

ISOM 5610 - FINAL PROJECT - GROUP #18 [AirBnB]

2022-12-11

Notes

1. The R codes and R markdown (together as “R Files”) serve as a supplementary materials which provides cross-check and some additional support for our analysis.
2. In specific, the R Files focus on the Section 5.1 in the Python code, which includes “Model 1: Logistic Regression on Feature Data” and “Model 2: Logistic Regression on Amenity Data”.

For the full code, please kindly refer to the Python file.

Prep

```
## Set working directory
setwd("F:/HKUST/ISOM 5610/FINAL_PROJECT")
rm(list = ls())

## Read the table
Data <- fread("cleaned_Airbnb_Data.csv",header = T, sep=",")
# used fread function from data.table package to accelerate the reading process
Data <-Data [,-1]

## Adjust the existence of specific values (1 if exist, 0 if not)
# Creating categorical variable for host_response_time
Data$response_time_few_hours=
  ifelse(Data$host_response_time=="within a few hours",1,0)

Data$response_time_an_hour=
  ifelse(Data$host_response_time=="within an hour",1,0)

Data$response_time_a_day=
  ifelse(Data$host_response_time=="within a day",1,0)

Data$response_time_a_few_days=
  ifelse(Data$host_response_time=="a few days or more",1,0)

attach(Data)

# Setting training data set approx 80% of all data
n <- dim(Data)[1]
train_set = Data[0:4050,]
test_set = Data[4051:n,]
```

5.Data Modeling

5.1 Model 1: Logistic Regression on Feature Data

```
fit=glm('host_is_superhost~
amenities_numbers+
host_acceptance_rate+
host_v_email+
neighborhood_overview_exist+
host_identity_verified+
response_time_a_day+
response_time_a_few_days+
beds+instant_bookable+
host_about_exist',
data=train_set,family=binomial)
summary(fit)

##
## Call:
## glm(formula = "host_is_superhost~\n          amenities_numbers+\n          host_acceptance_rate+\n          family = binomial, data = train_set)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -2.3221  -0.3844  -0.2264  -0.1215   3.0148
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -2.729941    0.215854 -12.647 < 2e-16 ***
## amenities_numbers     0.069812    0.006409  10.893 < 2e-16 ***
## host_acceptance_rate     2.767716    0.242250  11.425 < 2e-16 ***
## host_v_email    -1.931510    0.195985  -9.855 < 2e-16 ***
## neighborhood_overview_exist  1.116446    0.144323   7.736 1.03e-14 ***
## host_identity_verified  -0.882971    0.142032  -6.217 5.08e-10 ***
## response_time_a_day    -1.539260    0.300367  -5.125 2.98e-07 ***
## response_time_a_few_days -1.941760    0.597252  -3.251 0.001149 **
## beds              -0.185878    0.050171  -3.705 0.000211 ***
## instant_bookable    -0.584251    0.146989  -3.975 7.04e-05 ***
## host_about_exist    -0.279618    0.136363  -2.051 0.040311 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 2606.7  on 4049  degrees of freedom
## Residual deviance: 1865.5  on 4039  degrees of freedom
## AIC: 1887.5
##
## Number of Fisher Scoring iterations: 7
```

```
prob <- predict(fit,newdata=test_set, type = 'response')
```

```
# Confusion Table
```

```
table(test_set$host_is_superuser, prob > 0.5)
```

Estimated probabilities - initial attempt at cut-off level of 0.5

```
##  
##      FALSE TRUE  
##    0    790   84  
##    1    103   29
```

```
# Confusion Matrix plot
```

```
source("F:/HKUST/ISOM 5610/FINAL_PROJECT/unbalanced_function.R")
```

```
##  
##      'dplyr'
```

```
## The following object is masked from 'package:car':
```

```
##  
##      recode
```

```
## The following object is masked from 'package:MASS':
```

```
##  
##      select
```

```
## The following object is masked from 'package:gridExtra':
```

```
##  
##      combine
```

```
## The following objects are masked from 'package:data.table':
```

```
##  
##      between, first, last
```

```
## The following objects are masked from 'package:stats':
```

```
##  
##      filter, lag
```

```
## The following objects are masked from 'package:base':
```

```
##  
##      intersect, setdiff, setequal, union
```

```
p=predict(fit,type='response')
```

```
temp_train=cbind(train_set,p)
```

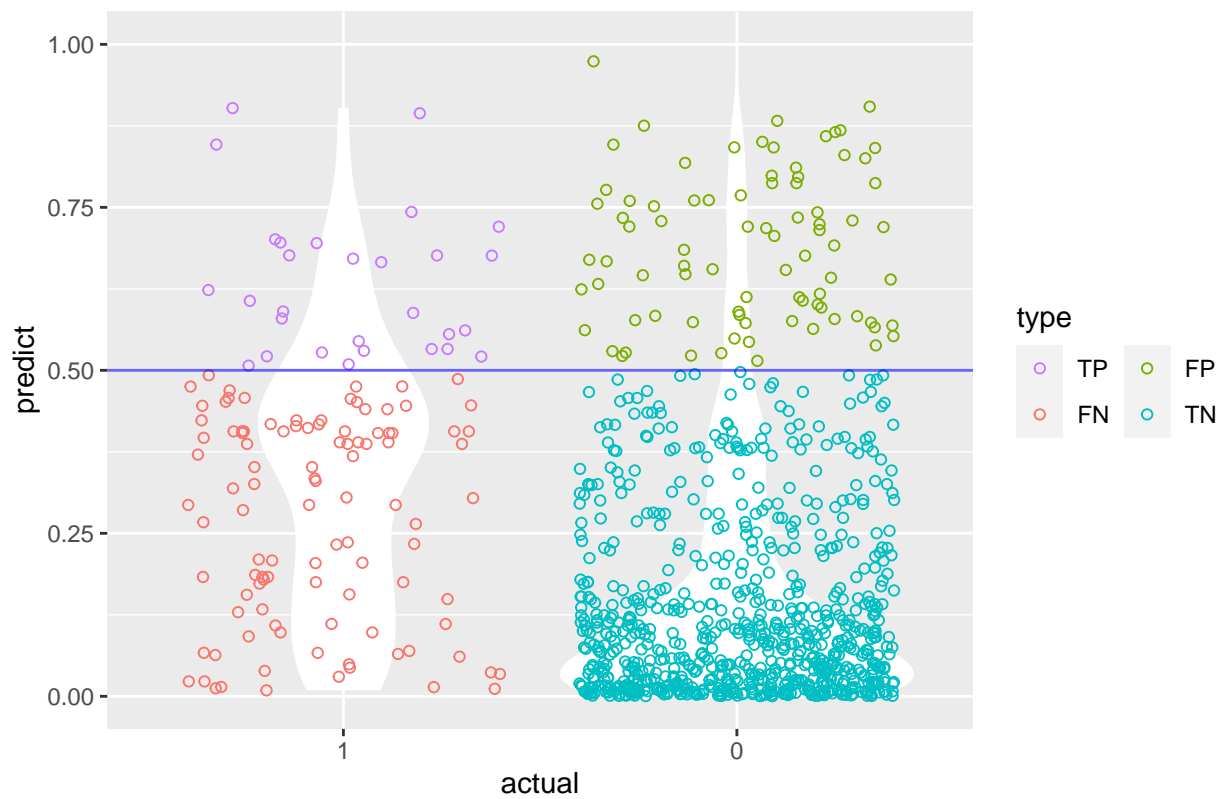
```
p=prob
```

```
temp_test=cbind(test_set,p)
```

```
cm_info <- ConfusionMatrixInfo( data = temp_test, predict = "p",  
                               actual = "host_is_superuser", cutoff = 0.5 )
```

