Table of Contents

Summary: 2

Boxplot: 2

Feature Selection: 3

Model Evaluation: 3

- Model 1: 3
- Model 2: 5

Comparing Model1 and Model 2: 6

Conclusion: 6

Summary: 7

Boxplot: 7

Train and Test Data: 8

- Model 1: 8
- Model 2: 10

Comparing ROC curves: 11

Tabulation: 12

Conclusion: 12

Question No 1 :

Whether the client has subscribed a term deposit or not

Available columns are: age","job","marital", "education", "default" ,"balance", "housing", "loan", "contact", "day", "month", "duration", "campaign", "pdays", "previous", "poutcome", "y"

Target Variable is: “y” i.e. in Categorical

Summary:

age	balance	day	duration	campaign	pdays	previous
Min. :18.00	Min. : -8019	Min. : 1.00	Min. : 0.0	Min. : 1.000	Min. : -1.0	Min. : 0.0000
1st Qu.:33.00	1st Qu.: 72	1st Qu.: 8.00	1st Qu.: 103.0	1st Qu.: 1.000	1st Qu.: -1.0	1st Qu.: 0.0000
Median :39.00	Median: 448	Median :16.00	Median: 180.0	Median: 2.000	Median: -1.0	Median: 0.0000
Mean :40.94	Mean : 1362	Mean :15.81	Mean : 258.2	Mean : 2.764	Mean : 40.2	Mean : 0.5803
3rd Qu.:48.00	3rd Qu.: 1428	3rd Qu.:21.00	3rd Qu.: 319.0	3rd Qu.: 3.000	3rd Qu.: -1.0	3rd Qu.: 0.0000
Max. :95.00	Max. :102127	Max. :31.00	Max. :4918.0	Max. :63.000	Max. :871.0	Max. :275.0000

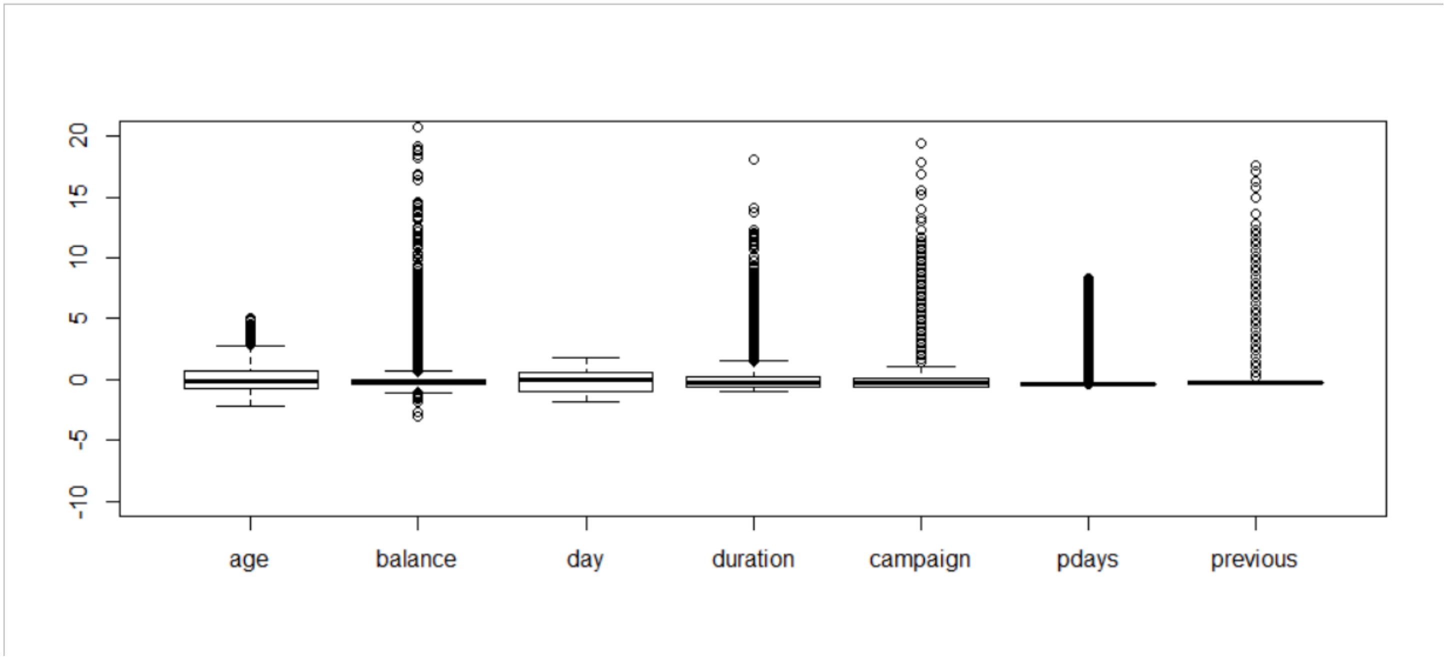
We can see significant difference between the mean and median of some of the variables in the dataset.

marital	education	default	housing	loan	contact	poutcome	y
divorced: 5207	primary: 6851	no :44396	no :20081	no :37967	cellular :29285	failure: 4901	no :39922
married :27214	secondary:23202	yes: 815	yes:25130	yes: 7244	telephone: 2906	other: 1840	yes: 5289
single :12790	tertiary :13301				unknown:13020	success: 1511	
	unknown: 1857					unknown:36959	

Here in the column Default and y, the categories are not balanced, and as it’s a natural data we can’t

job	month
blue-collar:9732	may :13766
management :9458	jul : 6895
technician :7597	aug : 6247
admin. :5171	jun : 5341
services :4154	nov : 3970
retired :2264	apr : 2932
(Other) :6835	(Other): 6060

Boxplot:



Feature Selection:

Train data set contains 31648 records and Test data set contains 13563 records

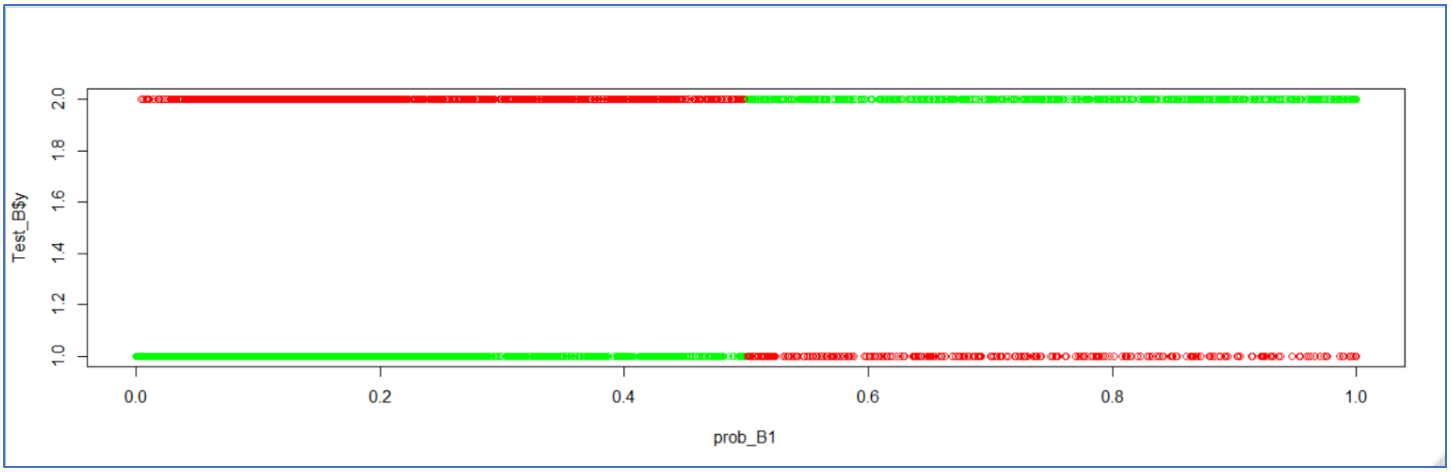
Model Evaluation:

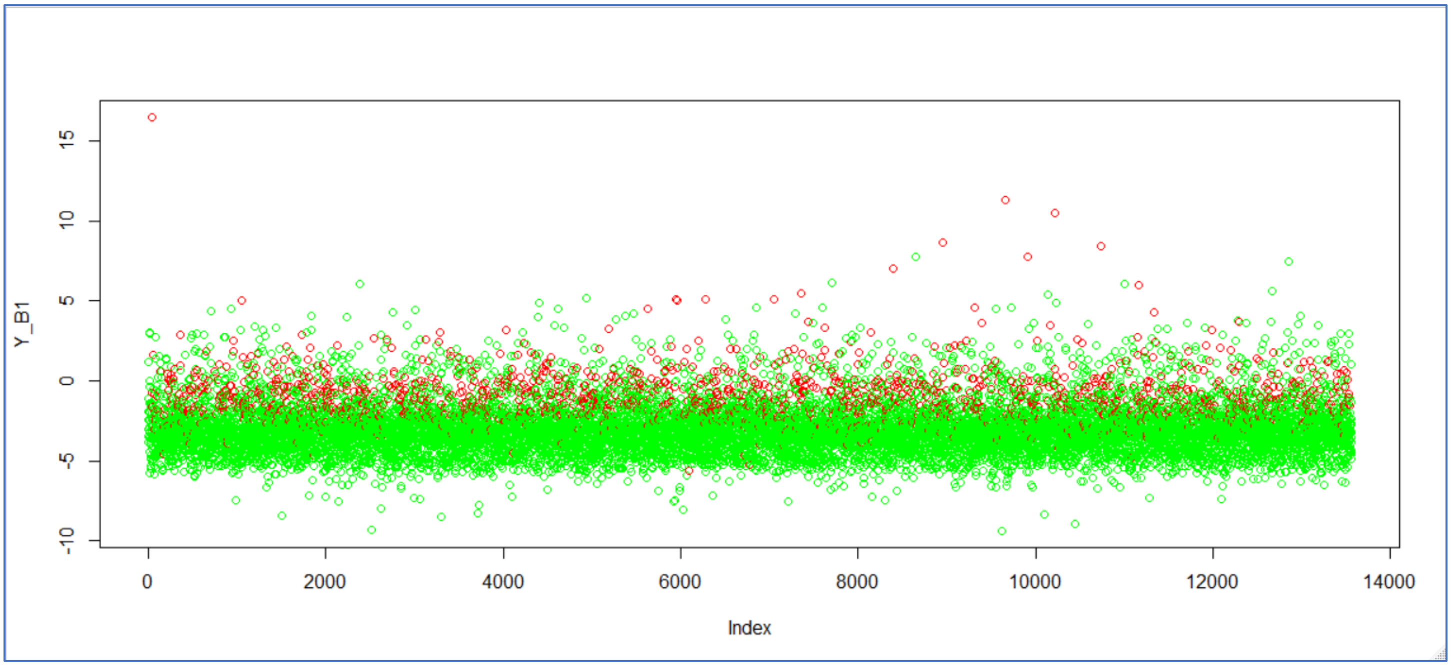
Model 1:

In model 1 I have considered all the columns as well as all the Train data records in my model.

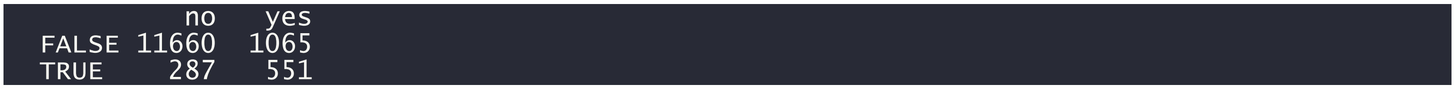
model_B1 <- glm(y~.,data = Train_B,family = binomial(link = "logit")) Here we get AIC = 15017

Plotting the prediction of the model below, where red means wrong prediction and green points means actual prediction.



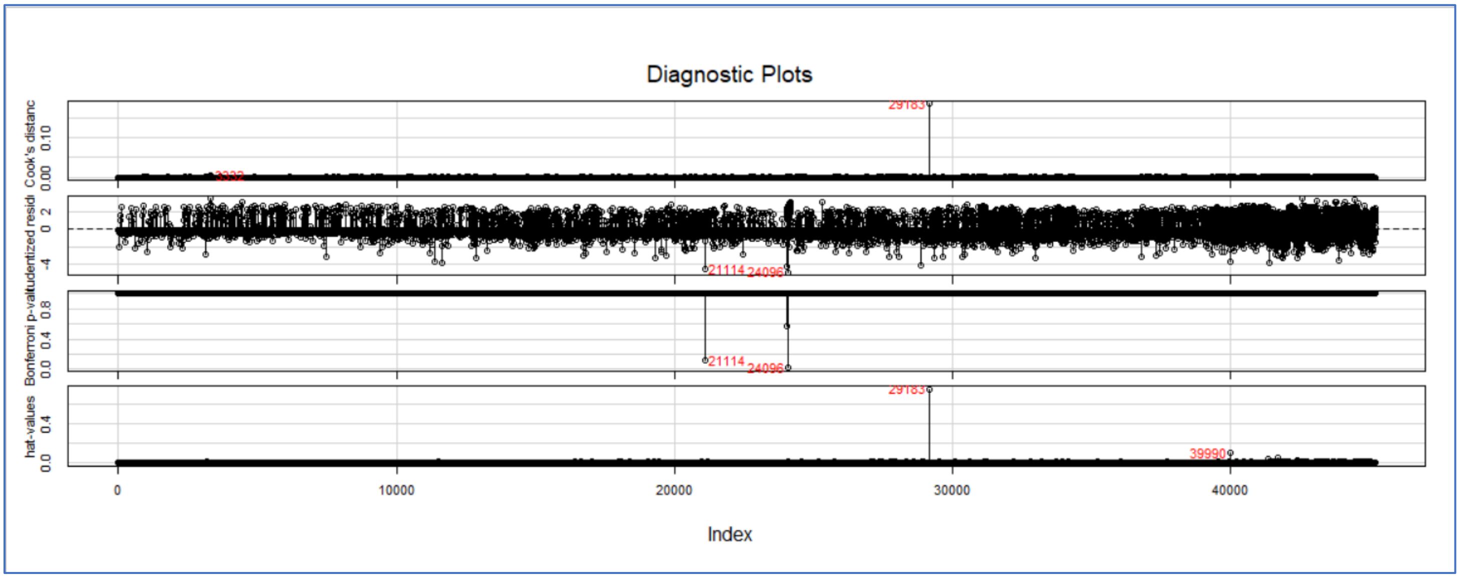


Confusion Matrix:

