ETC3250 – Project Presentation

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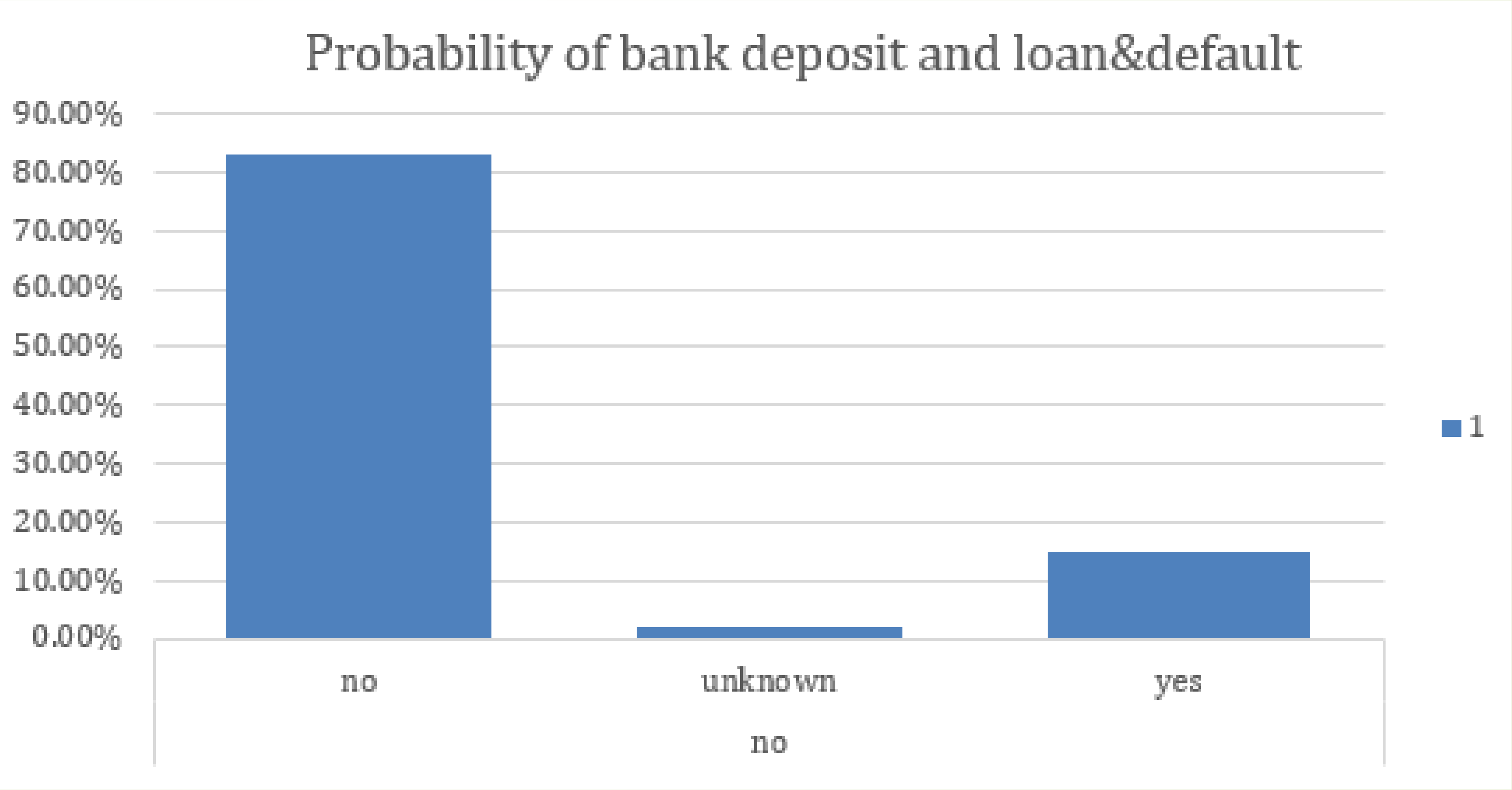
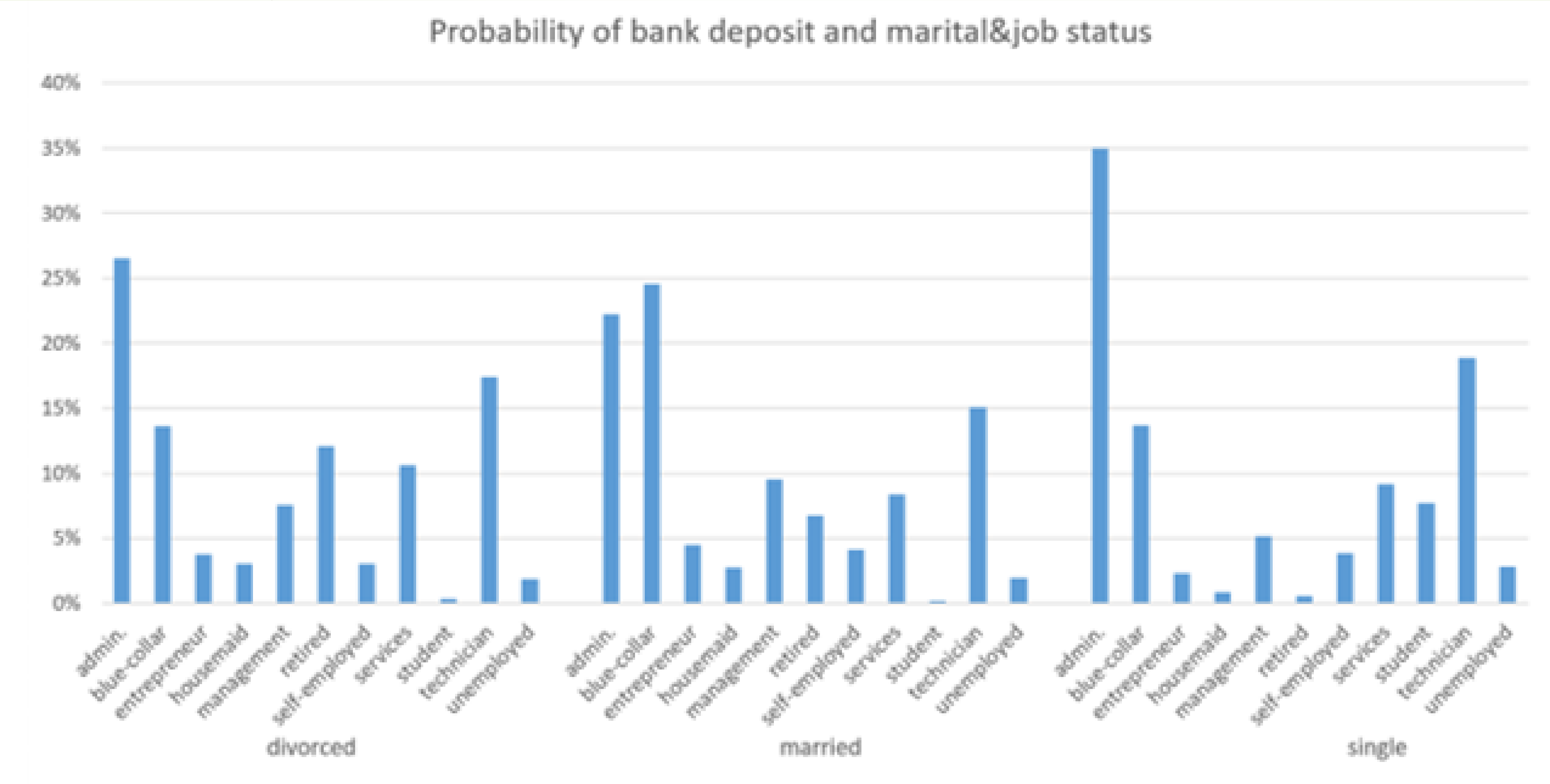
Introduction