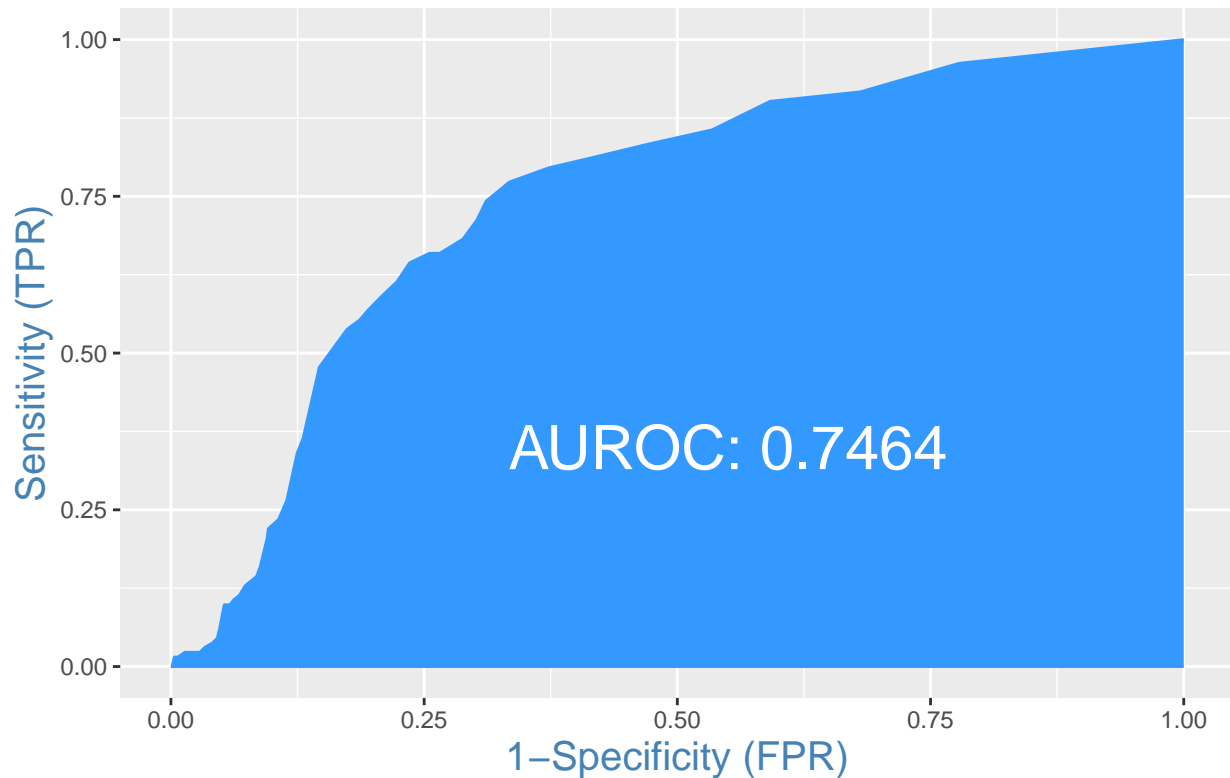
```
cm_info$plot
```

Confusion Matrix with Cutoff at 0.50



```
# AUC  
plotROC(test_set$host_is_superuser,prob)
```

ROC Curve



```
# Error measurements
```

```
cat(" [1] The sensitivity is",
    formatC(sensitivity(test_set$host_is_superhost,prob),dig=10),"\\n",
    "[2] The specificity is",
    formatC(specificity(test_set$host_is_superhost,prob),dig=10),"\\n",
    "[3] The Miss Classification Rate is",
    formatC(misClassError(test_set$host_is_superhost,prob),dig=10))
```

```
## [1] The sensitivity is 0.2196969697
## [2] The specificity is 0.9038901602
## [3] The Miss Classification Rate is      0.1859
```

```
# Confidence Interval for the odds ratio
```

```
OR_CI=exp(confint(fit))
```

```
## Waiting for profiling to be done...
```

```
cbind(exp(coef(fit)),OR_CI)
```

```
##                2.5 %      97.5 %
## (Intercept)      0.06522315 0.04242505 0.09895725
## amenities_numbers 1.07230637 1.05904955 1.08601191
## host_acceptance_rate 15.92222043 9.99577075 25.84715777
## host_v_email      0.14492912 0.09880187 0.21321327
```

```
## neighborhood_overview_exist 3.05398106 2.30711068 4.06369924
## host_identity_verified      0.41355225 0.31258837 0.54568651
## response_time_a_day        0.21453977 0.11463678 0.37403790
## response_time_a_few_days   0.14345129 0.03474057 0.39213780
## beds                       0.83037448 0.74979471 0.91296645
## instant_bookable           0.55752339 0.41724334 0.74254190
## host_about_exist           0.75607228 0.57982783 0.98991911
```

*# Comment: the Confusion Matrix together with other measurements showed that
we should decrease the cutoff in order to increase the sensitivity.*

