000	0.0002
##	80	1.0292	nan	0.1000	-0.0000
##	100	1.0226	nan	0.1000	-0.0000
##	120	1.0196	nan	0.1000	-0.0000
##	140	1.0175	nan	0.1000	-0.0001
##	160	1.0160	nan	0.1000	-0.0001
##	180	1.0146	nan	0.1000	-0.0001
##	200	1.0135	nan	0.1000	-0.0001
##	220	1.0119	nan	0.1000	-0.0002
##	240	1.0112	nan	0.1000	-0.0001
##	250	1.0108	nan	0.1000	-0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2890	nan	0.1000	0.0183
##	2	1.2583	nan	0.1000	0.0149
##	3	1.2277	nan	0.1000	0.0147
##	4	1.2054	nan	0.1000	0.0110
##	5	1.1864	nan	0.1000	0.0095
##	6	1.1665	nan	0.1000	0.0093
##	7	1.1518	nan	0.1000	0.0071
##	8	1.1374	nan	0.1000	0.0070
##	9	1.1259	nan	0.1000	0.0056
##	10	1.1128	nan	0.1000	0.0064
##	20	1.0389	nan	0.1000	0.0038
##	40	0.9318	nan	0.1000	0.0002
##	60	0.8018	nan	0.1000	0.0042
##	80	0.6875	nan	0.1000	0.0001
##	100	0.6415	nan	0.1000	0.0000
##	120	0.6080	nan	0.1000	-0.0001
##	140	0.5638	nan	0.1000	-0.0000
##	160	0.5366	nan	0.1000	0.0009
##	180	0.5117	nan	0.1000	0.0009
##	200	0.4989	nan	0.1000	-0.0002
##	220	0.4796	nan	0.1000	-0.0002
##	240	0.4604	nan	0.1000	0.0004

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##      250      0.4578      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      1.2678      nan      0.1000      0.0287
##      2      1.2211      nan      0.1000      0.0239
##      3      1.1794      nan      0.1000      0.0207
##      4      1.1476      nan      0.1000      0.0147
##      5      1.1149      nan      0.1000      0.0160
##      6      1.0817      nan      0.1000      0.0159
##      7      1.0593      nan      0.1000      0.0111
##      8      1.0334      nan      0.1000      0.0129
##      9      1.0179      nan      0.1000      0.0074
##     10      1.0027      nan      0.1000      0.0067
##     20      0.8671      nan      0.1000      0.0087
##     40      0.7285      nan      0.1000      0.0004
##     60      0.6426      nan      0.1000      0.0065
##     80      0.5939      nan      0.1000      0.0005
##    100      0.5233      nan      0.1000      0.0012
##    120      0.4785      nan      0.1000     -0.0002
##    140      0.4526      nan      0.1000     -0.0001
##    160      0.4256      nan      0.1000      0.0003
##    180      0.4104      nan      0.1000     -0.0002
##    200      0.3860      nan      0.1000     -0.0001
##    220      0.3718      nan      0.1000      0.0006
##    240      0.3569      nan      0.1000     -0.0001
##    250      0.3541      nan      0.1000     -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      1.2621      nan      0.1000      0.0320
##      2      1.2043      nan      0.1000      0.0275
##      3      1.1570      nan      0.1000      0.0237
##      4      1.1187      nan      0.1000      0.0186
##      5      1.0836      nan      0.1000      0.0174
##      6      1.0570      nan      0.1000      0.0125
##      7      1.0253      nan      0.1000      0.0156
##      8      0.9956      nan      0.1000      0.0143
##      9      0.9680      nan      0.1000      0.0136
##     10      0.9503      nan      0.1000      0.0088
##     20      0.7820      nan      0.1000      0.0053
##     40      0.6432      nan      0.1000      0.0006
##     60      0.5251      nan      0.1000      0.0005
##     80      0.4835      nan      0.1000      0.0012
##    100      0.4332      nan      0.1000      0.0000
##    120      0.4017      nan      0.1000     -0.0001
##    140      0.3758      nan      0.1000     -0.0000
##    160      0.3619      nan      0.1000     -0.0002
##    180      0.3531      nan      0.1000     -0.0001
##    200      0.3451      nan      0.1000     -0.0002
##    220      0.3360      nan      0.1000     -0.0001
##    240      0.3262      nan      0.1000     -0.0001
##    250      0.3226      nan      0.1000      0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      1.2512      nan      0.1000      0.0381

```

##	2	1.1683	nan	0.1000	0.0404
##	3	1.1166	nan	0.1000	0.0261
##	4	1.0684	nan	0.1000	0.0232
##	5	1.0346	nan	0.1000	0.0169
##	6	1.0031	nan	0.1000	0.0150
##	7	0.9570	nan	0.1000	0.0226
##	8	0.9137	nan	0.1000	0.0204
##	9	0.8927	nan	0.1000	0.0104
##	10	0.8619	nan	0.1000	0.0141
##	20	0.6526	nan	0.1000	0.0103
##	40	0.4847	nan	0.1000	0.0021
##	60	0.4269	nan	0.1000	0.0001
##	80	0.3899	nan	0.1000	-0.0001
##	100	0.3760	nan	0.1000	0.0006
##	120	0.3548	nan	0.1000	-0.0001
##	140	0.3407	nan	0.1000	-0.0000
##	160	0.3283	nan	0.1000	-0.0003
##	180	0.3184	nan	0.1000	-0.0002
##	200	0.3087	nan	0.1000	-0.0001
##	220	0.2998	nan	0.1000	-0.0001
##	240	0.2899	nan	0.1000	-0.0001
##	250	0.2868	nan	0.1000	-0.0001

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2992	nan	0.1000	0.0128
##	2	1.2779	nan	0.1000	0.0107
##	3	1.2595	nan	0.1000	0.0090
##	4	1.2442	nan	0.1000	0.0074
##	5	1.2297	nan	0.1000	0.0067
##	6	1.2189	nan	0.1000	0.0051
##	7	1.2095	nan	0.1000	0.0044
##	8	1.1991	nan	0.1000	0.0047
##	9	1.1923	nan	0.1000	0.0035
##	10	1.1831	nan	0.1000	0.0045
##	20	1.1260	nan	0.1000	0.0019
##	40	1.0655	nan	0.1000	0.0014
##	60	1.0411	nan	0.1000	0.0001
##	80	1.0290	nan	0.1000	0.0000
##	100	1.0226	nan	0.1000	-0.0001
##	120	1.0202	nan	0.1000	-0.0002
##	140	1.0178	nan	0.1000	-0.0001
##	160	1.0152	nan	0.1000	-0.0001
##	180	1.0142	nan	0.1000	-0.0001
##	200	1.0128	nan	0.1000	-0.0001
##	220	1.0116	nan	0.1000	-0.0000
##	240	1.0108	nan	0.1000	-0.0002
##	250	1.0105	nan	0.1000	-0.0001

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2891	nan	0.1000	0.0184
##	2	1.2574	nan	0.1000	0.0151
##	3	1.2292	nan	0.1000	0.0134
##	4	1.2074	nan	0.1000	0.0106
##	5	1.1854	nan	0.1000	0.0108

##	6	1.1667	nan	0.1000	0.0092
##	7	1.1504	nan	0.1000	0.0072
##	8	1.1367	nan	0.1000	0.0066
##	9	1.1244	nan	0.1000	0.0058
##	10	1.1137	nan	0.1000	0.0049
##	20	1.0323	nan	0.1000	0.0035
##	40	0.8666	nan	0.1000	0.0063
##	60	0.7373	nan	0.1000	0.0043
##	80	0.6613	nan	0.1000	-0.0001
##	100	0.6041	nan	0.1000	0.0008
##	120	0.5748	nan	0.1000	0.0003
##	140	0.5511	nan	0.1000	-0.0001
##	160	0.5243	nan	0.1000	0.0001
##	180	0.4995	nan	0.1000	0.0010
##	200	0.4797	nan	0.1000	-0.0001
##	220	0.4666	nan	0.1000	-0.0001
##	240	0.4583	nan	0.1000	0.0007
##	250	0.4549	nan	0.1000	-0.0002

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2716	nan	0.1000	0.0279
##	2	1.2204	nan	0.1000	0.0257
##	3	1.1809	nan	0.1000	0.0196
##	4	1.1419	nan	0.1000	0.0190
##	5	1.1093	nan	0.1000	0.0158
##	6	1.0807	nan	0.1000	0.0143
##	7	1.0614	nan	0.1000	0.0093
##	8	1.0394	nan	0.1000	0.0107
##	9	1.0172	nan	0.1000	0.0109
##	10	1.0041	nan	0.1000	0.0064
##	20	0.8538	nan	0.1000	0.0056
##	40	0.7491	nan	0.1000	-0.0001
##	60	0.6284	nan	0.1000	-0.0001
##	80	0.5809	nan	0.1000	0.0002
##	100	0.5410	nan	0.1000	0.0000
##	120	0.4913	nan	0.1000	0.0030
##	140	0.4773	nan	0.1000	-0.0001
##	160	0.4468	nan	0.1000	0.0020
##	180	0.4217	nan	0.1000	0.0009
##	200	0.4012	nan	0.1000	0.0016
##	220	0.3840	nan	0.1000	0.0006
##	240	0.3712	nan	0.1000	-0.0000
##	250	0.3617	nan	0.1000	0.0004

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2673	nan	0.1000	0.0287
##	2	1.2047	nan	0.1000	0.0306
##	3	1.1594	nan	0.1000	0.0225
##	4	1.1148	nan	0.1000	0.0222
##	5	1.0784	nan	0.1000	0.0178
##	6	1.0400	nan	0.1000	0.0183
##	7	1.0072	nan	0.1000	0.0166
##	8	0.9805	nan	0.1000	0.0123
##	9	0.9604	nan	0.1000	0.0094

##	10	0.9389	nan	0.1000	0.0105
##	20	0.7969	nan	0.1000	0.0047
##	40	0.6306	nan	0.1000	0.0035
##	60	0.5266	nan	0.1000	0.0017
##	80	0.4718	nan	0.1000	0.0047
##	100	0.4251	nan	0.1000	-0.0001
##	120	0.3983	nan	0.1000	-0.0002
##	140	0.3813	nan	0.1000	-0.0001
##	160	0.3668	nan	0.1000	0.0001
##	180	0.3566	nan	0.1000	-0.0001
##	200	0.3453	nan	0.1000	-0.0002
##	220	0.3370	nan	0.1000	-0.0001
##	240	0.3273	nan	0.1000	-0.0001
##	250	0.3213	nan	0.1000	0.0005

##

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2317	nan	0.1000	0.0472
##	2	1.1672	nan	0.1000	0.0319
##	3	1.0998	nan	0.1000	0.0325
##	4	1.0526	nan	0.1000	0.0236
##	5	1.0112	nan	0.1000	0.0205
##	6	0.9626	nan	0.1000	0.0242
##	7	0.9354	nan	0.1000	0.0136
##	8	0.9001	nan	0.1000	0.0173
##	9	0.8704	nan	0.1000	0.0148
##	10	0.8375	nan	0.1000	0.0157
##	20	0.6406	nan	0.1000	0.0060
##	40	0.4901	nan	0.1000	0.0018
##	60	0.4203	nan	0.1000	-0.0001
##	80	0.3901	nan	0.1000	0.0004
##	100	0.3748	nan	0.1000	-0.0002
##	120	0.3591	nan	0.1000	-0.0001
##	140	0.3390	nan	0.1000	-0.0001
##	160	0.3300	nan	0.1000	-0.0003
##	180	0.3180	nan	0.1000	-0.0001
##	200	0.3076	nan	0.1000	0.0001
##	220	0.2984	nan	0.1000	-0.0001
##	240	0.2888	nan	0.1000	0.0000
##	250	0.2843	nan	0.1000	-0.0001

##

##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	1.2501	nan	0.1000	0.0372
##	2	1.1897	nan	0.1000	0.0302
##	3	1.1186	nan	0.1000	0.0355
##	4	1.0556	nan	0.1000	0.0307
##	5	1.0042	nan	0.1000	0.0246
##	6	0.9699	nan	0.1000	0.0164
##	7	0.9441	nan	0.1000	0.0124
##	8	0.9146	nan	0.1000	0.0132
##	9	0.8805	nan	0.1000	0.0165
##	10	0.8573	nan	0.1000	0.0111
##	20	0.6541	nan	0.1000	0.0056
##	40	0.4984	nan	0.1000	0.0018
##	60	0.4294	nan	0.1000	0.0007