- To produce the most accurate prediction model for how likely it is a client will subscribe to a bank term deposit.
- 7 predictors and 7 variables related to previous campaign





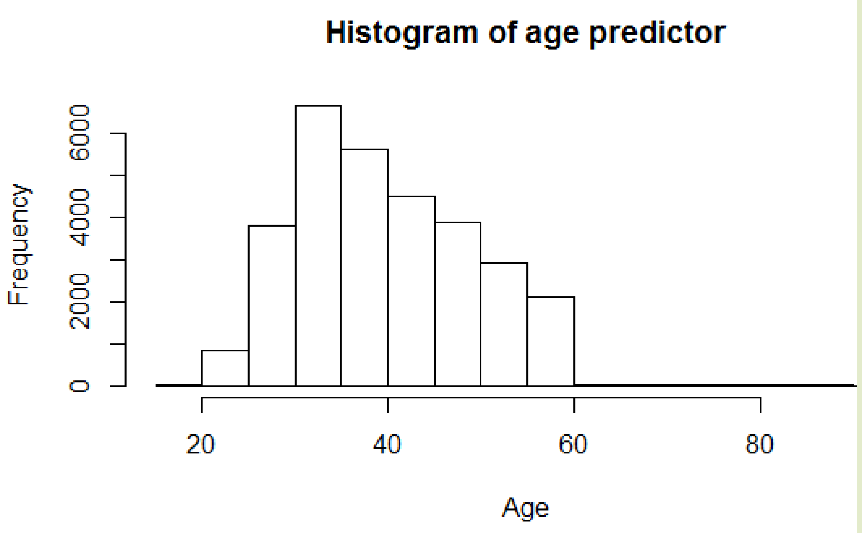
Probability of bank deposit and marital&job status
40%
35%
30%
25%
20%
15%
10%
5%
0%
admin.
blue-collar
entrepreneur
housemaid
management
retired
self-employed
services
student
technician
unemployed
divorced
married
single

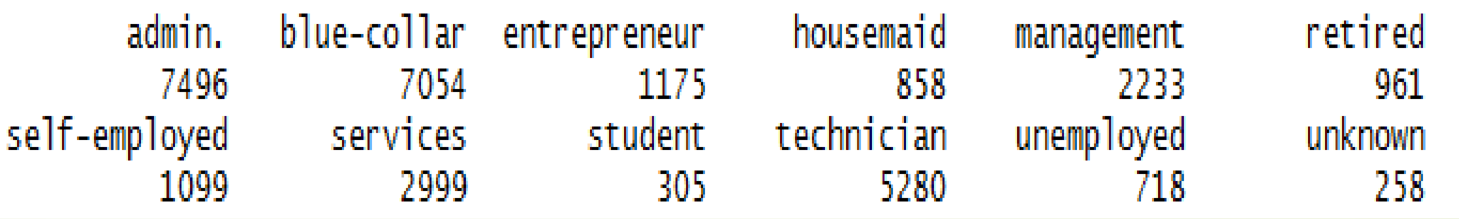
Methodology

- Initially the data set was examined to show the range/concentration of values and to identify potential outliers

- Various methods were used including logistic regression, probit models and decision trees

- Initial logistic regression:
  - ➢ $\hat{Y} = a\hat{g}e_i + j\hat{o}b_i + ma\hat{r}ital_i + \hat{e}d_i + hou\hat{s}ing_i + lo\hat{a}n_i$



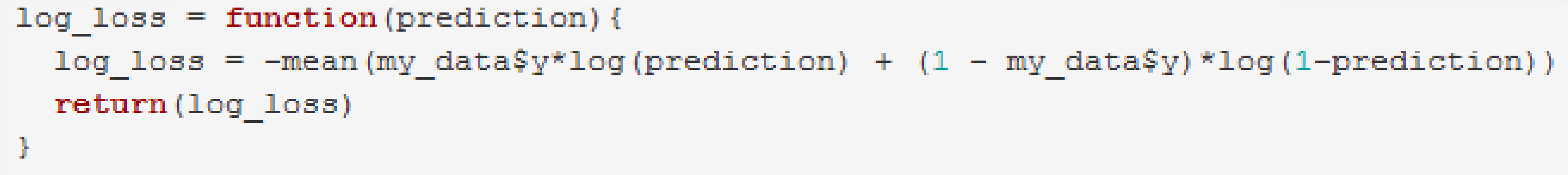


```
       admin.   blue-collar  entrepreneur     housemaid    management       retired 
         7496          7054          1175           858          2233           961 
self-employed      services       student    technician    unemployed       unknown 
         1099          2999           305          5280           718           258 
```