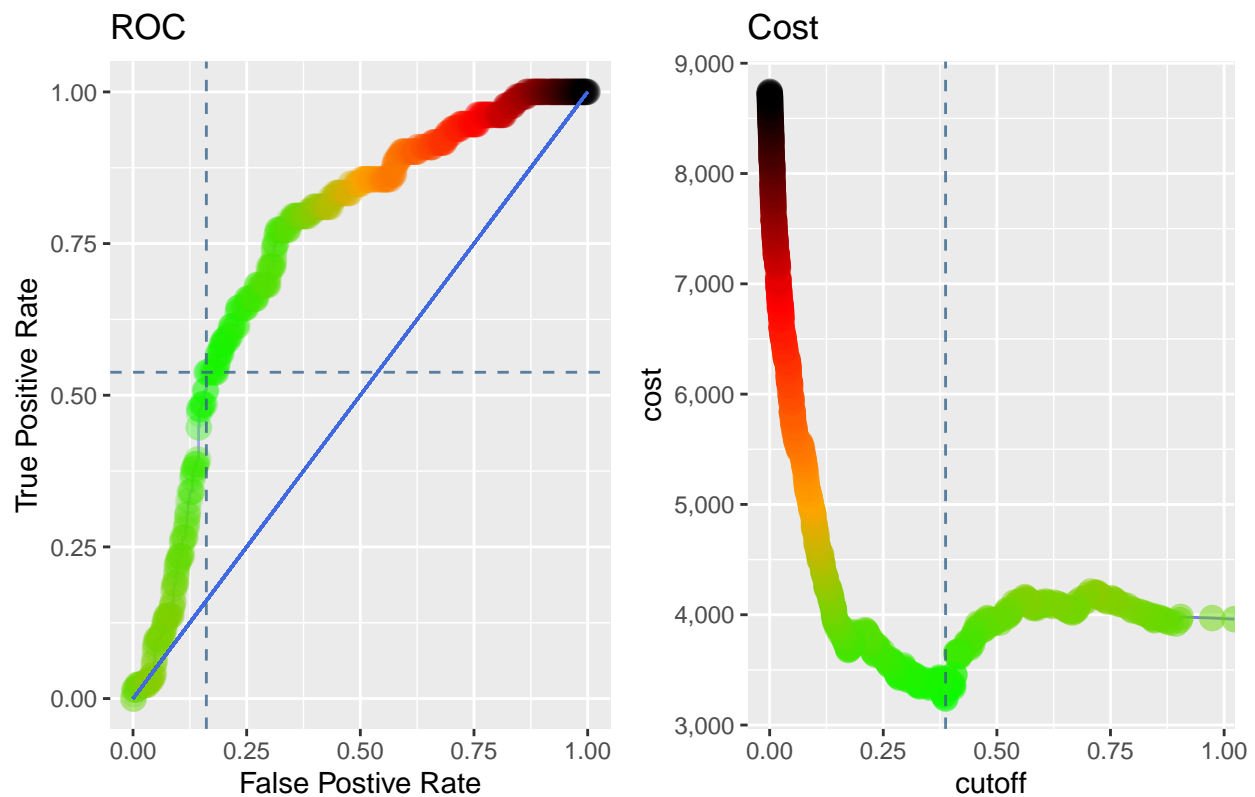
```
# Double density plot
ggplot(temp_train, aes( p, color = as.factor(host_is_superhost) ) ) +
  geom_density( linewidth = 1 ) +
  ggtitle( "Training Set's estimated probabilities" )
```



Determining the optimal cut-off level

```
# Finding optimal cutoff by considering cost through cross-validation
cost_fp <- 10
cost_fn <- 30
roc_info <- ROCInfo( data = cm_info$data, predict = "predict",
                     actual = "actual", cost.fp = cost_fp, cost.fn = cost_fn )
grid.draw(roc_info$plot)
```

Cutoff at 0.39 – Total Cost = 3240, AUC = 0.749



```
detach('package:caret')

# Updated Confusion Table
table(test_set$host_is_superhost, prob > roc_info$cutoff)
```

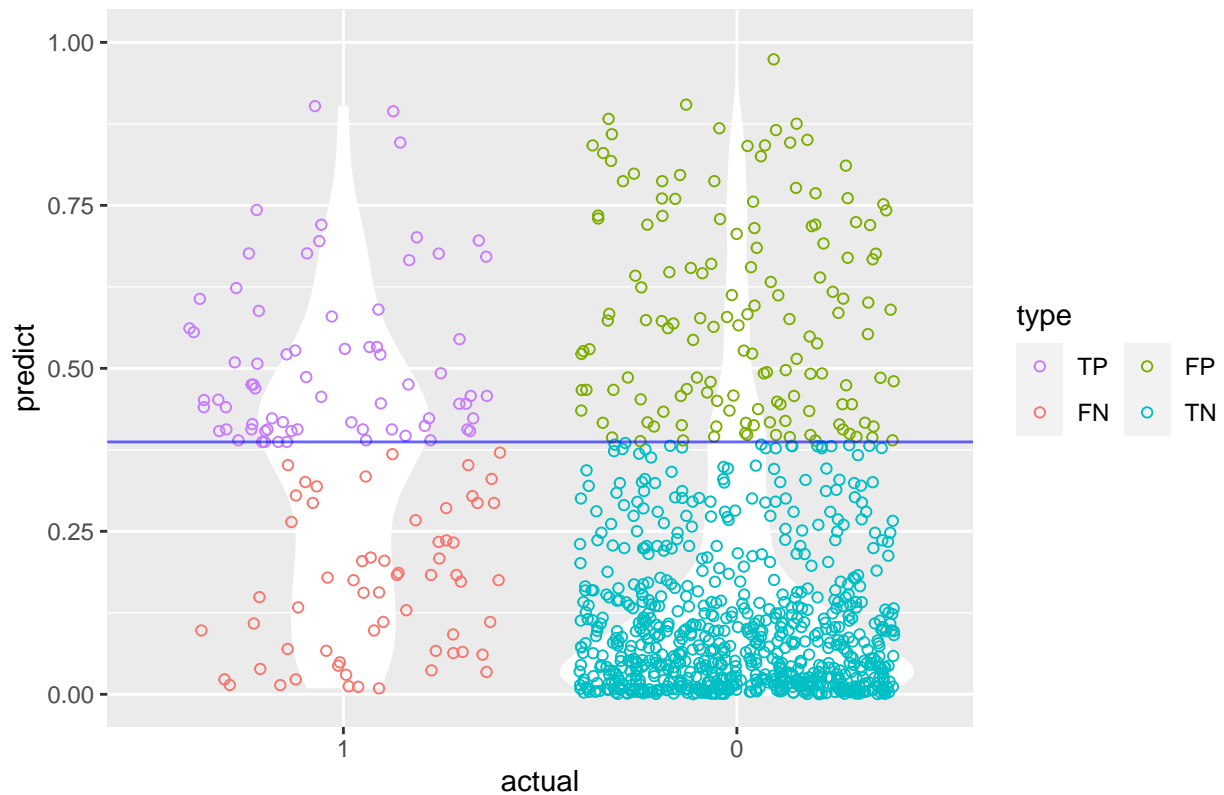
Updated error measurements using the optimal cutoff

```
##
##      FALSE TRUE
##  0    733  141
##  1     65   67
```

```
# Updated Confusion Matrix plot
cm_info_new <- ConfusionMatrixInfo( data = temp_test, predict = "p",
                                   actual = "host_is_superhost",
                                   cutoff = roc_info$cutoff)

cm_info_new$plot
```