```
##      80      0.3977      nan      0.1000     -0.0000
##     100      0.3745      nan      0.1000     -0.0001
```

```
gmbFitm0
```

```
## Stochastic Gradient Boosting
```

```
##
```

```
## 7424 samples
```

```
##      6 predictor
```

```
##      2 classes: '0', '1'
```

```
##
```

```
## No pre-processing
```

```
## Resampling: Cross-Validated (10 fold, repeated 1 times)
```

```
## Summary of sample sizes: 6681, 6682, 6681, 6681, 6682, 6681, ...
```

```
## Resampling results across tuning parameters:
```

```
##
```

##	interaction.depth	n.trees	Accuracy	Kappa
##	1	50	0.7315437	0.4328139
##	1	100	0.7303313	0.4290749
##	1	150	0.7312749	0.4302008
##	1	200	0.7319497	0.4312044
##	1	250	0.7335669	0.4336890
##	2	50	0.8023910	0.5850725
##	2	100	0.8783612	0.7466126
##	2	150	0.9082660	0.8071783
##	2	200	0.9164823	0.8236808
##	2	250	0.9224095	0.8357639
##	3	50	0.8778264	0.7478966
##	3	100	0.9057060	0.8024451
##	3	150	0.9209294	0.8330066
##	3	200	0.9242963	0.8400485
##	3	250	0.9249710	0.8413764
##	4	50	0.8977606	0.7877566
##	4	100	0.9201222	0.8317229
##	4	150	0.9244301	0.8403391
##	4	200	0.9252375	0.8418356
##	4	250	0.9257768	0.8429767
##	5	50	0.9225452	0.8364810
##	5	100	0.9263166	0.8440786
##	5	150	0.9260476	0.8435010
##	5	200	0.9259126	0.8432316
##	5	250	0.9236230	0.8383548

```
##
```

```
## Tuning parameter 'shrinkage' was held constant at a value of 0.1
```

```
##
```

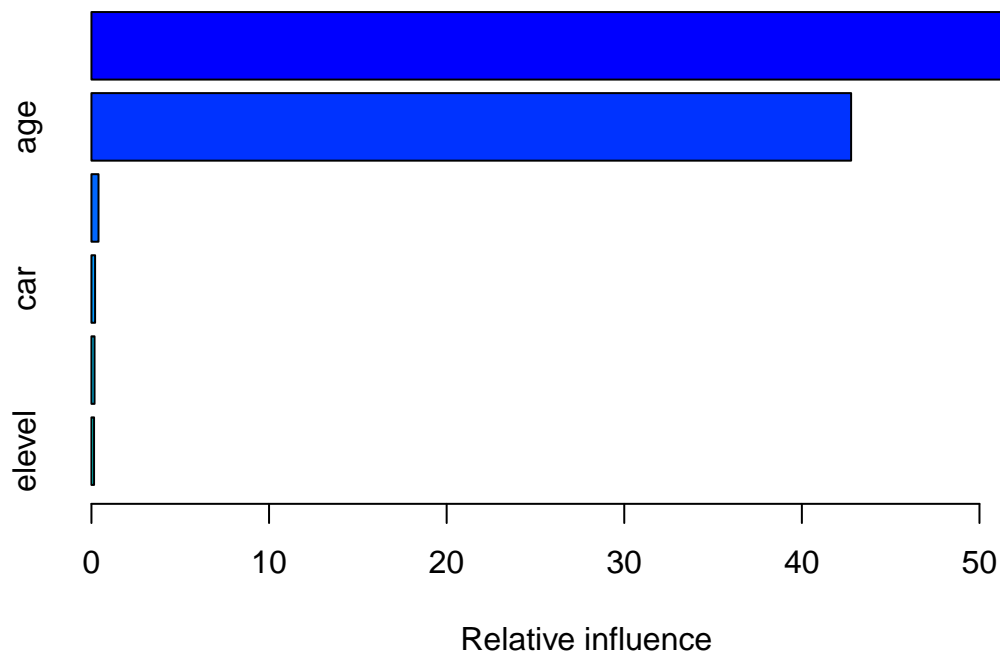
```
## Tuning parameter 'n.minobsinnode' was held constant at a value of 10
```

```
## Accuracy was used to select the optimal model using the largest value.
```

```
## The final values used for the model were n.trees = 100, interaction.depth =
```

```
## 5, shrinkage = 0.1 and n.minobsinnode = 10.
```

```
summary(gmbFitm0) # Shows the relative influence of each variable in the model.
```



```
##          var    rel.inf
## salary    salary 56.3021106
## age       age 42.7727326
## credit    credit 0.3981840
## car       car 0.2052312
## zipcode   zipcode 0.1745893
## elevel    elevel 0.1471523
```

```
VarImpGBM<-varImp(gmbFitm0,numTrees = NULL) # variable importance
```

```
VarImpGBM
```

```
## gbm variable importance
##
##          Overall
## salary 100.00000
## age    75.90706
## credit 0.44703
## car    0.10343
## zipcode 0.04886
## elevel 0.00000
```

```
# First, we will evaluate on the testing set to evaluate
```

```
gmbPredict1 <- predict(gmbFitm0,testing)# The values are discrete because
# the inputs were introduced as factors. In other case, the model returns
# continuous values, close to 0 and 1.
```