Methodology

- The predictions from the model were then calculated

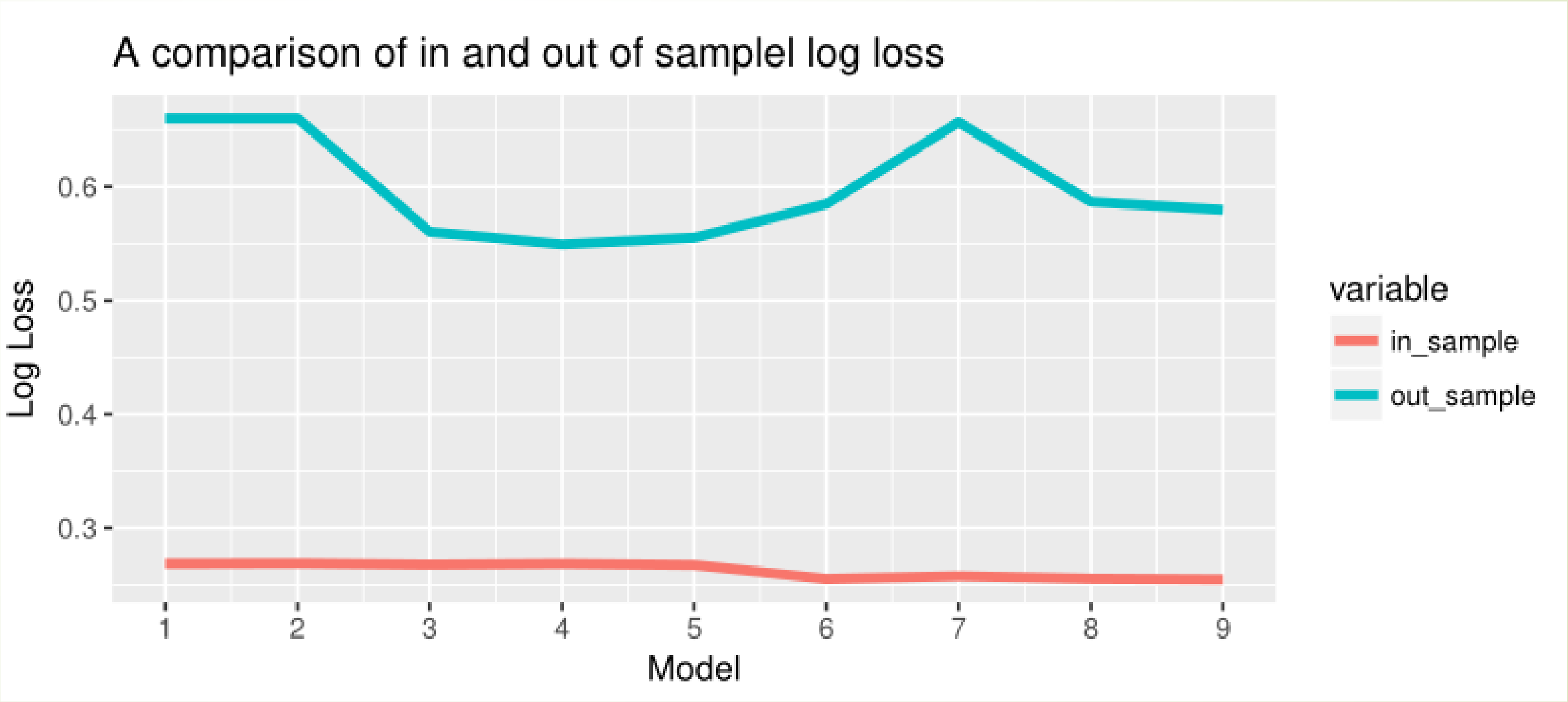
- To compare model predictions, the in sample log loss was calculated using the following function in R



```
log_loss = function(prediction){
  log_loss = -mean(my_data$y*log(prediction) + (1 - my_data$y)*log(1-prediction))
  return(log_loss)
}
```