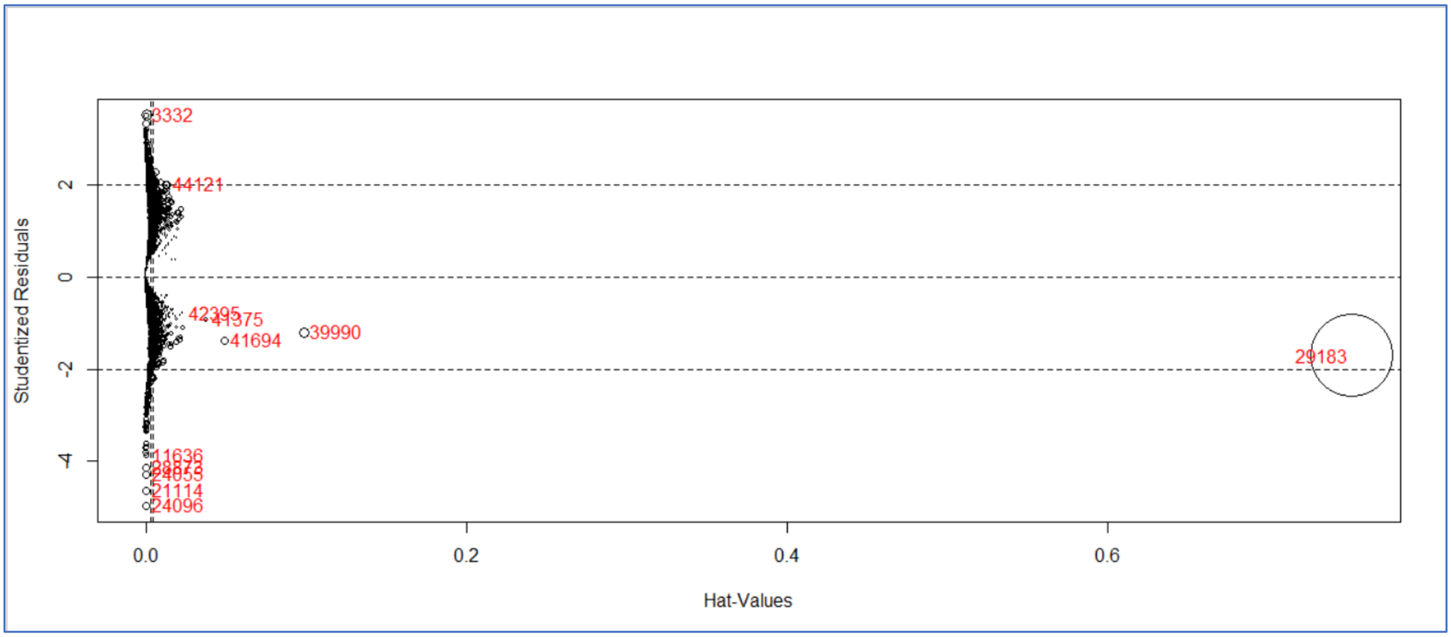


```
          no   yes
 FALSE 11660  1065
 TRUE    287   551
```

Efficiency: 0.900317



Influence Plot:

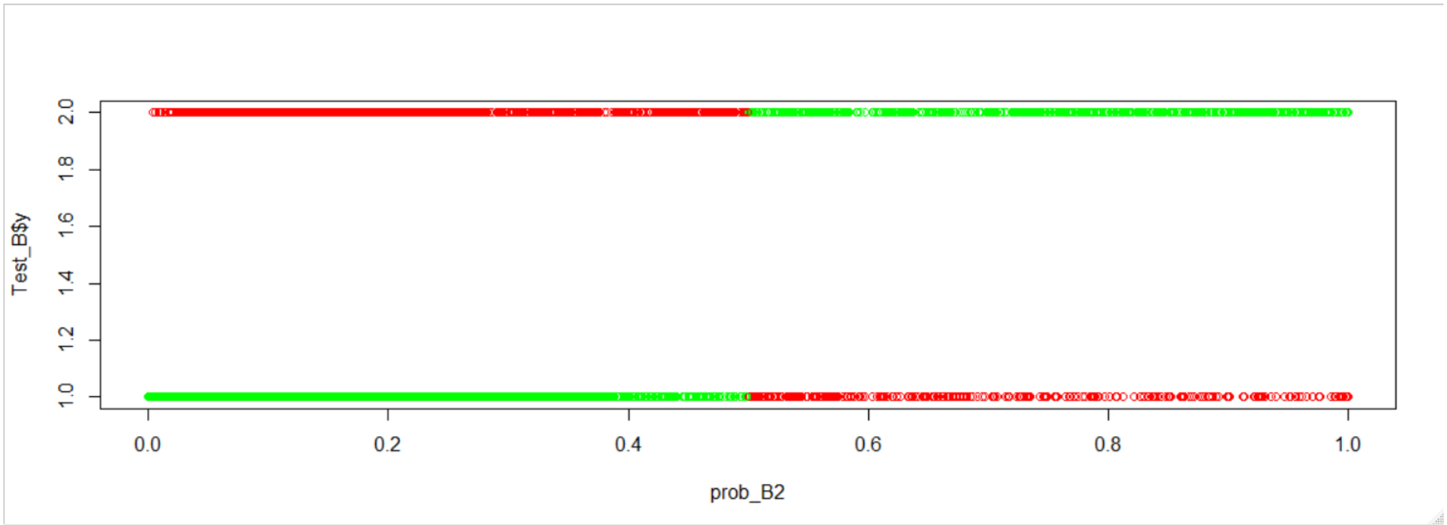


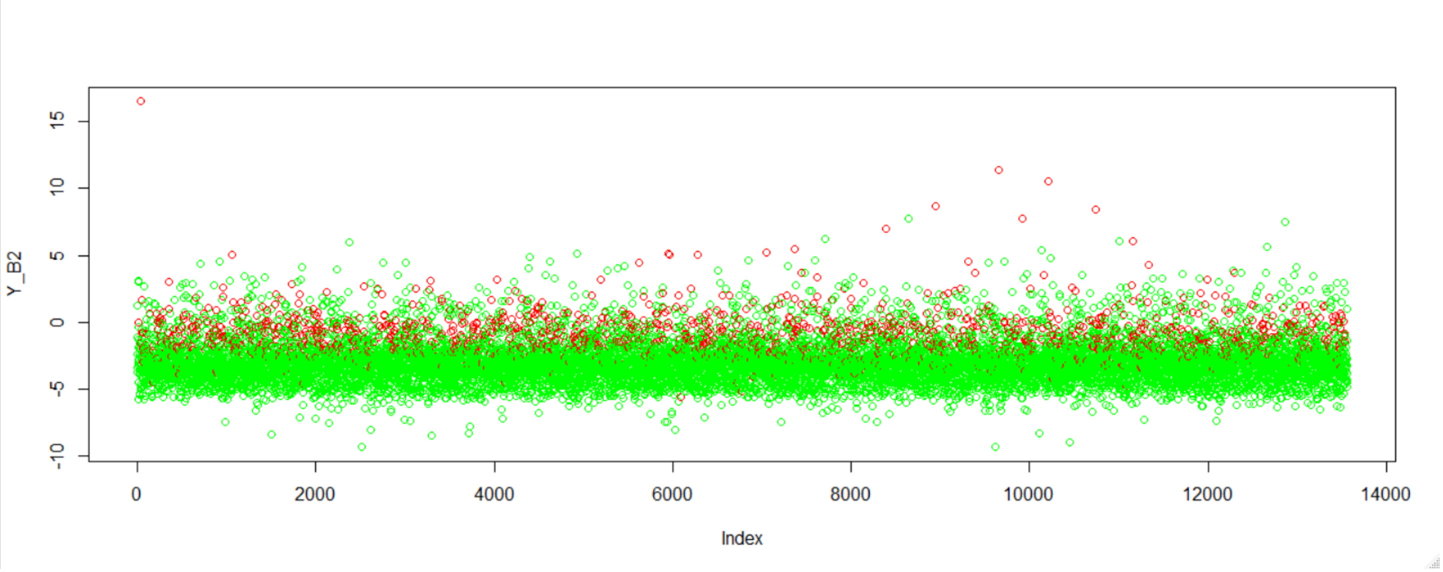
Model 2:

In model 2 I removed some of the influencing records. And removed some of the insignificant columns.

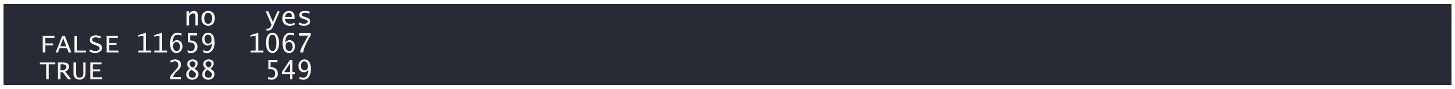
model_B2 <- glm(y~.,data = Train_B[-influence_B1,-c(1,14,5)],family = "binomial")

Where I got AIC value as 15010





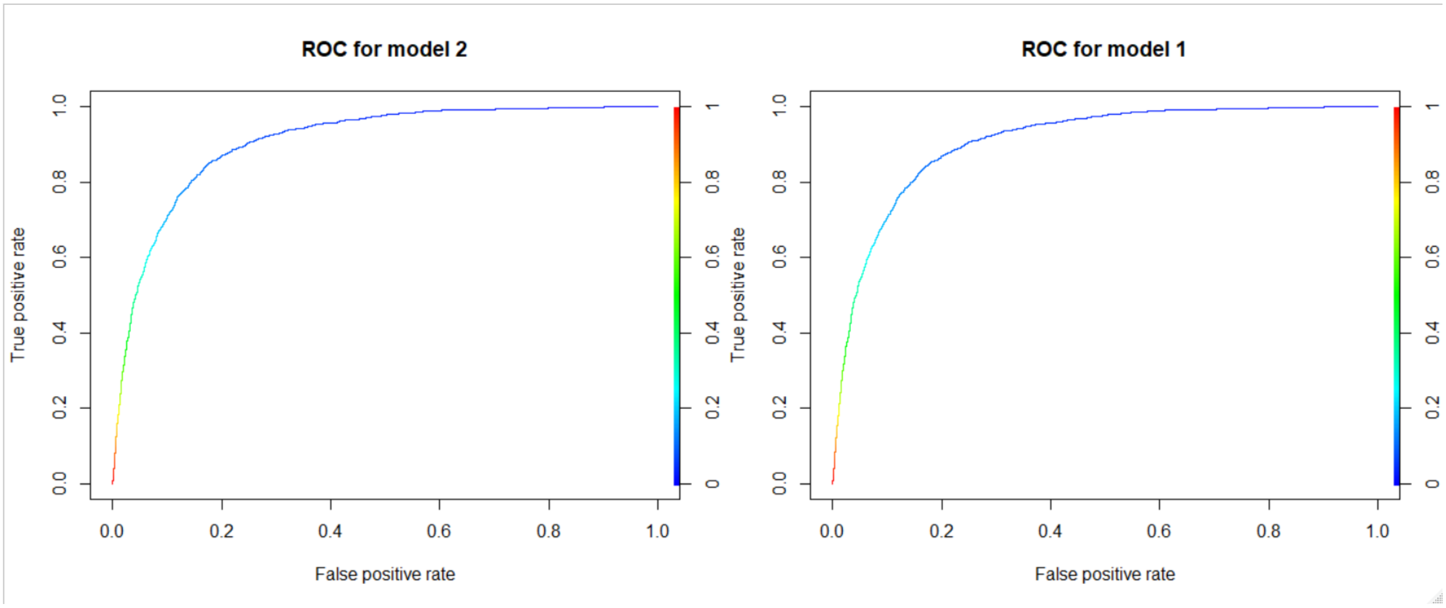
Confusion Matrix:



```
          no   yes
  FALSE 11659  1067
  TRUE    288   549
```

Efficiency: 0.9000958

Comparing Model1 and Model 2:



Model No	AIC	Efficiency	F1 Score
Model 1	15017	0.900317	0.945201
Model 2	15010	0.9000958	0.9450817

Conclusion:

Here In model 1 and model 2 we can’t see any major differences in our AIC, Efficiency as well as F1Score in both of the models up to 3 decimal point is almost same. As we know in our model 1 we have considered many insignificant variables and in model 2 we have considered only the significant variables for our model building. So I may consider my Model 2 as my final model.

Question 2:

I have a dataset containing family information of married couples, which have around 10 variables & 600+ observations. Independent variables are ~ gender, age, years married, children, religion etc. I have one response variable which is number of extra marital affairs. Now, I want to know what all factor influence the chances of extra marital affair. Since extra marital affair is a binary variable (either a person will have or not), so we can fit logistic regression model here to predict the probability of extra marital affair.

Answer:

Available Columns:

"X", "gender", "age", "yearsmarried", "children", "religiousness", "education", "occupation", "rating", "EMA"
Target Variable is “EMA” Extra Marital Affair, which is a categorical variable with values “yes” and “no”.