```
gmbPredict1
```

```
##      [1] 1 1 1 0 1 1 1 1 1 0 1 0 1 1 0 0 0 1 1 0 1 0 1 0 1 1 1 1 1 1 1 0 1 0 1 1 1
##     [38] 1 1 1 1 0 0 0 1 1 1 1 1 1 0 1 0 1 1 0 0 0 0 1 0 0 1 1 1 1 0 1 0 0 1 1 0 1 1
##     [75] 1 1 1 0 0 1 1 1 0 0 1 1 1 0 1 1 0 0 0 0 1 0 0 1 0 1 1 0 0 1 0 1 1 1 1 1 0
##    [112] 1 0 1 0 1 1 1 0 1 1 0 0 1 1 0 0 1 1 1 1 1 1 1 1 0 0 1 1 0 1 1 1 0 0 1 1
```

```

## [149] 1 1 1 1 0 0 1 1 1 0 1 0 1 1 1 1 1 0 0 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 0
## [186] 1 1 0 1 1 1 0 1 0 0 0 1 0 1 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 0 0 0 1 0
## [223] 1 1 1 1 1 0 1 1 0 1 0 1 1 1 1 0 0 0 0 1 1 1 0 0 1 1 1 1 0 1 1 1 1 0 0 1 1
## [260] 1 1 1 1 1 0 0 0 1 1 0 0 1 0 1 1 1 1 1 1 0 1 1 0 1 1 0 0 0 1 1 1 0 0 0 0 0
## [297] 0 0 0 0 1 1 1 0 1 0 1 1 0 0 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 0 1 1 1 0 0 0 0 1
## [334] 1 1 0 1 1 1 1 1 1 1 0 0 1 1 1 1 1 0 1 1 1 1 0 1 1 0 1 0 1 1 0 1 1 1 1 1 1
## [371] 1 0 1 0 0 0 1 0 0 1 1 0 1 1 1 0 1 0 0 0 1 1 1 1 0 0 1 1 1 1 1 0 1 0 1 1 1 1
## [408] 0 0 1 0 1 0 1 1 0 1 1 0 1 0 0 1 0 1 1 1 0 1 1 1 0 0 1 1 1 0 1 1 1 0 1 1 1
## [445] 0 1 0 1 0 0 0 0 0 1 1 0 1 1 1 0 1 1 1 1 0 1 0 1 1 0 0 1 1 0 1 0 1 0 1 0 0
## [482] 0 0 1 1 1 0 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 1 1 1 1 1
## [519] 0 1 0 0 0 1 1 0 0 1 0 0 1 0 0 1 1 0 1 0 0 1 0 0 1 1 1 1 0 0 1 0 1 1 1 0 1
## [556] 1 1 0 1 0 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1 1 1 0 1 0 0 1 1 1 0 0 0 0 0 1
## [593] 1 0 1 1 1 0 0 0 0 1 1 0 1 0 0 0 1 1 0 1 0 0 1 1 0 0 0 0 0 0 0 1 1 0 0 0 1
## [630] 0 1 0 1 1 0 1 1 1 0 0 1 1 0 1 1 1 1 0 1 0 1 0 1 1 1 0 0 1 1 1 0 0 1 1 0 0
## [667] 0 1 1 0 1 0 0 1 1 1 0 1 1 1 0 1 0 1 1 1 1 1 0 1 0 1 0 1 0 1 0 0 0 1 1 0 1
## [704] 1 1 1 1 1 0 0 0 0 1 1 1 0 0 1 1 1 0 1 1 1 1 0 1 1 1 0 0 0 0 1 1 0 0 1 0 1
## [741] 0 1 0 1 0 1 0 1 1 1 0 1 1 0 0 1 1 1 1 1 1 0 0 1 1 0 0 1 0 1 1 1 0 0 0 0 0
## [778] 0 0 0 1 1 1 1 1 1 0 1 1 0 1 1 1 0 0 1 1 1 1 0 1 0 0 1 1 1 1 0 1 0 1 1 1 0
## [815] 0 0 0 1 0 1 1 0 1 1 0 1 0 1 0 1 1 0 0 1 1 1 1 0 0 1 1 0 1 0 1 0 1 0 0 1 1 1
## [852] 0 1 0 1 1 1 1 1 0 1 0 1 1 1 1 0 1 1 0 1 1 1 0 1 1 1 1 0 0 1 0 1 0 1 1 0 0
## [889] 1 0 0 1 1 1 1 0 1 1 0 0 1 1 0 1 1 0 1 0 0 1 0 1 0 1 1 1 1 1 1 0 0 1 1 1 0
## [926] 1 1 1 0 1 1 1 1 0 1 0 0 1 1 0 0 1 0 1 1 0 1 0 1 0 0 1 1 1 0 0 0 1 0 1 1 0
## [963] 1 1 1 1 1 1 1 1 1 0 1 1 1 1 0 1 1 1 0 1 0 1 0 1 0 1 1 0 1 1 1 1 0 0 1 1 0
## [1000] 0 0 1 0 0 0 0 1 0 1 1 1 1 1 0 1 1 1 1 1 1 0 1 0 1 1 1 0 1 0 1 1 0 0 0 1 1
## [1037] 1 0 0 1 1 1 1 1 1 1 1 1 0 1 0 0 1 0 1 1 1 0 1 1 0 1 0 1 1 0 1 1 1 1 1 0 0
## [1074] 1 1 0 1 1 0 0 1 1 0 0 0 0 0 0 1 1 0 1 1 1 1 1 1 1 0 0 1 1 1 0 1 1 1 1 1 1
## [1111] 0 0 1 1 1 1 0 1 1 1 1 1 0 0 1 1 0 0 0 1 1 0 1 1 1 0 0 1 0 1 1 0 1 1 1 1 1
## [1148] 1 1 1 0 0 1 0 0 0 0 1 0 0 0 0 1 0 0 1 1 1 1 0 1 1 0 0 0 1 1 0 1 1 1 0 1 1
## [1185] 1 1 0 0 1 0 1 1 1 1 0 1 0 0 1 1 1 1 1 1 0 0 0 0 1 1 0 0 1 1 1 1 1 0 0 1 0
## [1222] 1 1 0 1 0 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 0 1 0 0 1 1 0 0 0 1 1 1 1 0 1 1 1
## [1259] 1 0 0 1 1 0 1 1 1 0 0 1 1 0 1 1 0 1 0 0 1 1 1 0 0 1 0 1 1 1 1 1 1 1 0 0 1
## [1296] 0 1 0 1 1 1 1 1 0 0 1 0 1 1 1 1 1 1 1 1 1 1 0 0 1 0 0 1 1 1 1 0 0 0 0 1
## [1333] 0 1 1 0 0 0 0 0 1 1 0 0 1 1 0 0 1 0 1 1 0 1 1 1 1 0 1 0 0 1 1 1 0 1 1 0 1
## [1370] 1 1 0 1 1 1 1 1 1 1 0 0 1 1 0 1 1 1 1 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 0
## [1407] 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 0 1 0 1 1 1 1 1 0 1 1 0 1
## [1444] 0 1 1 0 1 1 0 1 0 1 1 0 0 1 0 1 1 1 1 1 1 1 0 1 1 1 1 1 0 0 1 1 1 1 0 1 0
## [1481] 1 1 0 0 1 1 1 1 1 1 0 0 0 0 1 1 1 1 1 1 1 0 0 0 1 0 0 0 1 1 1 1 0 1 0 0 0
## [1518] 0 1 0 1 0 0 1 1 1 0 1 1 1 1 1 1 0 0 1 0 0 1 1 1 1 0 0 0 1 1 0 0 0 0 1 0 0
## [1555] 0 0 1 1 0 0 0 1 0 0 1 1 1 1 1 0 1 0 1 0 1 1 1 1 1 0 0 0 1 1 0 0 1 1 1 1 0
## [1592] 1 0 0 0 0 0 1 1 0 1 1 0 0 0 0 1 1 1 1 1 1 1 0 1 0 0 1 1 1 1 0 1 0 0 1 1 1
## [1629] 1 1 0 0 0 1 1 1 0 1 1 1 0 0 0 1 0 0 1 0 0 0 0 1 1 0 1 1 1 1 0 0 0 0 1 1 0
## [1666] 1 0 1 0 0 1 0 0 0 1 1 0 0 1 1 1 1 1 1 0 1 1 0 0 1 0 1 1 1 0 1 1 1 1 0 0 1
## [1703] 0 1 1 1 1 1 0 1 0 0 0 1 1 0 0 0 1 1 1 0 0 0 0 0 0 1 1 0 0 0 1 1 1 1 1 1 0
## [1740] 1 0 0 1 0 0 1 0 1 0 1 0 1 0 0 1 0 0 0 1 1 0 0 1 1 0 0 0 1 1 1 1 1 1 1 0 0
## [1777] 0 1 1 0 0 1 1 1 0 1 0 1 0 1 1 1 0 1 1 1 1 0 0 1 0 1 1 1 0 1 1 1 0 0 0 1 1
## [1814] 1 0 0 0 0 0 0 1 1 1 0 0 1 0 0 1 1 1 1 0 1 1 1 1 0 0 1 1 1 0 1 1 1 0 1 1 0
## [1851] 0 0 1 1 0 0 1 1 1 1 0 1 1 1 0 1 1 1 1 0 0 1 1 1 0 1 1 1 1 0 1 1 1 0 1 0 1
## [1888] 0 1 0 0 1 0 1 0 1 1 1 1 0 0 1 0 1 0 0 0 0 1 0 0 0 1 0 1 0 0 0 1 0 0 1 0 1
## [1925] 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 0 1 1 0 1 1 0 0 1 0 1 1 1 1 1 0
## [1962] 1 1 0 1 1 1 0 1 1 1 0 1 0 1 1 0 1 1 1 1 0 0 1 1 1 1 1 0 1 0 1 1 0 1 1 0 1
## [1999] 1 1 0 0 1 0 1 0 0 0 0 0 1 1 0 0 1 1 0 0 0 0 1 1 1 1 1 1 0 1 1 1 1 1 1 1 0
## [2036] 1 1 1 1 1 1 0 1 1 1 1 1 1 0 0 0 0 0 1 0 1 1 1 1 1 1 0 1 0 1 1 1 1 1 0 0 0
## [2073] 1 0 0 0 0 0 1 1 1 1 0 1 1 0 0 1 1 1 1 1 1 0 1 0 1 1 1 1 0 1 0 1 1 0 0 0 1
## [2110] 0 1 0 1 1 0 0 1 1 1 0 1 1 1 1 0 1 0 1 0 1 0 1 1 1 1 0 1 1 1 1 1 1 1 0 1 0

```