Confusion Matrix with Cutoff at 0.39



```
# Updated error measurements
cat(" [1] The sensitivity is",
    formatC(sensitivity(test_set$host_is_superhost,prob,
                        threshold = roc_info$cutoff),dig=10),"\n",
    "[2] The specificity is",
    formatC(specificity(test_set$host_is_superhost,prob,
                        threshold = roc_info$cutoff),dig=10),"\n",
    "[3] The Miss Classification Rate is",
    formatC(misClassError(test_set$host_is_superhost,prob,
                        threshold = roc_info$cutoff),dig=10))
```

```
## [1] The sensitivity is 0.5378787879
## [2] The specificity is 0.8386727689
## [3] The Miss Classification Rate is      0.2008
```

```
fit_full=glm('host_is_superhost~
    amenities_numbers+
    host_acceptance_rate+
    host_v_email+
    neighborhood_overview_exist+
    host_identity_verified+
    response_time_a_day+
```



```

        response_time_a_few_days+
        beds+
        instant_bookable+
        host_about_exist',
        data=Data,family=binomial)
summary(fit_full)

```

Final Model on Full Data Set

```

##
## Call:
## glm(formula = "host_is_superhost~\n          amenities_numbers+\n          host_acceptance_rate",
##      family = binomial, data = Data)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -2.1530  -0.4365  -0.2712  -0.1448   3.0342
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -2.754150   0.176377 -15.615 < 2e-16 ***
## amenities_numbers     0.053782   0.004479  12.008 < 2e-16 ***
## host_acceptance_rate     2.188136   0.188933  11.582 < 2e-16 ***
## host_v_email        -1.261973   0.151862  -8.310 < 2e-16 ***
## neighborhood_overview_exist  1.163178   0.112903  10.302 < 2e-16 ***
## host_identity_verified  -0.890396   0.116722  -7.628 2.38e-14 ***
## response_time_a_day    -1.245385   0.237432  -5.245 1.56e-07 ***
## response_time_a_few_days -2.137219   0.591675  -3.612 0.000304 ***
## beds                -0.139787   0.042423  -3.295 0.000984 ***
## instant_bookable      -0.526131   0.122316  -4.301 1.70e-05 ***
## host_about_exist      -0.388402   0.112080  -3.465 0.000529 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 3397.5  on 5055  degrees of freedom
## Residual deviance: 2614.8  on 5045  degrees of freedom
## AIC: 2636.8
##
## Number of Fisher Scoring iterations: 7

```

Model 2: Logistic Regression on Amenity data

```

# Read the table
top_amenities <-
  fread("F:/HKUST/ISOM 5610/FINAL_PROJECT/Airbnb_Amenities.csv",
        header = T, sep=",")
top_amenities<-top_amenities[,-1]

# Setting training data set approx 80% of all data

```

```
n <- dim(top_amenities)[1]
train_set_a = top_amenities[0:4050,]
test_set_a = top_amenities[4051:n,]
```

```
fit_af=glm('host_is_superhost~.',data=train_set_a,family=binomial)
summary(fit_af)
```

Full logistic regression on amenity

```
##
## Call:
## glm(formula = "host_is_superhost~.", family = binomial, data = train_set_a)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.9442  -0.3998  -0.1768  -0.0992   3.5347
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -5.19400    0.64369  -8.069 7.08e-16 ***
## Air_conditioning  -0.49399    0.23939  -2.064 0.039060 *
## Bed_linens        -0.15366    0.21554  -0.713 0.475910
## Cable_TV           0.97272    0.24542   3.963 7.39e-05 ***
## Carbon_monoxide_alarm 0.27525    0.16972   1.622 0.104844
## Coffee_maker       0.87061    0.19800   4.397 1.10e-05 ***
## Cooking_basics     0.49596    0.19228   2.579 0.009897 **
## Dedicated_workspace 0.70838    0.19333   3.664 0.000248 ***
## Dishes_and_silverware 1.00366    0.25179   3.986 6.72e-05 ***
## Dryer              0.54131    0.17384   3.114 0.001846 **
## Elevator          -1.06460    0.13942  -7.636 2.24e-14 ***
## Essentials        -0.58793    0.24052  -2.444 0.014506 *
## Extra_pillows_and_blankets -0.48461    0.22027  -2.200 0.027803 *
## Fire_extinguisher   0.40553    0.17990   2.254 0.024179 *
## First_aid_kit       0.53892    0.14896   3.618 0.000297 ***
## Hair_dryer         0.53945    0.24402   2.211 0.027054 *
## Hangers            0.41480    0.19703   2.105 0.035264 *
## Heating            -0.12923    0.15327  -0.843 0.399144
## Host_greets_you     0.06790    0.19647   0.346 0.729631
## Hot_water          -0.50609    0.18138  -2.790 0.005267 **
## Hot_water_kettle    0.91281    0.24873   3.670 0.000243 ***
## Iron              1.11778    0.16469   6.787 1.14e-11 ***
## Kitchen            -1.13880    0.19036  -5.983 2.20e-09 ***
## Lock_on_bedroom_door 0.21419    0.15287   1.401 0.161168
## Long_term_stays_allowed 0.58163    0.38085   1.527 0.126711
## Luggage_dropoff_allowed -0.32572    0.17528  -1.858 0.063131 .
## Microwave          -0.05797    0.19810  -0.293 0.769806
## Private_entrance    0.17350    0.13829   1.255 0.209618
## Refrigerator       -0.41495    0.23015  -1.803 0.071397 .
## Room_darkening_shades 0.21175    0.21851   0.969 0.332511
## Shampoo           1.49536    0.25510   5.862 4.58e-09 ***
```

```
## Shower_gel          0.13855    0.23449    0.591 0.554601
## Smoke_alarm        -0.08801    0.18655   -0.472 0.637101
## Stove              0.21140    0.21882    0.966 0.333986
## TV                 1.33014    0.21005    6.333 2.41e-10 ***
## Washer             0.01405    0.18038    0.078 0.937921
## Wifi               0.23603    0.42485    0.556 0.578510
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 2606.7  on 4049  degrees of freedom
## Residual deviance: 1806.6  on 4013  degrees of freedom
## AIC: 1880.6
##
## Number of Fisher Scoring iterations: 7
```

```
null_m=glm('host_is_superhost~1',data=train_set_a,family=binomial)
stepAIC(null_m,scope=list(lower=null_m,upper=fit_af),direction = "forward")
```