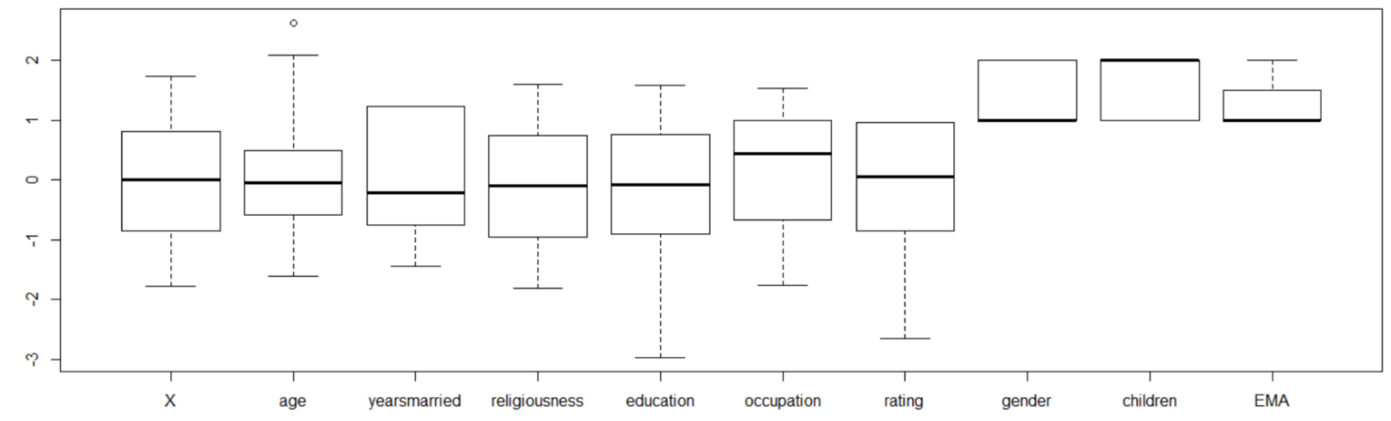
Summary:

X	age	Years married	religiousness	education	occupation	rating
Min. : 4.0	Min. :17.50	Min. : 0.125	Min. :1.000	Min. : 9.00	Min. :1.0	Min. :1.000
1st Qu.: 524.5	1st Qu.:27.00	1st Qu.: 4.000	1st Qu.:2.000	1st Qu.:14.00	1st Qu.:3.0	1st Qu.:3.000
Median : 998.5	Median :32.00	Median : 7.000	Median :3.000	Median :16.00	Median :5.0	Median :4.000
Mean : 993.0	Mean :32.46	Mean : 8.147	Mean :3.119	Mean :16.17	Mean :4.2	Mean :3.933
3rd Qu.:1447.0	3rd Qu.:37.00	3rd Qu.:15.000	3rd Qu.:4.000	3rd Qu.:18.00	3rd Qu.:6.0	3rd Qu.:5.000
Max. :1960.0	Max. :57.00	Max. :15.000	Max. :5.000	Max. :20.00	Max. :7.0	Max. :5.000

EMA	gender	children
no :447	female:313	no :170
yes:149	male :283	yes:426

From the summary we can say, possible There are negligible difference between the median and mean, may be data contains very a smaller number of outliers.

Boxplot:



From boxplot we can say that age variable contains outlier.

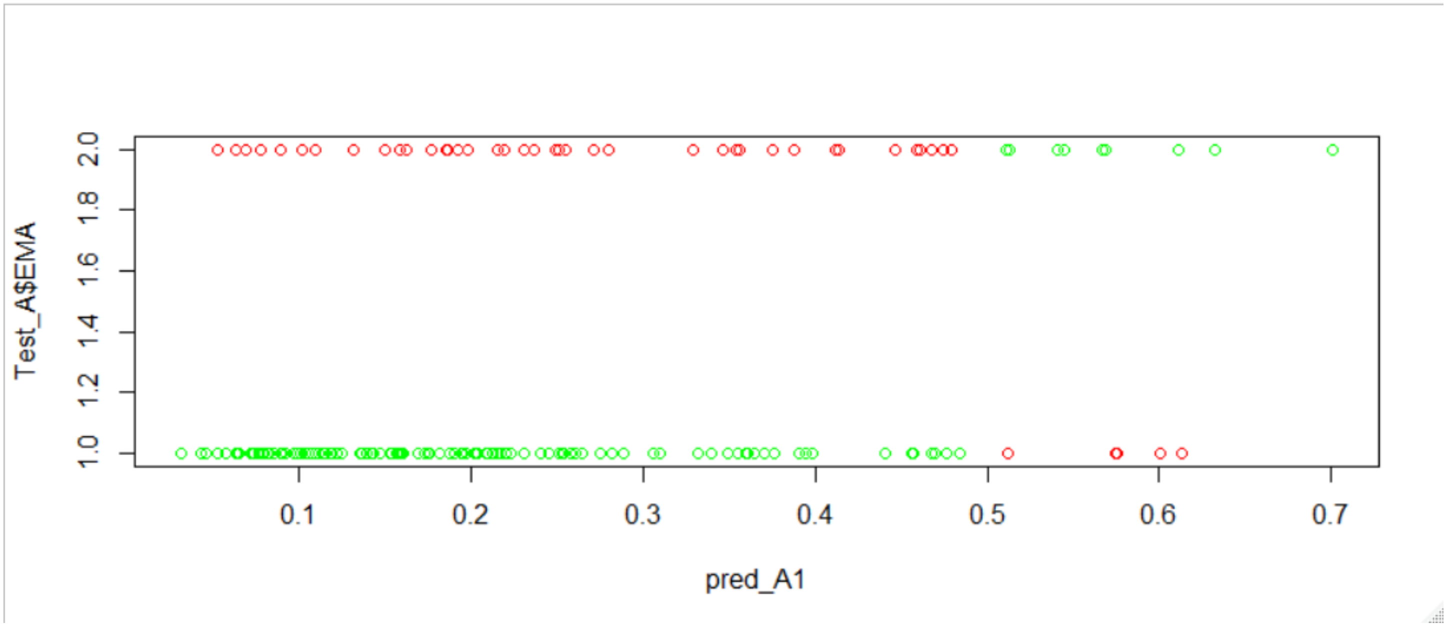
Train and Test Data:

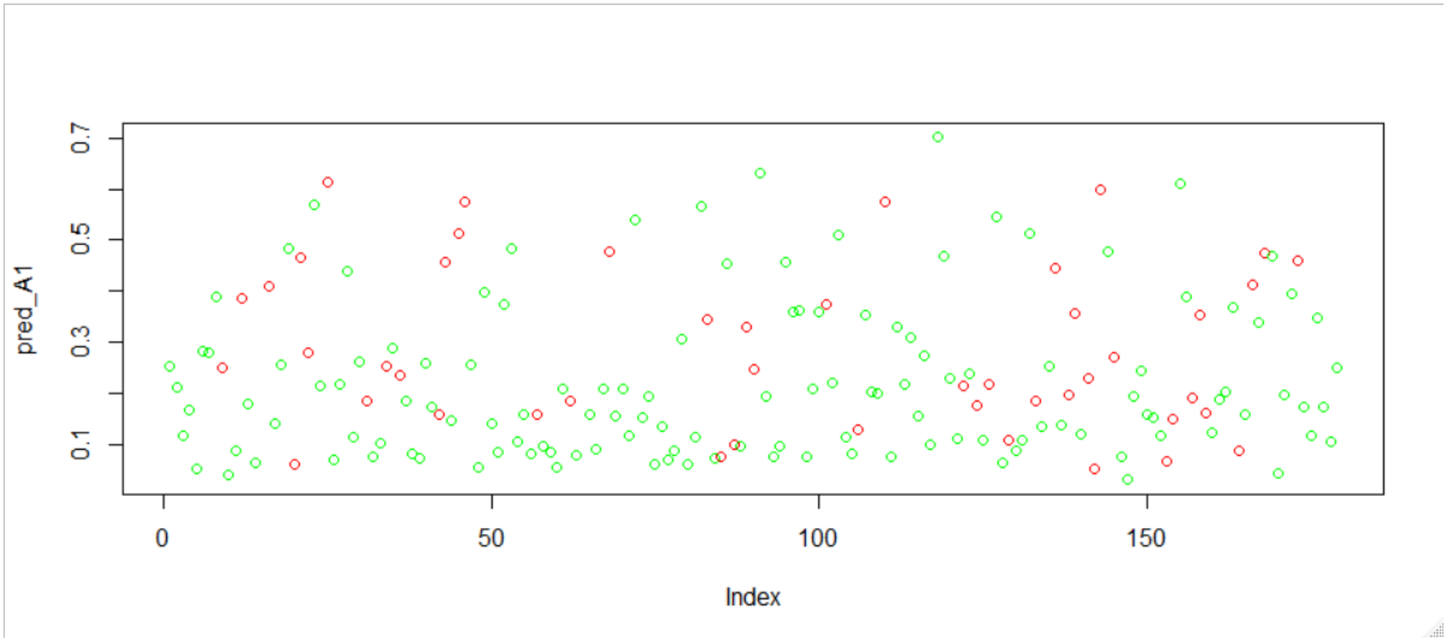
Train Data contains 419 records and my test data contains 179 records in my data.

Model Building:

Model 1:

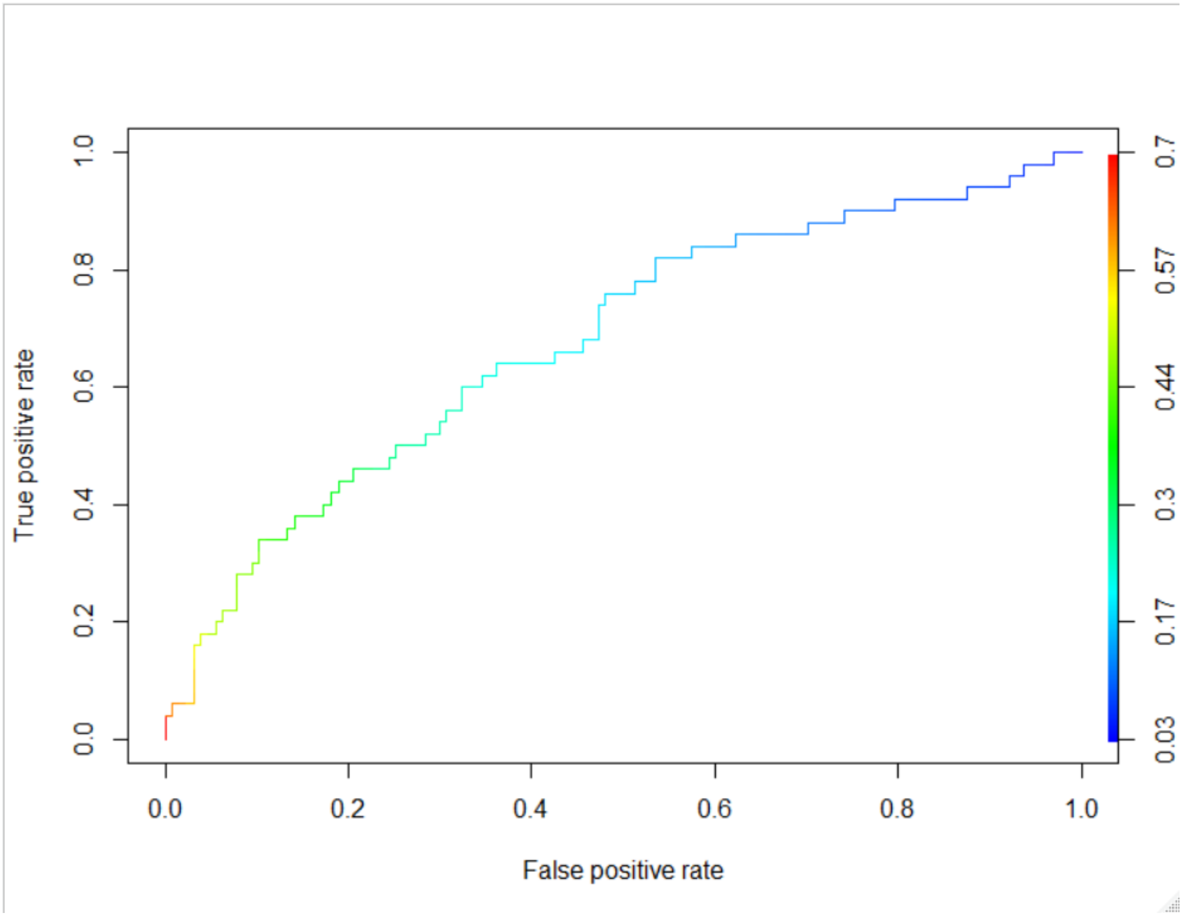
In my model 1 i have considered all my variables and records from the Train data, where I get my AIC value as 429.34, and efficiency is 0.740113.