```
## [2147] 1 0 1 1 0 1 1 1 0 1 1 1 1 1 0 0 0 1 0 1 1 1 0 1 0 1 1 1 1 0 1 0 1 0 1 0 1 1 0
## [2184] 0 0 0 1 1 0 1 1 1 0 0 1 0 1 0 0 1 1 1 1 1 1 0 1 1 1 0 1 0 1 0 1 1 1 0 0 1
## [2221] 1 0 0 0 1 0 1 1 0 1 1 0 1 1 1 1 1 1 1 1 1 0 0 1 1 0 1 0 0 1 1 0 0 1 0 1 1
## [2258] 0 1 0 0 1 1 0 1 0 1 0 0 0 1 1 0 1 1 1 1 1 1 1 1 1 0 1 0 0 1 1 1 0 1 0 0
## [2295] 0 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 0 1 0 1 1 1 0 1 1 1 1 1 0 1 1 0 1 1 0 0 1 1
## [2332] 1 0 0 1 0 0 1 0 1 1 0 1 1 1 1 0 1 1 0 0 1 0 0 1 0 0 0 1 0 0 0 1 1 1 0 1 1
## [2369] 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 1 0 1 0 0 1 0 1 0 0 1 0 1 1 1 1 0 0 1 1 1 0
## [2406] 1 1 0 1 1 1 0 0 1 0 0 0 1 0 1 1 0 1 0 1 0 1 0 0 0 1 1 1 1 1 1 1 1 0 1 1 0
## [2443] 0 0 1 1 1 1 0 1 1 1 1 1 0 0 1 1 0 1 1 0 0 1 0 0 0 1 1 0 0 0 1 1
## Levels: 0 1
```

```
summary(gmbPredict1)
```

```
##      0      1
## 967 1507
```

```
Results1gmb<-postResample(gmbPredict1,testing$brand)# Show accuracy and kappa.
```

```
Results1gmb  # over 92% of accuracy, 0.83 kappa.
```

```
## Accuracy      Kappa
## 0.9211803 0.8335184
```

```
# Prediction of the Incomplete Surveys.
```

```
gmbPredictBrand <- predict(gmbFitm0,Incomplete)
```

```
gmbPredictBrand
```

```
##      [1] 1 0 1 1 1 1 1 1 1 0 0 0 1 1 1 1 0 1 1 0 0 1 1 1 1 1 0 1 1 1 1 0 1 1 1 1 1
##      [38] 1 1 1 1 0 1 1 1 1 1 0 0 0 0 1 1 1 1 1 0 1 0 0 0 1 1 1 1 0 1 0 0 0 1 0 1 0
##      [75] 0 1 1 1 0 0 0 1 0 1 0 1 1 0 0 0 0 0 0 0 0 1 0 0 1 1 1 1 0 1 1 0 1 1 1 1 1
##     [112] 1 0 0 0 1 0 0 1 0 1 1 1 0 0 1 1 0 1 0 1 1 1 1 0 1 0 0 0 0 1 0 0 0 1 0 0 0
##     [149] 1 1 0 1 1 1 0 0 0 0 1 1 0 1 1 0 1 1 0 1 1 1 0 0 1 1 1 1 1 1 1 1 1 1 0 1 0
##     [186] 0 1 1 1 0 0 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 1 0 0 0 1 0 1 1
##     [223] 1 0 0 0 1 1 0 1 1 0 1 0 0 1 0 1 0 1 0 1 0 0 1 1 0 1 1 1 1 0 0 1 1 0 1 0 1 1 1
##     [260] 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 0 0 0 0 0 1 0 1 0 1 0 1 1 0 1 1 1 1 0 1 0 1
##     [297] 0 0 0 1 0 0 1 0 1 0 1 1 0 1 0 0 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 1 0 0 1 1 0 1 0
##     [334] 0 1 1 1 1 1 0 0 0 1 1 1 1 0 0 1 1 1 0 0 0 0 1 0 0 1 1 1 0 1 1 1 1 0 1 0 1 0 0
##     [371] 1 0 1 1 1 0 1 0 1 1 0 1 1 1 0 1 0 1 0 1 1 1 0 1 1 1 0 0 0 0 1 1 1 0 0 0 1 1
##     [408] 1 0 0 1 0 1 1 1 1 1 1 1 0 1 1 1 1 0 1 0 1 1 1 1 1 1 1 0 1 0 0 0 1 0 1 0 0 0
##     [445] 0 0 1 1 1 1 0 0 1 0 1 1 1 0 0 0 1 0 0 0 0 0 0 0 0 1 1 1 0 1 0 1 1 0 0 1 0 0
##     [482] 1 1 0 1 0 0 1 0 0 1 0 1 1 1 1 1 0 0 0 0 0 1 0 1 1 1 0 0 1 1 1 1 1 1 1 1 1 0
##     [519] 1 1 1 0 1 1 0 1 1 0 1 0 1 0 1 1 1 1 1 1 0 1 0 0 1 1 0 0 0 1 0 1 1 1 1 0 0 1
##     [556] 0 1 1 1 1 1 0 0 0 1 1 1 0 0 1 1 1 1 1 1 1 0 1 0 1 1 1 0 1 1 1 1 0 1 1 1 0
##     [593] 1 1 1 0 0 1 0 1 1 0 1 1 0 1 0 1 1 1 0 1 1 0 1 0 0 1 0 1 1 1 1 0 1 0 0 0 1
##     [630] 1 1 1 1 0 1 0 0 1 1 1 0 1 0 1 1 0 0 1 0 0 0 0 0 1 0 1 1 1 1 0 1 0 1 1 0 1
##     [667] 1 0 1 1 1 0 1 1 0 0 1 1 0 1 1 1 0 0 1 1 1 1 0 1 1 1 1 1 1 1 1 0 1 1 1 1 1 0
##     [704] 1 0 1 1 1 0 1 1 1 1 1 0 1 1 1 1 1 0 1 1 0 0 1 0 1 1 1 1 0 1 0 0 0 0 0 0 1 1
##     [741] 1 1 0 1 1 1 0 0 1 0 1 0 0 1 0 0 0 0 0 0 0 1 1 0 0 0 1 1 0 0 0 1 0 0 0 1 1 1
##     [778] 1 1 0 1 0 1 1 0 1 0 0 1 0 1 0 1 0 1 0 0 1 0 1 0 1 1 1 1 1 0 0 1 1 1 1 0 0
##     [815] 0 0 1 1 1 1 1 0 1 1 0 1 0 0 1 1 0 1 1 1 1 1 1 0 1 1 1 0 1 0 1 1 1 1 0 0
##     [852] 0 1 0 1 1 1 1 0 1 1 0 1 1 0 1 1 1 0 0 0 1 0 1 1 1 1 1 0 0 1 0 1 1 0 1 0 1
##     [889] 0 0 0 1 1 0 0 0 1 1 1 0 1 0 0 1 1 1 1 1 1 0 0 1 0 1 1 1 1 0 0 1 1 1 1 1 0
##     [926] 0 0 0 0 1 1 1 0 1 0 0 1 1 1 0 1 1 1 1 1 0 0 0 1 0 0 0 0 1 1 0 0 1 0 0 1 1
##     [963] 1 0 1 1 0 0 0 1 0 1 0 0 0 1 1 0 0 1 1 0 0 1 0 0 0 1 0 1 0 0 1 1 1 1 0 1 1 1
```