Variable selection using AIC

```
## Start:  AIC=2608.71
## host_is_superhost ~ 1
##
##              Df Deviance    AIC
## + Shampoo          1  2289.2 2293.2
## + Hair_dryer        1  2307.0 2311.0
## + Essentials        1  2408.7 2412.7
## + First_aid_kit      1  2428.5 2432.5
## + Dishes_and_silverware 1  2439.4 2443.4
## + Cooking_basics    1  2455.3 2459.3
## + Coffee_maker      1  2455.9 2459.9
## + Dedicated_workspace 1  2471.7 2475.7
## + Heating           1  2479.5 2483.5
## + Carbon_monoxide_alarm 1  2481.2 2485.2
## + Refrigerator      1  2483.2 2487.2
## + Hangers           1  2491.3 2495.3
## + Fire_extinguisher  1  2500.4 2504.4
## + Hot_water_kettle   1  2503.0 2507.0
## + Shower_gel        1  2509.4 2513.4
## + Iron              1  2510.0 2514.0
## + Microwave         1  2514.5 2518.5
## + Smoke_alarm       1  2520.1 2524.1
## + Room_darkening_shades 1  2521.6 2525.6
## + Stove             1  2521.7 2525.7
## + Extra_pillows_and_blankets 1  2534.8 2538.8
## + TV               1  2537.3 2541.3
## + Private_entrance  1  2537.6 2541.6
## + Bed_linens        1  2545.8 2549.8
## + Dryer            1  2550.7 2554.7
```

```

## + Air_conditioning      1  2558.6 2562.6
## + Hot_water             1  2559.4 2563.4
## + Cable_TV             1  2564.1 2568.1
## + Luggage_dropoff_allowed 1  2572.7 2576.7
## + Kitchen              1  2591.5 2595.5
## + Host_greets_you      1  2594.3 2598.3
## + Wifi                 1  2599.3 2603.3
## <none>                  2606.7 2608.7
## + Lock_on_bedroom_door  1  2605.7 2609.7
## + Washer               1  2606.0 2610.0
## + Long_term_stays_allowed 1  2606.5 2610.5
## + Elevator             1  2606.7 2610.7
##
## Step:  AIC=2293.18
## host_is_superhost ~ Shampoo
##
##              Df Deviance    AIC
## + Iron        1  2182.2 2188.2
## + Coffee_maker 1  2189.1 2195.1
## + Hot_water_kettle 1  2201.7 2207.7
## + Dishes_and_silverware 1  2203.5 2209.5
## + First_aid_kit 1  2210.9 2216.9
## + Dedicated_workspace 1  2211.9 2217.9
## + Cooking_basics 1  2216.2 2222.2
## + Refrigerator 1  2241.8 2247.8
## + Microwave    1  2242.0 2248.0
## + Hair_dryer   1  2244.7 2250.7
## + Air_conditioning 1  2245.0 2251.0
## + Stove        1  2249.9 2255.9
## + Room_darkening_shades 1  2250.1 2256.1
## + Carbon_monoxide_alarm 1  2251.6 2257.6
## + Heating      1  2252.3 2258.3
## + Shower_gel   1  2254.3 2260.3
## + Elevator     1  2262.2 2268.2
## + Private_entrance 1  2265.1 2271.1
## + Hangers      1  2265.9 2271.9
## + Extra_pillows_and_blankets 1  2266.8 2272.8
## + Dryer        1  2268.4 2274.4
## + Cable_TV     1  2269.9 2275.9
## + Bed_linens   1  2271.0 2277.0
## + Fire_extinguisher 1  2271.2 2277.2
## + Smoke_alarm  1  2280.8 2286.8
## + Host_greets_you 1  2284.7 2290.7
## + Long_term_stays_allowed 1  2284.8 2290.8
## + Essentials   1  2285.8 2291.8
## + Washer       1  2286.3 2292.3
## + Hot_water    1  2287.0 2293.0
## + Kitchen      1  2287.2 2293.2
## <none>         2289.2 2293.2
## + TV          1  2287.9 2293.9
## + Wifi        1  2288.2 2294.2
## + Luggage_dropoff_allowed 1  2288.5 2294.5
## + Lock_on_bedroom_door 1  2288.5 2294.5
##

```

```

## Step: AIC=2188.25
## host_is_superhost ~ Shampoo + Iron
##
##
## Df Deviance AIC
## + Hot_water_kettle 1 2122.7 2130.7
## + Coffee_maker 1 2123.2 2131.2
## + First_aid_kit 1 2132.9 2140.9
## + Dedicated_workspace 1 2138.4 2146.4
## + Cooking_basics 1 2138.6 2146.6
## + Dishes_and_silverware 1 2140.5 2148.5
## + Elevator 1 2145.9 2153.9
## + Air_conditioning 1 2150.0 2158.0
## + Fire_extinguisher 1 2158.1 2166.1
## + Carbon_monoxide_alarm 1 2158.2 2166.2
## + Room_darkening_shades 1 2160.9 2168.9
## + Hair_dryer 1 2160.9 2168.9
## + Shower_gel 1 2162.4 2170.4
## + Microwave 1 2165.9 2173.9
## + Stove 1 2166.0 2174.0
## + Refrigerator 1 2168.2 2176.2
## + Dryer 1 2170.4 2178.4
## + Heating 1 2170.7 2178.7
## + TV 1 2170.7 2178.7
## + Smoke_alarm 1 2170.8 2178.8
## + Private_entrance 1 2171.1 2179.1
## + Cable_TV 1 2173.9 2181.9
## + Hangers 1 2177.6 2185.6
## + Host_greets_you 1 2178.5 2186.5
## + Extra_pillows_and_blankets 1 2178.6 2186.6
## + Bed_linens 1 2178.7 2186.7
## + Long_term_stays_allowed 1 2179.1 2187.1
## + Kitchen 1 2179.1 2187.1
## + Essentials 1 2179.8 2187.8
## <none> 2182.2 2188.2
## + Luggage_dropoff_allowed 1 2182.0 2190.0
## + Wifi 1 2182.2 2190.2
## + Hot_water 1 2182.2 2190.2
## + Washer 1 2182.2 2190.2
## + Lock_on_bedroom_door 1 2182.2 2190.2
##
## Step: AIC=2130.7
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle
##
##
## Df Deviance AIC
## + First_aid_kit 1 2086.4 2096.4
## + Elevator 1 2088.0 2098.0
## + Coffee_maker 1 2089.2 2099.2
## + Carbon_monoxide_alarm 1 2097.6 2107.6
## + Dedicated_workspace 1 2100.1 2110.1
## + Fire_extinguisher 1 2100.2 2110.2
## + TV 1 2101.3 2111.3
## + Cooking_basics 1 2102.1 2112.1
## + Hair_dryer 1 2105.8 2115.8
## + Dishes_and_silverware 1 2107.8 2117.8