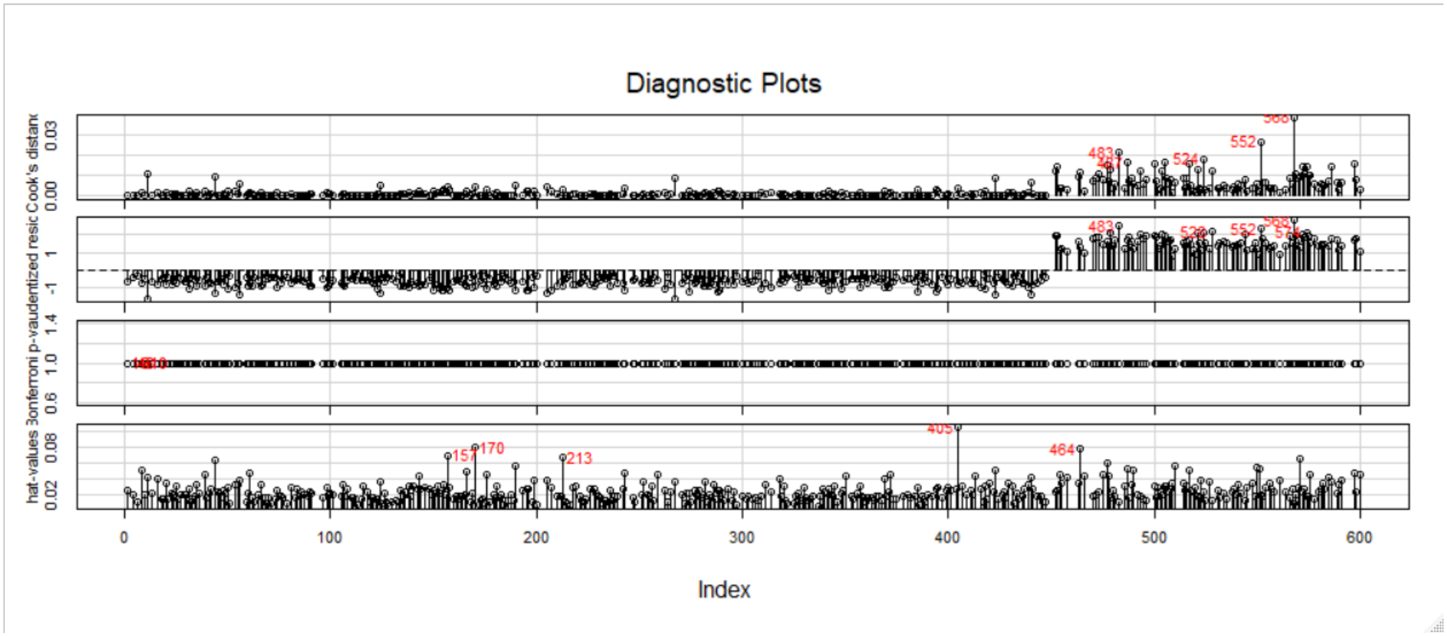
The red marks are wrong prediction and the green marks are correct prediction using my model 1.

ROC Curve:



Here we can see that the area under the curve is very less.

Influence Plot:

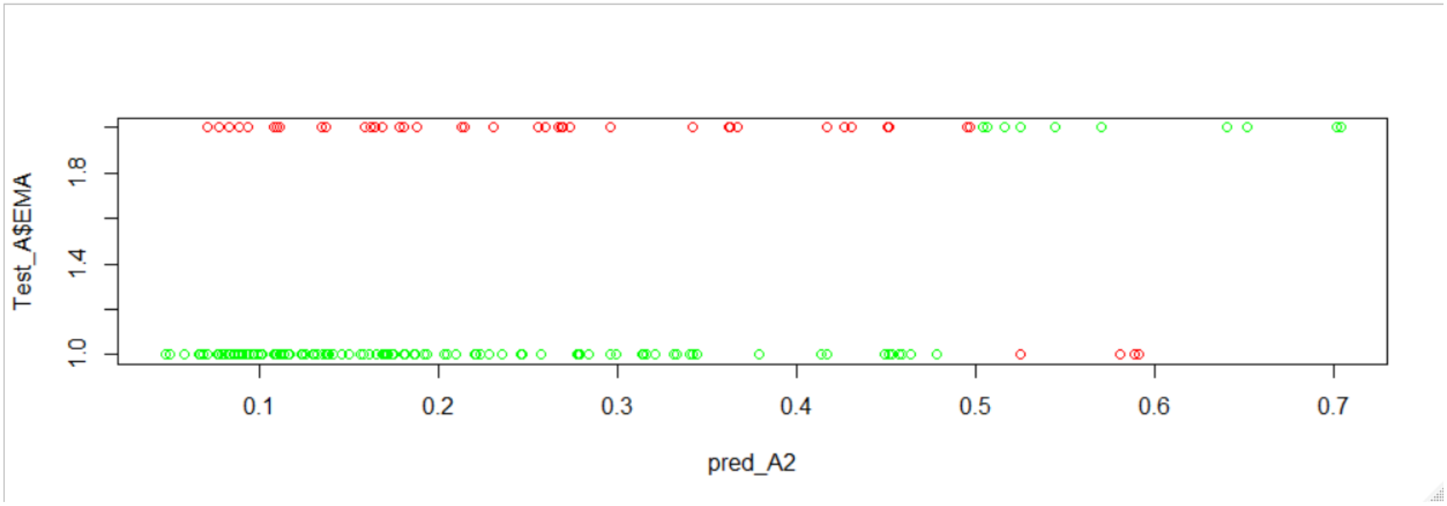


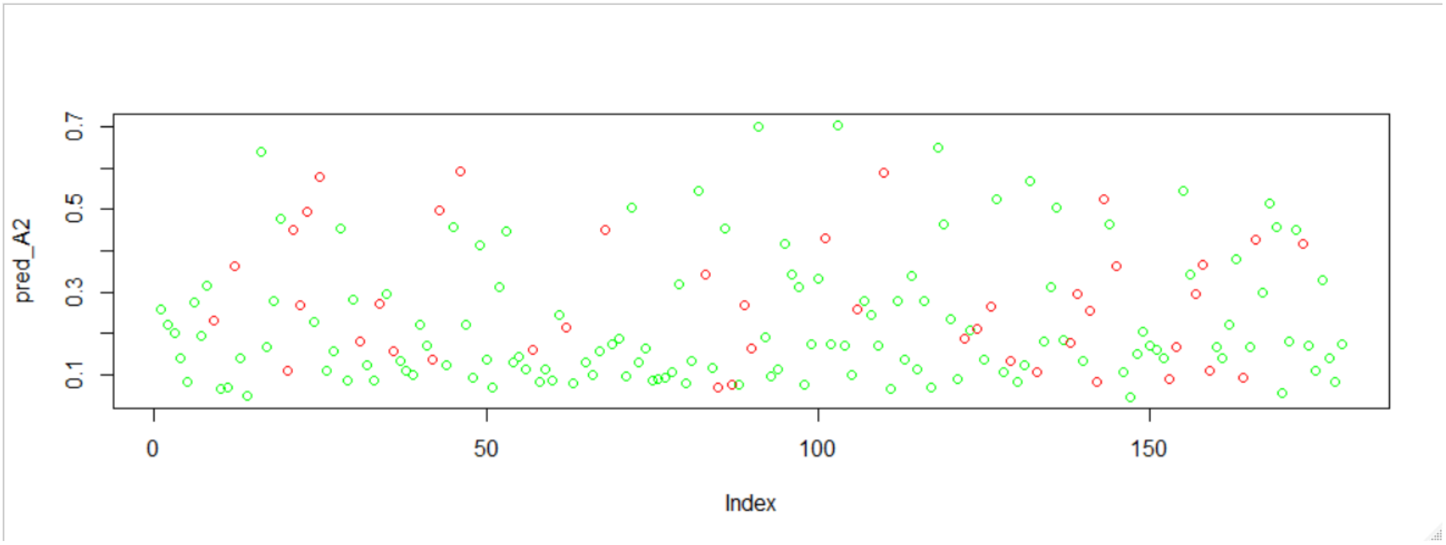
We can see some Influencing value in our model, so we may remove the Influencing Records for my next model.