```

## [1000] 0 1 1 1 0 1 0 1 0 1 0 1 0 1 1 1 1 1 0 1 1 1 0 0 1 1 1 1 1 1 0 0 1 1 0 0 1
## [1037] 1 1 0 1 0 1 0 1 1 1 0 1 1 1 1 1 1 1 0 1 0 1 1 1 0 0 1 1 1 1 0 1 0 1 1 1 1
## [1074] 0 0 0 1 1 1 1 1 0 1 0 0 1 1 0 1 0 0 1 1 1 1 1 0 1 1 1 0 1 1 0 1 1 0 1 1 1
## [1111] 0 1 1 0 0 0 0 1 1 0 1 0 1 1 1 1 1 0 1 1 0 1 1 1 0 1 1 1 0 0 1 1 1 1 0 1 1
## [1148] 0 1 0 0 0 0 1 0 1 1 0 1 1 1 0 1 1 0 1 1 0 0 1 1 1 0 1 0 1 0 1 0 1 0 0 0 0
## [1185] 1 1 1 0 1 1 0 1 1 1 1 1 1 0 1 1 1 0 1 1 0 0 1 1 0 1 1 0 1 1 0 1 1 1 1 1 1
## [1222] 1 0 1 1 1 1 1 0 0 1 0 0 1 1 1 1 0 0 1 0 0 1 1 0 0 0 1 1 1 0 1 1 1 1 1 0 1
## [1259] 1 0 0 1 1 1 1 0 1 1 1 1 1 0 0 1 0 1 1 1 0 0 1 0 1 0 1 0 1 0 1 1 1 0 0 1 1
## [1296] 0 1 0 1 1 1 0 1 0 0 1 1 1 0 1 1 0 1 1 1 1 1 1 1 0 0 1 1 0 1 0 0 1 1 1 0 1
## [1333] 0 1 0 1 0 1 0 1 1 1 1 1 1 0 1 0 0 0 0 0 0 0 1 1 0 0 1 1 0 1 1 1 0 0 1 0 0 0
## [1370] 1 0 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 0 1 1 0 1 1 1 1 1 1 1 1 1 0 1 1 1 0 0 1
## [1407] 1 1 1 1 1 1 1 1 0 0 1 0 1 1 1 0 1 1 0 1 0 1 0 1 1 0 1 0 0 1 0 1 1 1 0 0 1 0
## [1444] 0 1 0 0 1 0 1 0 1 0 1 1 1 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 0 1 0
## [1481] 1 0 1 1 1 1 0 0 1 0 1 0 1 1 0 1 0 1 0 1 0 0 1 0 0 0 1 1 0 1 0 1 0 1 0 1 1 1 1
## [1518] 1 1 1 1 1 0 0 1 0 1 1 1 1 1 0 0 1 0 1 0 1 1 0 1 0 1 1 1 1 1 1 1 0 1 1 1 1 0
## [1555] 1 1 1 1 0 1 1 1 1 0 1 0 1 1 1 1 0 1 0 1 0 0 1 1 1 1 0 1 1 0 1 0 1 0 1 0 0 1 1
## [1592] 1 1 1 0 1 0 1 1 0 0 1 1 1 1 1 0 1 1 1 0 1 1 0 1 1 0 0 1 1 0 0 1 0 0 0 0 0
## [1629] 0 0 1 1 0 1 1 1 1 1 0 1 0 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 0 1 0 1 1 1 0 0 0 1
## [1666] 0 1 0 1 0 1 0 1 1 1 1 1 1 0 1 1 0 0 1 1 0 1 1 0 0 0 1 0 0 0 1 0 0 1 0 1 1 1
## [1703] 1 0 0 0 1 0 1 1 1 0 1 1 1 1 0 1 1 0 0 1 1 1 1 1 1 1 1 0 1 0 0 1 1 1 1 0 0 0
## [1740] 0 0 1 1 1 0 0 1 0 0 1 0 1 0 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 1 1 1
## [1777] 1 1 0 1 1 1 0 1 0 1 0 0 0 1 1 0 1 1 0 1 1 0 1 0 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1
## [1814] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 0 1 0 1 1 1 1 0 0 1 0 1 1 0 1 0
## [1851] 0 1 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 1 1 0 0 1 0 0 0 1 0 1 1 0 1 1 1 1 1 1 1 1
## [1888] 1 0 1 0 1 0 0 1 0 1 0 1 1 0 1 1 1 1 0 0 1 1 0 1 1 0 0 0 1 0 1 0 1 0 1 1 1 1
## [1925] 1 1 0 1 1 1 1 0 0 1 1 0 1 1 0 1 0 0 1 0 1 1 0 1 0 0 1 0 1 1 1 0 1 0 1 0 0
## [1962] 1 1 1 0 1 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 0 0 0 0 1 0 0 1 0
## [1999] 0 1 1 1 1 1 1 1 1 0 0 1 1 1 0 1 1 1 1 0 0 0 1 1 0 1 1 1 0 1 1 0 1 1 1 1 1 0
## [2036] 1 1 1 1 1 1 0 1 0 0 1 1 1 1 1 0 1 0 1 0 1 1 1 0 0 1 0 0 1 0 1 0 0 1 0 0 1
## [2073] 1 0 0 1 0 1 0 0 1 1 0 1 1 1 0 0 1 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1 1 0 1 0 0 0
## [2110] 0 1 1 1 0 1 0 1 0 1 1 1 1 1 0 0 1 0 1 0 1 1 1 1 0 1 1 1 1 0 0 1 0 1 0 0 1 1
## [2147] 0 1 0 1 1 1 1 1 1 1 0 0 0 1 0 0 0 1 1 0 1 0 0 0 1 0 1 1 0 1 1 0 0 1 1 1 1 1
## [2184] 1 1 1 0 0 0 1 0 0 0 0 0 1 1 0 0 1 1 1 1 1 1 0 1 1 1 0 0 1 1 0 1 1 0 1 1 1 1
## [2221] 0 1 0 1 1 0 1 0 1 1 0 0 1 1 1 1 0 1 1 1 0 1 1 1 0 1 1 0 0 1 1 1 1 0 0 1 1 0
## [2258] 1 1 0 1 1 1 1 1 0 0 1 0 0 1 1 1 1 1 1 0 0 0 1 0 0 1 0 1 1 1 1 0 0 1 0 1 1
## [2295] 0 0 1 0 1 1 1 1 0 1 0 1 0 0 1 1 0 1 1 1 1 0 1 1 1 1 1 0 0 0 0 0 0 1 1 0 1
## [2332] 0 0 1 0 1 0 0 0 1 0 1 1 1 1 1 0 1 0 1 1 0 1 0 0 0 1 1 1 1 1 0 0 0 0 1 0 0
## [2369] 1 1 1 1 1 0 1 1 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 1 0 1 1 1 1 1 0 0 1
## [2406] 1 1 1 0 1 0 0 1 0 1 0 1 1 1 0 1 0 0 1 1 0 1 1 1 1 1 0 1 1 1 0 0 0 0 0 1 1
## [2443] 0 0 0 1 1 1 1 1 0 0 0 1 0 1 1 1 1 0 1 1 1 1 1 1 1 1 1 0 1 0 1 0 1 1 0 1 1 1
## [2480] 0 1 0 1 1 1 1 1 1 0 1 1 1 0 0 0 0 0 0 1 1 1 1 0 1 1 0 1 1 1 1 1 0 0 0 1 1 1
## [2517] 0 0 0 1 1 1 0 0 0 0 1 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 0 1 1 1 1 0 0 0 1 1 1
## [2554] 1 1 0 1 1 0 0 1 1 0 0 1 0 1 0 1 1 1 1 1 1 1 1 0 1 1 1 1 0 0 1 0 1 0 1 1 1
## [2591] 1 0 1 1 1 0 1 1 1 1 1 1 1 1 1 0 0 0 0 1 1 1 1 1 1 1 1 0 1 1 0 0 0 1 1 1 1
## [2628] 1 1 1 0 0 1 0 0 1 0 1 0 1 1 0 1 0 0 0 1 1 0 1 1 0 1 1 1 1 1 1 1 0 0 1 1 0
## [2665] 1 1 1 1 1 0 1 1 1 0 1 1 0 1 1 0 1 1 1 0 0 0 1 1 1 1 0 0 1 1 1 1 1 1 1 1 1
## [2702] 0 1 0 0 0 0 0 0 1 0 0 0 1 0 1 1 0 1 1 1 0 0 0 1 0 0 1 0 1 0 1 0 1 1 1 1 0
## [2739] 1 0 1 1 1 0 1 1 1 1 0 0 1 1 1 0 1 0 1 1 0 1 0 0 0 1 0 1 0 1 1 1 1 1 1 1 1
## [2776] 0 1 0 0 1 1 1 1 0 0 0 1 0 0 0 1 0 0 0 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1
## [2813] 1 0 1 0 1 0 1 0 1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 0 0 1 0 0 1 1 1 0 1 1 0 0 1
## [2850] 1 1 1 0 0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 1 0 1 1 0 0 1 0 0 1 1 1 1 0 0 1 1 1
## [2887] 1 1 1 0 1 1 1 1 1 0 1 1 0 1 0 1 1 1 0 1 0 1 1 1 0 1 1 0 0 1 0 1 0 1 0 0 1
## [2924] 1 1 1 1 0 0 1 1 0 1 1 1 1 0 0 0 0 1 1 0 1 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 1
## [2961] 0 1 0 0 1 1 1 1 1 1 1 1 1 1 0 1 0 0 1 0 1 0 1 1 0 1 1 1 1 1 1 1 0 0 0 1 1 1

```