```

```

## + Smoke_alarm      1  2110.1 2120.1
## + Dryer             1  2110.2 2120.2
## + Air_conditioning  1  2111.7 2121.7
## + Kitchen           1  2112.1 2122.1
## + Heating           1  2115.7 2125.7
## + Private_entrance  1  2117.6 2127.6
## + Stove             1  2118.5 2128.5
## + Hot_water         1  2118.7 2128.7
## + Long_term_stays_allowed 1  2119.2 2129.2
## + Cable_TV          1  2119.7 2129.7
## + Microwave         1  2119.8 2129.8
## + Room_darkening_shades 1  2120.0 2130.0
## + Hangers           1  2120.2 2130.2
## <none>              2122.7 2130.7
## + Wifi              1  2121.0 2131.0
## + Refrigerator      1  2121.1 2131.1
## + Host_greets_you   1  2121.6 2131.6
## + Extra_pillows_and_blankets 1  2121.8 2131.8
## + Bed_linens        1  2122.0 2132.0
## + Essentials        1  2122.1 2132.1
## + Shower_gel        1  2122.3 2132.3
## + Luggage_dropoff_allowed 1  2122.4 2132.4
## + Lock_on_bedroom_door 1  2122.5 2132.5
## + Washer            1  2122.6 2132.6
##
## Step:  AIC=2096.4
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit
##
##              Df Deviance    AIC
## + Elevator      1  2046.1 2058.1
## + Coffee_maker  1  2059.2 2071.2
## + TV            1  2064.5 2076.5
## + Cooking_basics 1  2066.5 2078.5
## + Dedicated_workspace 1  2066.9 2078.9
## + Dryer         1  2072.1 2084.1
## + Carbon_monoxide_alarm 1  2074.7 2086.7
## + Dishes_and_silverware 1  2074.7 2086.7
## + Hair_dryer    1  2074.8 2086.8
## + Air_conditioning 1  2076.8 2088.8
## + Kitchen       1  2078.3 2090.3
## + Fire_extinguisher 1  2079.2 2091.2
## + Hot_water     1  2079.5 2091.5
## + Smoke_alarm   1  2081.6 2093.6
## + Long_term_stays_allowed 1  2082.4 2094.4
## + Stove         1  2082.6 2094.6
## + Heating       1  2082.8 2094.8
## + Luggage_dropoff_allowed 1  2083.7 2095.7
## + Extra_pillows_and_blankets 1  2083.8 2095.8
## + Private_entrance 1  2084.0 2096.0
## + Bed_linens    1  2084.2 2096.2
## <none>          2086.4 2096.4
## + Hangers      1  2084.4 2096.4
## + Cable_TV     1  2084.7 2096.7
## + Wifi         1  2084.9 2096.9

```

```

## + Microwave                1    2085.2 2097.2
## + Room_darkening_shades    1    2085.3 2097.3
## + Shower_gel               1    2085.7 2097.7
## + Refrigerator             1    2085.8 2097.8
## + Host_greets_you          1    2085.8 2097.8
## + Washer                   1    2086.1 2098.1
## + Essentials                1    2086.1 2098.1
## + Lock_on_bedroom_door     1    2086.4 2098.4
##
## Step:  AIC=2058.12
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator
##
##              Df Deviance    AIC
## + Coffee_maker      1    2018.1 2032.1
## + TV                 1    2023.2 2037.2
## + Dedicated_workspace 1    2023.5 2037.5
## + Dryer              1    2026.5 2040.5
## + Hair_dryer         1    2028.9 2042.9
## + Cooking_basics     1    2029.3 2043.3
## + Fire_extinguisher  1    2030.0 2044.0
## + Carbon_monoxide_alarm 1    2031.1 2045.1
## + Kitchen            1    2034.4 2048.4
## + Smoke_alarm        1    2034.5 2048.5
## + Dishes_and_silverware 1    2035.1 2049.1
## + Air_conditioning    1    2036.3 2050.3
## + Long_term_stays_allowed 1    2040.5 2054.5
## + Cable_TV           1    2042.1 2056.1
## + Private_entrance    1    2042.1 2056.1
## + Hangers            1    2042.8 2056.8
## + Stove               1    2043.2 2057.2
## + Heating            1    2043.5 2057.5
## + Wifi               1    2043.6 2057.6
## + Microwave          1    2043.8 2057.8
## + Extra_pillows_and_blankets 1    2043.9 2057.9
## + Hot_water          1    2044.1 2058.1
## <none>              2046.1 2058.1
## + Bed_linens         1    2045.0 2059.0
## + Room_darkening_shades 1    2045.2 2059.2
## + Refrigerator       1    2045.2 2059.2
## + Lock_on_bedroom_door 1    2045.3 2059.3
## + Host_greets_you    1    2045.3 2059.3
## + Essentials         1    2045.5 2059.5
## + Luggage_dropoff_allowed 1    2045.5 2059.5
## + Washer             1    2045.5 2059.5
## + Shower_gel         1    2045.8 2059.8
##
## Step:  AIC=2032.11
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker
##
##              Df Deviance    AIC
## + TV                 1    1983.1 1999.1
## + Kitchen            1    1998.0 2014.0