Model 2:

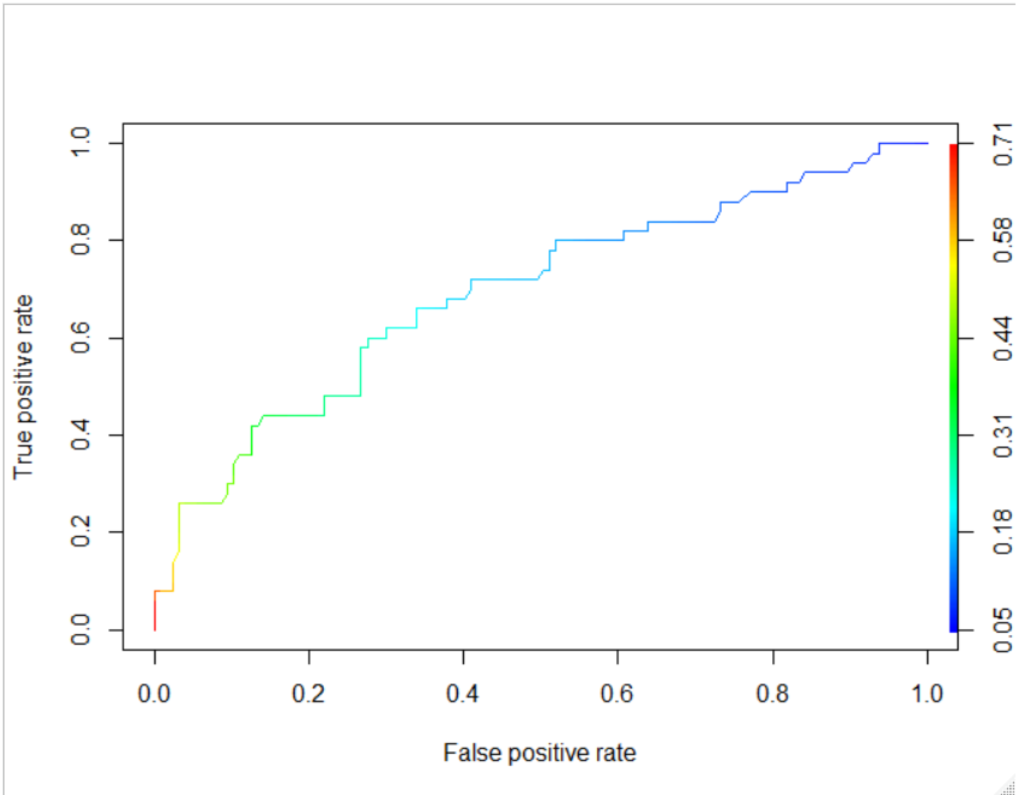
I modeled my second model with only the significant columns and removing the influence index. As I have tested the model with all the columns and removing the influence index once, and come up with conclusion that, even if I remove the influence index, the variables are still insignificant, so in my model 2 I removed both influencing records as well as the insignificant columns.

Here in model 2 I come up with AIC as 421.8 which is less than our previous model, and efficiency as 0.7570621 i.e. little bit increased.

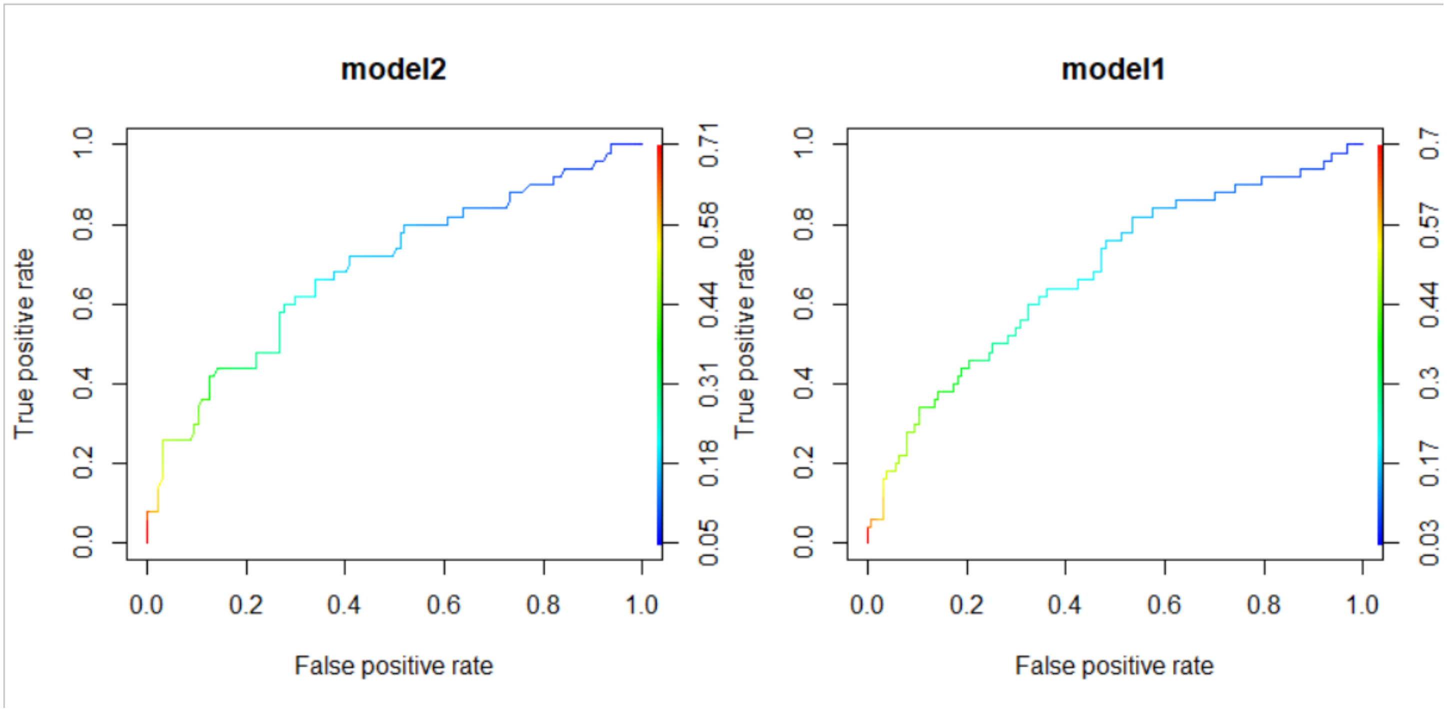




ROC Curve:



Comparing ROC curves:


model2

model1

Looking at the model 2 we can say that the area under the ROC curve is increased in model 2 as compare to model 1.

Tabulation:

Model No	AIC	Efficiency	F1 Score
Model 1	429.34	0.740113	0.8413793
Model 2	421.8	0.7570621	0.8512111

Conclusion:

From the ROC curve and the above tabulation, I come up with conclusion that, in our model 2 we are getting less AIC, Higher Efficiency, and Higher F1 Score in our model 2. So I may prefer to go for my model2.