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## [2998] 1 0 1 0 1 0 1 1 1 1 1 0 1 1 1 0 1 1 1 0 1 1 1 0 1 1 1 0 1 1 1 1 1 1 1 0 1 1 1 1 1
## [3035] 1 0 1 0 1 1 1 1 1 1 0 1 0 1 1 0 1 1 0 1 1 1 1 1 0 1 1 0 0 1 1 1 1 0 0 0 0 1 1
## [3072] 1 1 0 0 1 0 0 1 1 1 0 1 1 0 1 1 1 0 1 1 1 1 1 1 0 1 1 1 1 0 0 1 1 1 1 1 1 1
## [3109] 1 1 1 0 1 1 1 1 0 1 0 0 1 0 0 0 0 0 1 0 1 0 0 0 1 0 1 1 1 1 0 0 1 1 0 1 0
## [3146] 0 1 0 1 1 0 1 1 0 0 1 1 0 1 1 0 0 0 0 1 0 1 0 1 1 1 0 0 0 0 0 1 1 1 0 1 0
## [3183] 0 1 1 0 1 0 1 1 0 0 1 1 1 0 1 1 0 1 1 0 1 0 0 1 1 1 0 1 0 1 0 1 1 1 0 1 0
## [3220] 1 0 0 0 1 1 0 1 0 1 0 1 0 0 0 1 1 1 1 1 1 1 1 1 1 0 1 1 0 1 1 0 0 1 1 1 0
## [3257] 0 0 1 1 1 1 0 1 0 1 1 0 1 1 1 1 0 1 0 1 1 1 0 1 0 1 0 1 0 1 0 1 1 1 1 1 1
## [3294] 1 1 1 1 0 0 0 1 1 1 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 1 0 0 0 1 0 0 0 1 1 1 1
## [3331] 0 1 1 0 1 1 1 0 1 0 1 0 0 1 1 1 0 1 0 1 0 0 0 1 0 0 0 1 1 1 1 1 1 1 1 1 1
## [3368] 0 1 1 1 1 0 1 1 0 1 0 1 1 0 1 1 1 0 1 1 1 0 0 1 1 0 1 1 1 1 1 1 0 1 0 1 0
## [3405] 0 1 0 1 1 0 0 0 0 1 0 1 1 0 0 1 1 1 1 1 1 1 1 0 1 1 0 1 1 0 0 1 1 1 1 1
## [3442] 0 0 1 0 1 1 0 0 1 1 1 1 1 1 0 1 0 1 0 0 1 1 1 1 1 1 1 1 0 0 1 1 0 0 0 1 0
## [3479] 0 1 1 1 1 0 1 1 0 0 0 0 0 1 0 0 1 0 1 1 0 1 1 1 1 0 1 1 1 0 1 1 1 1 0 1 1
## [3516] 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 0 1 1 1 0 1 1
## [3553] 1 1 1 0 1 1 1 0 1 1 1 1 0 1 1 0 1 1 0 1 0 1 0 1 1 0 1 1 0 1 1 1 1 1 1 1 0
## [3590] 1 1 1 1 1 1 0 0 0 0 1 1 1 1 0 0 1 1 0 1 0 1 1 0 0 0 0 1 0 0 1 1 1 0 1 0 1
## [3627] 1 1 1 0 1 1 1 0 1 0 1 1 0 1 1 0 1 1 1 0 1 1 0 1 0 1 1 0 0 1 1 1 1 1 0 1 0
## [3664] 1 1 0 0 1 1 0 1 0 1 1 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 1 0 1 0 1 0 1 0 1 0
## [3701] 0 0 0 1 0 0 1 1 0 1 0 1 0 1 0 1 1 1 0 0 1 1 1 1 0 1 0 0 1 1 1 1 1 1 0 1
## [3738] 1 1 0 1 1 1 1 1 0 1 1 1 0 1 1 1 0 1 0 0 1 1 1 1 1 0 1 0 1 0 0 1 0 0 1 0 1
## [3775] 0 0 0 0 1 1 1 1 0 1 0 1 0 0 0 0 0 1 1 1 1 0 0 1 1 0 0 1 1 0 0 1 1 1 0 1 1
## [3812] 0 1 1 1 0 1 1 1 0 0 0 1 0 0 1 1 1 1 1 0 1 0 1 1 1 0 0 1 0 1 0 1 0 1 1 1 0
## [3849] 1 0 0 0 0 0 1 1 1 1 1 0 1 1 1 0 1 1 1 0 1 0 0 0 1 0 0 1 0 0 1 1 1 0 1 0 0
## [3886] 0 0 0 0 1 1 0 1 1 1 0 1 0 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 0 1 0 1 0 1 0 1 0
## [3923] 1 1 1 1 1 0 1 1 1 1 1 0 0 0 0 0 1 1 0 0 1 1 0 0 0 1 1 1 0 0 0 1 1 0 0 0 1
## [3960] 1 1 1 1 0 1 0 1 1 1 1 1 0 0 1 0 0 0 0 0 0 1 0 1 1 0 1 1 0 0 0 1 1 0 1 1 0
## [3997] 1 1 1 1 1 0 1 1 1 0 1 1 1 1 0 1 0 0 1 1 1 0 0 0 1 1 1 0 1 0 1 1 1 0 0 0 1
## [4034] 1 1 0 1 1 1 0 1 0 1 0 0 1 1 1 1 0 0 1 1 0 0 1 1 1 0 0 1 0 0 0 1 1 1 1 0 1
## [4071] 0 1 1 1 0 0 0 1 1 1 1 1 1 1 1 0 0 0 0 1 1 0 1 0 1 1 0 0 1 0 1 1 0 0 1 1 0 1
## [4108] 1 0 0 0 0 1 1 0 1 1 0 1 1 0 0 1 0 0 1 1 1 0 1 0 1 1 0 1 1 1 1 0 0 0 0 0 0
## [4145] 1 0 1 1 1 1 1 1 1 1 1 1 0 0 1 1 1 0 1 0 1 1 0 0 1 0 1 1 0 1 1 0 1 0 1 0 1
## [4182] 1 1 0 0 1 1 0 1 1 1 1 1 1 1 1 0 1 1 1 1 0 1 0 1 1 1 1 0 1 0 1 1 0 0 1 1 1 0
## [4219] 1 1 1 0 1 1 1 1 0 0 1 1 1 1 0 1 1 1 0 0 1 1 1 1 1 0 0 1 1 1 1 1 0 0 0 1 0
## [4256] 1 1 0 0 0 1 1 1 0 1 1 1 1 0 0 0 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 0 1 0 1 1
## [4293] 1 0 1 1 1 1 1 1 0 0 1 0 0 1 0 1 1 0 1 0 1 0 0 0 1 1 1 1 0 0 1 0 1 1 0 0 1
## [4330] 0 1 1 1 1 0 1 1 0 1 0 0 1 1 0 1 1 1 1 1 1 0 0 0 1 1 0 1 1 1 0 1 1 0 1 1 1
## [4367] 0 0 0 0 1 1 0 1 1 1 1 0 0 0 0 1 0 1 1 1 1 1 0 1 0 1 1 1 0 1 1 0 1 1 1 1 0
## [4404] 0 1 1 1 0 1 1 1 0 1 1 0 1 1 0 1 0 1 0 0 1 0 1 0 0 1 1 0 1 0 1 0 0 1 0 0 0
## [4441] 1 1 1 0 0 0 1 1 1 1 0 0 1 1 0 1 1 0 1 1 0 1 1 0 0 1 1 1 1 1 0 1 1 0 1 1 0
## [4478] 0 0 1 0 1 1 0 0 0 0 1 0 0 1 0 0 1 0 1 1 0 1 1 1 0 1 1 1 1 0 0 0 1 1 1 0 0
## [4515] 1 1 1 1 1 1 0 1 0 1 0 0 1 0 1 0 1 1 0 0 1 1 0 1 0 1 1 0 0 0 1 1 1 1 1 1 0
## [4552] 1 0 0 1 1 1 0 0 1 1 0 1 1 0 1 0 0 0 0 1 0 1 1 1 0 1 1 0 0 0 1 1 1 0 0 0 0
## [4589] 0 0 1 1 1 1 0 0 1 0 1 0 1 1 1 1 0 1 1 1 1 1 0 0 0 1 1 1 1 1 1 0 1 0 0 1 1
## [4626] 0 0 1 1 1 0 0 1 1 0 1 0 1 1 1 1 1 0 1 0 1 1 0 0 1 1 1 0 0 1 0 1 0 1 0 0 1
## [4663] 1 1 1 1 0 0 0 0 1 1 0 1 0 1 0 0 1 1 0 1 1 1 0 1 1 1 0 1 1 1 1 0 1 1 1 0 1
## [4700] 0 0 1 1 1 0 0 1 0 1 0 1 1 1 1 0 1 0 1 1 1 0 1 1 1 1 1 1 1 1 0 1 1 1 1 1 0
## [4737] 1 0 0 0 1 1 0 1 1 0 1 0 0 1 1 1 1 0 1 1 1 1 1 0 1 1 0 0 1 1 0 0 0 1 1 0 1
## [4774] 0 1 0 0 1 1 0 1 1 0 1 1 0 1 0 1 1 1 0 1 0 1 0 0 0 0 0 1 1 0 1 0 1 1 0 1 1
## [4811] 0 1 1 0 1 1 1 0 0 0 0 0 1 1 1 1 0 1 1 1 1 0 1 0 0 0 1 1 0 0 1 0 1 1 0 0 0
## [4848] 1 1 1 1 1 1 0 0 1 1 0 1 1 1 1 0 0 0 0 1 1 1 1 1 1 1 0 1 1 1 0 0 1 1 0 1 1
## [4885] 1 0 1 1 1 1 1 0 1 0 0 1 1 0 1 1 0 1 1 0 0 1 1 0 1 1 1 0 0 1 0 1 1 0 1 1 1
## [4922] 1 1 0 0 1 0 1 1 1 0 1 0 0 1 1 1 1 1 0 1 0 1 1 1 1 0 0 1 1 1 1 1 1 1 0 1 1
## [4959] 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 0