```

```

## + Fire_extinguisher      1  2001.1 2017.1
## + Dedicated_workspace    1  2001.9 2017.9
## + Dryer                  1  2002.4 2018.4
## + Hair_dryer             1  2003.2 2019.2
## + Carbon_monoxide_alarm  1  2003.9 2019.9
## + Smoke_alarm            1  2006.1 2022.1
## + Extra_pillows_and_blankets 1  2011.2 2027.2
## + Cooking_basics         1  2011.9 2027.9
## + Long_term_stays_allowed 1  2012.0 2028.0
## + Hot_water              1  2012.4 2028.4
## + Bed_linens             1  2013.0 2029.0
## + Air_conditioning       1  2014.5 2030.5
## + Private_entrance       1  2014.6 2030.6
## + Wifi                   1  2015.0 2031.0
## + Hangers                1  2015.4 2031.4
## + Lock_on_bedroom_door   1  2016.0 2032.0
## + Dishes_and_silverware  1  2016.1 2032.1
## <none>                   1  2018.1 2032.1
## + Refrigerator           1  2016.8 2032.8
## + Luggage_dropoff_allowed 1  2016.9 2032.9
## + Cable_TV               1  2016.9 2032.9
## + Heating                1  2017.8 2033.8
## + Essentials             1  2017.8 2033.8
## + Shower_gel             1  2017.9 2033.9
## + Washer                 1  2018.0 2034.0
## + Room_darkening_shades  1  2018.1 2034.1
## + Stove                  1  2018.1 2034.1
## + Host_greets_you        1  2018.1 2034.1
## + Microwave              1  2018.1 2034.1
##
## Step: AIC=1999.09
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker + TV
##
##              Df Deviance    AIC
## + Cable_TV      1  1951.3 1969.3
## + Dedicated_workspace 1  1960.8 1978.8
## + Kitchen        1  1965.4 1983.4
## + Fire_extinguisher 1  1967.8 1985.8
## + Hair_dryer     1  1970.7 1988.7
## + Carbon_monoxide_alarm 1  1970.9 1988.9
## + Dryer          1  1971.9 1989.9
## + Smoke_alarm    1  1972.0 1990.0
## + Air_conditioning 1  1973.4 1991.4
## + Cooking_basics  1  1975.4 1993.4
## + Long_term_stays_allowed 1  1976.4 1994.4
## + Extra_pillows_and_blankets 1  1978.6 1996.6
## + Hot_water      1  1979.0 1997.0
## + Dishes_and_silverware 1  1980.3 1998.3
## + Private_entrance 1  1980.3 1998.3
## + Bed_linens     1  1980.6 1998.6
## + Hangers        1  1980.6 1998.6
## + Lock_on_bedroom_door 1  1980.8 1998.8
## <none>           1  1983.1 1999.1

```



```

## + Wifi 1 1981.3 1999.3
## + Luggage_dropoff_allowed 1 1982.2 2000.2
## + Refrigerator 1 1982.3 2000.3
## + Room_darkening_shades 1 1982.6 2000.6
## + Heating 1 1982.7 2000.7
## + Stove 1 1982.9 2000.9
## + Washer 1 1983.0 2001.0
## + Essentials 1 1983.0 2001.0
## + Host_greets_you 1 1983.0 2001.0
## + Microwave 1 1983.1 2001.1
## + Shower_gel 1 1983.1 2001.1
##
## Step: AIC=1969.29
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
## Elevator + Coffee_maker + TV + Cable_TV
##
## Df Deviance AIC
## + Dedicated_workspace 1 1931.1 1951.1
## + Kitchen 1 1931.5 1951.5
## + Fire_extinguisher 1 1937.5 1957.5
## + Carbon_monoxide_alarm 1 1939.3 1959.3
## + Smoke_alarm 1 1939.6 1959.6
## + Hair_dryer 1 1942.1 1962.1
## + Air_conditioning 1 1943.0 1963.0
## + Dryer 1 1943.5 1963.5
## + Extra_pillows_and_blankets 1 1944.2 1964.2
## + Hot_water 1 1946.0 1966.0
## + Long_term_stays_allowed 1 1946.1 1966.1
## + Lock_on_bedroom_door 1 1947.0 1967.0
## + Bed_linens 1 1948.2 1968.2
## + Cooking_basics 1 1948.9 1968.9
## + Refrigerator 1 1949.2 1969.2
## <none> 1951.3 1969.3
## + Hangers 1 1949.4 1969.4
## + Private_entrance 1 1949.4 1969.4
## + Essentials 1 1949.4 1969.4
## + Dishes_and_silverware 1 1950.4 1970.4
## + Luggage_dropoff_allowed 1 1950.4 1970.4
## + Wifi 1 1950.7 1970.7
## + Washer 1 1950.8 1970.8
## + Microwave 1 1950.9 1970.9
## + Heating 1 1951.1 1971.1
## + Shower_gel 1 1951.2 1971.2
## + Stove 1 1951.2 1971.2
## + Host_greets_you 1 1951.3 1971.3
## + Room_darkening_shades 1 1951.3 1971.3
##
## Step: AIC=1951.09
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
## Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace
##
## Df Deviance AIC
## + Kitchen 1 1911.1 1933.1
## + Fire_extinguisher 1 1918.0 1940.0

```

```

## + Smoke_alarm          1  1921.3 1943.3
## + Hair_dryer           1  1922.0 1944.0
## + Extra_pillows_and_blankets 1  1922.0 1944.0
## + Dryer                1  1922.4 1944.4
## + Hot_water            1  1923.6 1945.6
## + Carbon_monoxide_alarm 1  1924.0 1946.0
## + Long_term_stays_allowed 1  1926.2 1948.2
## + Bed_linens           1  1927.2 1949.2
## + Air_conditioning     1  1927.4 1949.4
## + Refrigerator         1  1927.9 1949.9
## + Lock_on_bedroom_door 1  1928.2 1950.2
## + Luggage_dropoff_allowed 1  1928.3 1950.3
## + Essentials           1  1928.5 1950.5
## <none>                 1931.1 1951.1
## + Hangers              1  1929.6 1951.6
## + Private_entrance     1  1929.6 1951.6
## + Cooking_basics       1  1930.2 1952.2
## + Heating              1  1930.3 1952.3
## + Wifi                 1  1930.3 1952.3
## + Microwave            1  1930.4 1952.4
## + Dishes_and_silverware 1  1930.8 1952.8
## + Washer               1  1931.0 1953.0
## + Host_greets_you      1  1931.0 1953.0
## + Stove                1  1931.1 1953.1
## + Room_darkening_shades 1  1931.1 1953.1
## + Shower_gel           1  1931.1 1953.1
##
## Step:  AIC=1933.07
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##      Kitchen
##
##
##              Df Deviance    AIC
## + Dryer          1  1897.0 1921.0
## + Cooking_basics 1  1902.2 1926.2
## + Dishes_and_silverware 1  1902.2 1926.2
## + Extra_pillows_and_blankets 1  1903.3 1927.3
## + Hot_water      1  1903.9 1927.9
## + Hair_dryer     1  1904.1 1928.1
## + Luggage_dropoff_allowed 1  1905.3 1929.3
## + Fire_extinguisher 1  1905.3 1929.3
## + Carbon_monoxide_alarm 1  1906.6 1930.6
## + Long_term_stays_allowed 1  1906.7 1930.7
## + Air_conditioning 1  1907.0 1931.0
## + Smoke_alarm    1  1907.5 1931.5
## + Essentials     1  1907.7 1931.7
## + Bed_linens     1  1907.8 1931.8
## + Hangers        1  1908.0 1932.0
## + Washer         1  1908.0 1932.0
## + Private_entrance 1  1908.6 1932.6
## + Stove          1  1908.7 1932.7
## <none>           1911.1 1933.1
## + Refrigerator   1  1910.4 1934.4
## + Lock_on_bedroom_door 1  1910.6 1934.6