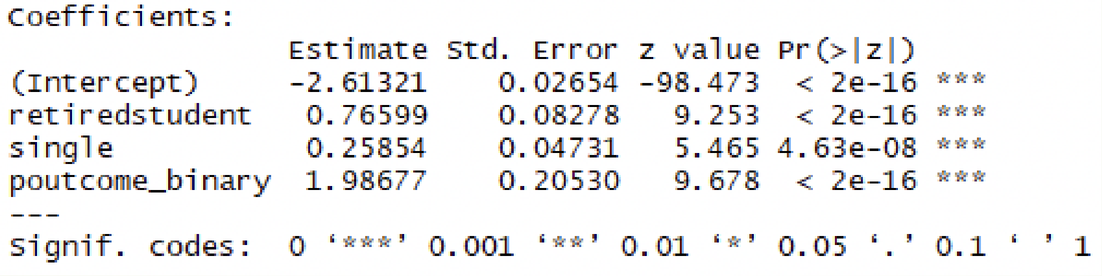
Results and Discussion

- Evaluation Method
  - In Sample Log loss
    - Overfitting



Results and Discussion

- Data set manipulation and reduction
- fit = **glm**(y ~ retiredstudent + single + poutcome_binary, data = my_data, family = binomial) (In sample log loss = 0.26835 vs out of sample = 0.55529)



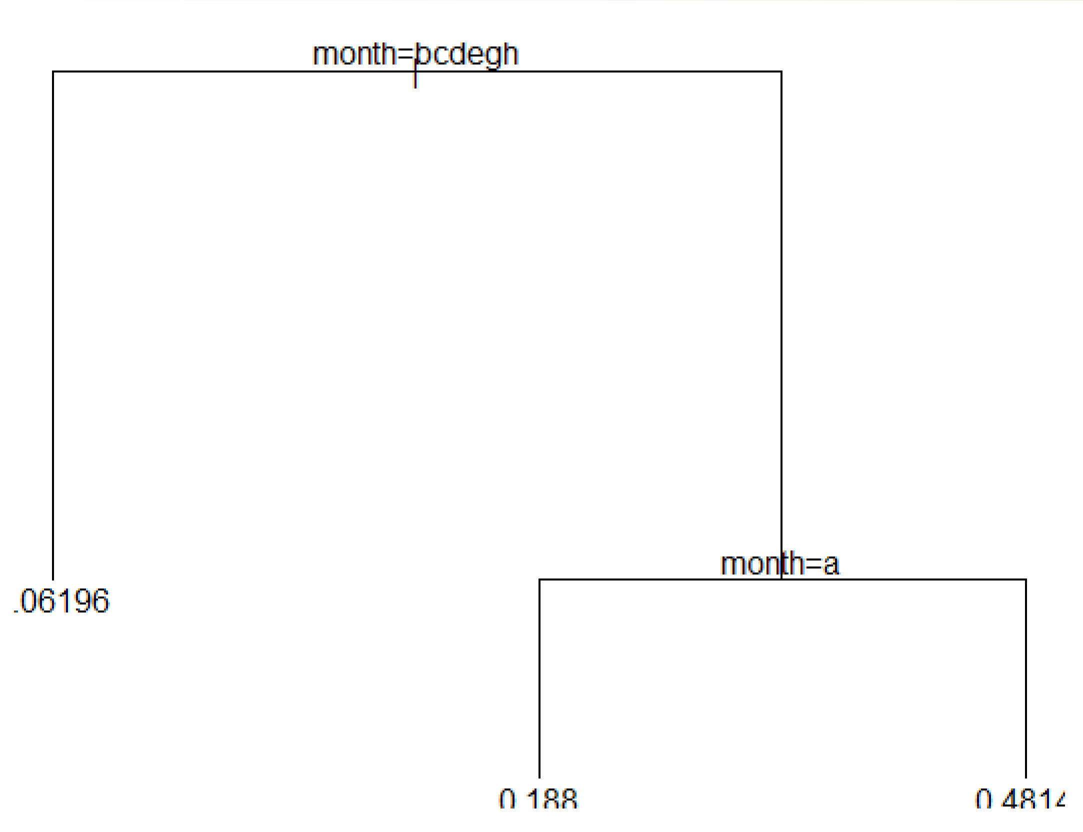
```
Coefficients:
                Estimate Std. Error z value Pr(>|z|)    
(Intercept)     -2.61321    0.02654 -98.473  < 2e-16 ***
retiredstudent   0.76599    0.08278   9.253  < 2e-16 ***
single           0.25854    0.04731   5.465 4.63e-08 ***
poutcome_binary  1.98677    0.20530   9.678  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

- Investigation into best model
- fit = **glm**(y ~ marital + default + loan + pdays + poutcome, data=my_data, family=binomial) (In sample log loss = 0.26879 vs out of sample = 0.54941)

Results and Discussion

Alternative Methods

- Tree functions
- Random Forests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0.4814