```

```
## [4996] 0 1 0 0 0
## Levels: 0 1

summary(gmbPredictBrand) # 1940 Acer, 3060 Sony.

##      0      1
## 1940 3060

#Random Forest model. With 5 manual values for mtry.

#dataframe for manual tuning of mtry
rfGrid <- expand.grid(mtry=c(1,2,3,4,5))

#train Random Forest Regression model
#note the system time wrapper. system.time()
#this is used to measure process execution time
rfFitm1 <- train(brand~., data = training, method = "rf", trControl=fitControl, tuneGrid=rfGrid)

#training results
rfFitm1

## Random Forest
##
## 7424 samples
##      6 predictor
##      2 classes: '0', '1'
##
## No pre-processing
## Resampling: Cross-Validated (10 fold, repeated 1 times)
## Summary of sample sizes: 6681, 6681, 6682, 6682, 6681, 6682, ...
## Resampling results across tuning parameters:
##
##  mtry  Accuracy   Kappa
##  1     0.8545232  0.6788543
##  2     0.9230906  0.8369402
##  3     0.9240318  0.8388522
##  4     0.9218769  0.8342634
##  5     0.9194527  0.8288669
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was mtry = 3.

summary(rfFitm1)

##           Length Class      Mode
## call              4 -none-    call
## type              1 -none- character
## predicted        7424 factor   numeric
## err.rate         1500 -none-    numeric
## confusion         6 -none-    numeric
## votes           14848 matrix   numeric
## oob.times        7424 -none-    numeric
## classes          2 -none- character
## importance        6 -none-    numeric
## importanceSD      0 -none-    NULL
```



```
## localImportance      0 -none-      NULL
## proximity            0 -none-      NULL
## ntree                1 -none-      numeric
## mtry                1 -none-      numeric
## forest              14 -none-      list
## y                   7424 factor      numeric
## test                0 -none-      NULL
## inbag               0 -none-      NULL
## xNames              6 -none-      character
## problemType         1 -none-      character
## tuneValue           1 data.frame list
## obsLevels           2 -none-      character
## param               0 -none-      list
```

```
VarImprf <- varImp(rfFitm1)
VarImprf
```

```
## rf variable importance
##
##      Overall
## salary 100.000
## age    65.560
## credit  9.185
## car     3.386
## zipcode 1.455
## elevel  0.000
```

```
rfPredict1 <- predict(rfFitm1,testing) # The values are discrete because
# the imputs were introduced as factors. In other case, the model returns
# continuous values, close to 0 and 1.
```

```
rfPredict1
```

```
##      [1] 1 1 1 0 1 1 1 1 1 0 1 0 1 1 0 0 0 1 1 0 1 0 1 0 1 1 1 1 1 1 1 0 1 0 1 1 1
##      [38] 1 1 1 1 0 0 0 1 1 1 1 1 1 0 0 0 1 1 1 0 0 0 1 0 0 1 1 1 1 0 1 0 0 1 1 0 1 1
##      [75] 1 1 1 0 0 1 1 1 1 0 0 1 1 1 0 1 1 0 0 0 0 1 0 0 1 0 1 1 0 0 1 0 1 1 1 1 1 0
##     [112] 1 0 1 0 1 1 1 1 0 1 1 0 0 1 1 0 0 1 1 1 1 1 1 1 1 1 1 0 0 1 1 0 1 1 1 0 0 1 1
##     [149] 1 1 1 1 0 0 1 1 1 0 1 0 1 1 1 1 1 1 1 0 0 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 0
##     [186] 1 1 0 1 1 1 1 0 1 0 0 0 1 0 1 1 1 1 0 1 1 1 1 0 1 0 1 1 1 1 1 1 1 1 1 0 0 0 1 0
##     [223] 1 1 1 1 1 0 1 1 0 1 0 1 1 1 1 0 0 0 0 1 1 1 0 0 1 1 1 0 0 1 1 1 1 1 0 0 1 1
##     [260] 1 1 0 1 1 0 0 0 1 1 0 0 1 0 1 1 1 1 1 1 0 1 1 0 1 1 0 0 0 1 1 1 1 1 0 0 0 0
##     [297] 0 0 0 0 1 1 1 0 1 0 1 1 0 0 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 0 1 1 1 0 0 0 0 1
##     [334] 1 1 0 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 0 1 1 1 1 0 1 1 0 1 1 0 1 1 0 1 1 1 1 1 1
##     [371] 1 0 1 0 0 0 1 0 0 1 1 0 1 1 1 0 1 0 0 0 1 1 1 0 0 1 1 1 1 1 1 1 0 1 0 1 1 1 1
##     [408] 0 0 1 0 1 0 1 1 0 1 1 0 1 0 0 1 0 1 1 1 0 1 1 1 0 0 1 1 1 0 1 1 1 1 1 1 1 1
##     [445] 0 1 0 1 0 0 0 0 1 1 0 1 1 1 0 1 1 1 1 1 0 1 0 1 1 0 0 1 1 1 1 0 1 0 1 0 1 0 0
##     [482] 0 0 1 1 1 0 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 1 1 1 1 1 1
##     [519] 0 1 0 0 0 1 1 0 0 1 0 1 1 0 0 1 1 0 1 0 0 1 1 0 1 1 1 1 0 0 1 0 1 1 1 0 1
##     [556] 1 1 0 1 0 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 0 1 0 0 1 1 1 0 0 1 0 0 1
##     [593] 1 0 1 1 1 0 0 0 0 1 1 0 1 1 0 0 1 1 0 1 0 0 1 1 0 0 0 1 0 0 0 1 1 0 0 0 1
##     [630] 0 1 0 1 1 0 1 0 1 0 0 1 1 0 1 1 1 1 0 1 0 1 0 1 1 1 0 0 1 1 1 0 0 1 0 0 0
##     [667] 0 1 1 0 1 0 0 1 1 1 0 1 1 1 0 1 0 1 1 1 1 1 0 1 1 1 0 1 1 1 0 0 0 1 1 0 1
##     [704] 1 1 1 1 1 0 1 0 0 1 1 1 0 0 1 1 1 0 1 1 1 1 0 0 1 1 0 0 0 0 1 1 0 1 1 0 1
##     [741] 0 1 0 1 0 1 1 1 1 1 0 1 1 0 0 1 1 1 1 1 1 0 0 1 1 0 0 1 0 1 1 1 0 0 0 0 0
##     [778] 0 0 0 1 1 1 1 1 1 0 1 1 0 1 1 1 0 1 1 1 1 0 1 0 0 1 1 1 1 0 1 0 1 1 1 0
##     [815] 0 0 0 1 0 1 1 0 1 1 0 1 0 1 1 0 0 1 1 1 1 1 0 1 1 0 1 0 1 0 1 1 0 1 1 1 1
```

```
## [852] 1 1 0 1 1 1 1 1 0 1 0 1 1 1 1 0 1 1 0 1 1 1 1 0 0 1 0 0 0 1 1 0 0
## [889] 1 0 0 1 1 1 1 0 1 1 0 0 1 1 0 1 1 0 1 0 0 1 0 1 1 1 1 1 1 0 0 1 1 1 0
## [926] 1 1 0 0 1 1 1 1 0 1 0 0 1 1 0 0 1 0 0 1 0 1 0 1 0 0 1 1 1 0 0 1 1 0 1 1 0
## [963] 1 1 1 1 1 1 1 1 1 0 1 1 1 1 0 1 1 1 0 1 0 1 0 1 0 1 1 0 1 1 1 1 0 0 1 1 0
## [1000] 0 0 1 0 0 0 0 0 1 0 1 1 1 1 1 0 1 1 1 1 1 1 0 1 0 1 0 1 0 1 1 0 0 0 1 1
## [1037] 1 0 0 1 1 1 1 1 1 1 1 1 0 1 0 0 1 0 1 1 1 0 1 1 0 1 0 1 1 0 1 1 1 1 1 0 0
## [1074] 1 1 0 1 1 0 0 1 1 0 0 0 0 0 0 1 1 0 1 1 1 1 1 1 1 1 0 0 1 1 1 0 1 1 1 1 1 1
## [1111] 0 0 1 1 1 1 0 1 1 1 1 1 0 0 1 1 0 0 0 1 1 0 1 1 1 0 0 1 0 1 1 0 1 1 1 1 1 1
## [1148] 1 1 1 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 1 1 1 1 0 1 1 1 0 0 1 1 0 1 1 1 0 1 1
## [1185] 1 1 0 0 1 0 1 1 1 1 0 1 0 0 1 1 1 1 1 1 0 0 0 0 1 1 0 0 1 1 1 1 1 0 0 1 0
## [1222] 1 1 0 1 0 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 0 1 0 0 1 1 0 0 0 1 1 1 1 0 1 1 1
## [1259] 1 0 0 1 1 0 1 1 1 0 0 1 1 0 1 1 0 1 0 0 1 1 1 0 1 1 1 1 1 1 1 1 1 1 0 0 0 1
## [1296] 0 1 0 1 1 1 1 0 0 1 0 1 1 1 1 1 1 1 1 1 1 1 0 0 1 0 0 1 1 1 1 0 0 0 0 1
## [1333] 0 1 1 0 0 0 0 0 1 1 0 0 1 1 0 0 1 0 1 1 0 1 1 1 1 0 1 0 0 1 1 1 0 1 1 0 0
## [1370] 1 1 1 1 1 1 1 1 1 1 0 0 1 1 0 1 1 1 1 1 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 0 0
## [1407] 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 0 1 0 1 1 1 1 1 0 1 1 0 1 1 0
## [1444] 0 1 1 0 1 0 0 1 0 1 1 0 0 1 0 1 1 1 1 1 1 0 1 1 1 1 1 0 0 1 1 1 1 0 1 0 0
## [1481] 1 1 0 0 1 1 1 1 1 1 0 0 0 0 1 1 1 1 1 1 1 0 0 0 1 0 0 0 1 1 1 1 0 1 0 0 0
## [1518] 0 1 0 1 0 0 1 1 1 0 1 1 1 1 1 1 0 0 1 0 0 1 1 1 1 0 0 0 1 1 0 0 0 0 1 0 0
## [1555] 0 0 1 0 0 0 0 1 0 0 1 1 1 1 1 0 1 0 1 0 1 1 1 1 1 0 0 0 1 1 0 0 1 1 1 1 0
## [1592] 1 0 0 0 0 0 1 1 1 1 1 0 0 0 0 1 1 1 1 1 1 1 0 1 0 0 1 1 1 1 0 1 0 0 1 1 1
## [1629] 1 1 0 0 0 1 1 0 0 1 1 1 0 0 0 1 0 0 1 0 0 0 0 1 1 0 1 0 1 1 0 0 0 0 1 1 0
## [1666] 1 0 1 0 0 1 0 0 0 1 1 0 0 1 1 1 1 1 1 0 1 1 0 0 1 0 1 1 1 0 1 1 1 1 0 0 1
## [1703] 0 1 1 1 1 1 0 1 0 0 0 1 1 0 0 0 1 1 1 0 0 0 0 0 0 1 1 0 0 0 1 1 1 1 1 1 0
## [1740] 1 0 0 1 0 0 1 0 1 0 1 0 1 0 0 1 0 0 0 1 1 0 0 1 1 0 0 0 1 1 1 1 1 1 1 0 0
## [1777] 0 1 1 0 0 1 1 1 0 1 0 1 0 1 1 1 0 1 1 1 1 0 0 1 0 1 1 1 0 1 1 1 0 0 0 1 1
## [1814] 1 0 0 1 0 0 0 1 1 1 0 0 1 0 0 1 0 1 1 0 1 1 1 1 1 0 1 1 1 0 1 1 1 0 1 1 0
## [1851] 0 0 1 1 0 0 1 1 1 1 0 1 1 1 0 1 1 1 1 0 0 1 1 1 1 1 1 1 1 1 0 1 1 1 0 1 0 1
## [1888] 0 1 0 0 1 0 1 0 1 1 1 1 0 0 1 0 1 0 0 0 0 1 0 0 0 1 0 1 0 0 0 1 0 0 1 0 1
## [1925] 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 0 0 0 1 0 1 1 0 1 0 0 0 1 0 1 1 1 1 1
## [1962] 1 1 0 1 1 1 0 1 1 1 0 1 0 1 1 0 1 1 1 1 0 0 1 1 1 1 1 0 1 1 1 1 0 1 1 0 1
## [1999] 1 1 0 0 1 0 1 0 0 0 0 0 1 1 0 0 1 1 0 0 0 0 1 1 1 1 1 1 0 1 1 1 1 1 1 1 0
## [2036] 1 1 1 1 1 1 0 1 1 0 1 1 1 0 0 0 0 0 1 0 1 1 1 1 1 1 0 1 0 1 1 1 1 1 0 0 0
## [2073] 1 0 0 0 1 0 1 1 1 1 0 1 1 0 1 1 1 1 1 1 1 0 1 0 1 1 1 1 0 1 1 1 0 0 1
## [2110] 0 1 0 1 1 1 0 1 1 1 0 1 1 1 1 0 1 0 1 0 1 0 1 1 1 1 0 1 1 1 1 0 1 1 0 1 0
## [2147] 1 0 1 0 0 1 1 1 0 1 1 1 1 1 0 0 0 1 0 1 1 1 0 1 0 1 1 1 1 0 1 0 1 0 1 1 0
## [2184] 0 0 0 0 1 0 1 1 1 0 0 1 0 1 1 0 1 1 1 1 1 1 0 1 1 1 0 1 0 1 0 1 1 1 0 0 1
## [2221] 1 0 0 0 1 0 1 1 0 1 1 0 1 1 1 1 1 1 1 1 1 1 0 1 1 0 1 0 0 1 1 0 0 1 0 1 1
## [2258] 0 1 0 0 1 1 0 1 0 1 0 0 0 1 1 0 1 1 1 1 1 1 1 1 1 1 0 1 0 0 1 0 1 0 1 0 0
## [2295] 0 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 0 1 0 1 1 1 0 1 1 1 1 1 1 1 1 1 0 1 1 0 0 1 1
## [2332] 1 0 0 1 0 1 1 0 1 1 0 1 1 1 1 0 1 1 0 0 1 0 0 1 0 0 0 1 0 0 0 1 1 1 0 1 1
## [2369] 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 1 0 1 0 0 1 0 1 0 0 0 0 1 1 1 1 0 0 1 1 1 0
## [2406] 1 1 0 1 1 1 0 0 1 0 0 0 1 0 1 1 0 1 1 1 0 1 0 0 0 1 1 1 1 1 1 1 1 1 0 1 1 0
## [2443] 0 0 1 1 1 1 0 1 1 1 1 1 0 0 1 1 0 1 1 0 0 1 0 0 0 1 1 1 0 0 1 1
```

```
## Levels: 0 1
```

```
summary(rfPredict1)
```

```
##      0      1
```

```
## 953 1521
```

```
Results1rf<-postResample(rfPredict1,testing$brand)# Show accuracy and kappa.
```

```
Results1rf # almost 92% of accuracy, 0.82 kappa.
```

```
## Accuracy      Kappa
## 0.9163298 0.8227579
```

```
# Prediction of the Incomplete Surveys.
```

```
rfPredictBrand <- predict(rfFitm1 ,Incomplete)
```

```
rfPredictBrand
```

```
##      [1] 1 0 1 1 1 1 1 1 1 0 0 0 1 1 1 1 0 1 1 0 0 1 1 1 1 1 0 1 1 1 0 1 1 1 1 1
##     [38] 1 1 1 1 0 1 1 1 1 1 0 0 0 0 1 1 1 1 1 0 1 0 1 1 1 1 1 1 0 1 1 0 0 1 0 1 0
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