```

```

## + Room_darkening_shades      1   1910.7 1934.7
## + Wifi                        1   1910.8 1934.8
## + Microwave                   1   1911.0 1935.0
## + Host_greets_you             1   1911.0 1935.0
## + Shower_gel                  1   1911.1 1935.1
## + Heating                      1   1911.1 1935.1
##
## Step:  AIC=1921.05
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##      Kitchen + Dryer
##
##                               Df Deviance    AIC
## + Dishes_and_silverware      1   1887.3 1913.3
## + Cooking_basics             1   1887.5 1913.5
## + Extra_pillows_and_blankets  1   1888.6 1914.6
## + Luggage_dropoff_allowed     1   1890.2 1916.2
## + Hot_water                   1   1890.6 1916.6
## + Air_conditioning            1   1891.3 1917.3
## + Hair_dryer                  1   1891.4 1917.4
## + Fire_extinguisher           1   1892.5 1918.5
## + Carbon_monoxide_alarm       1   1892.7 1918.7
## + Bed_linens                  1   1892.7 1918.7
## + Long_term_stays_allowed     1   1892.9 1918.9
## + Essentials                  1   1894.1 1920.1
## + Hangers                     1   1894.6 1920.6
## + Smoke_alarm                 1   1894.9 1920.9
## + Stove                       1   1895.0 1921.0
## <none>                        1   1897.0 1921.0
## + Private_entrance            1   1895.1 1921.1
## + Refrigerator                1   1896.1 1922.1
## + Lock_on_bedroom_door        1   1896.3 1922.3
## + Microwave                   1   1896.7 1922.7
## + Room_darkening_shades      1   1896.7 1922.7
## + Washer                      1   1896.8 1922.8
## + Shower_gel                  1   1896.9 1922.9
## + Wifi                        1   1897.0 1923.0
## + Host_greets_you             1   1897.0 1923.0
## + Heating                      1   1897.0 1923.0
##
## Step:  AIC=1913.28
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##      Kitchen + Dryer + Dishes_and_silverware
##
##                               Df Deviance    AIC
## + Hot_water                   1   1871.8 1899.8
## + Extra_pillows_and_blankets  1   1873.8 1901.8
## + Bed_linens                  1   1876.6 1904.6
## + Refrigerator                1   1876.6 1904.6
## + Luggage_dropoff_allowed     1   1879.5 1907.5
## + Air_conditioning            1   1881.9 1909.9
## + Fire_extinguisher           1   1881.9 1909.9
## + Cooking_basics              1   1882.6 1910.6

```

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## + Essentials          1  1882.8 1910.8
## + Hair_dryer          1  1882.8 1910.8
## + Long_term_stays_allowed 1  1883.0 1911.0
## + Carbon_monoxide_alarm 1  1883.5 1911.5
## + Microwave           1  1883.8 1911.8
## + Smoke_alarm         1  1885.2 1913.2
## <none>                 1  1887.3 1913.3
## + Hangers             1  1885.7 1913.7
## + Lock_on_bedroom_door 1  1885.8 1913.8
## + Private_entrance     1  1885.9 1913.9
## + Shower_gel          1  1886.8 1914.8
## + Washer              1  1886.9 1914.9
## + Wifi                1  1887.2 1915.2
## + Heating             1  1887.2 1915.2
## + Room_darkening_shades 1  1887.2 1915.2
## + Stove               1  1887.3 1915.3
## + Host_greets_you      1  1887.3 1915.3
##
## Step:  AIC=1899.79
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##      Kitchen + Dryer + Dishes_and_silverware + Hot_water
##
##              Df Deviance    AIC
## + Extra_pillows_and_blankets 1  1863.1 1893.1
## + Fire_extinguisher          1  1863.6 1893.6
## + Hair_dryer                 1  1864.8 1894.8
## + Cooking_basics             1  1866.1 1896.1
## + Refrigerator               1  1866.2 1896.2
## + Hangers                    1  1866.3 1896.3
## + Air_conditioning           1  1867.2 1897.2
## + Carbon_monoxide_alarm      1  1867.5 1897.5
## + Long_term_stays_allowed    1  1867.7 1897.7
## + Lock_on_bedroom_door       1  1867.8 1897.8
## + Bed_linens                 1  1867.9 1897.9
## + Smoke_alarm                1  1868.5 1898.5
## + Essentials                 1  1868.7 1898.7
## + Private_entrance           1  1868.7 1898.7
## <none>                       1  1871.8 1899.8
## + Luggage_dropoff_allowed    1  1869.9 1899.9
## + Microwave                  1  1870.5 1900.5
## + Stove                      1  1871.5 1901.5
## + Room_darkening_shades      1  1871.5 1901.5
## + Host_greets_you            1  1871.5 1901.5
## + Washer                     1  1871.5 1901.5
## + Wifi                       1  1871.6 1901.6
## + Shower_gel                 1  1871.8 1901.8
## + Heating                    1  1871.8 1901.8
##
## Step:  AIC=1893.14
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##      Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets
##

```

```

##                               Df Deviance    AIC
## + Fire_extinguisher          1   1854.4 1886.4
## + Hair_dryer                  1   1856.9 1888.9
## + Hangers                     1   1857.6 1889.6
## + Cooking_basics              1   1858.0 1890.0
## + Long_term_stays_allowed     1   1858.2 1890.2
## + Carbon_monoxide_alarm       1   1858.4 1890.4
## + Air_conditioning            1   1858.4 1890.4
## + Lock_on_bedroom_door        1   1858.7 1890.7
## + Refrigerator                1   1858.8 1890.8
## + Private_entrance            1   1859.6 1891.6
## + Essentials                  1   1860.2 1892.2
## + Smoke_alarm                 1   1860.2 1892.2
## <none>                        1863.1 1893.1
## + Luggage_dropoff_allowed     1   1861.9 1893.9
## + Room_darkening_shades       1   1862.2 1894.2
## + Microwave                   1   1862.5 1894.5
## + Stove                       1   1862.5 1894.5
## + Shower_gel                  1   1862.8 1894.8
## + Host_greets_you             1   1862.9 1894.9
## + Washer                      1   1862.9 1894.9
## + Bed_linens                  1   1862.9 1894.9
## + Wifi                        1   1863.0 1895.0
## + Heating                     1   1863.1 1895.1
##
## Step:  AIC=1886.42
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##      Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##      Fire_extinguisher
##
##                               Df Deviance    AIC
## + Cooking_basics              1   1846.5 1880.5
## + Hangers                      1   1848.2 1882.2
## + Hair_dryer                   1   1849.6 1883.6
## + Air_conditioning             1   1850.0 1884.0
## + Refrigerator                 1   1850.0 1884.0
## + Long_term_stays_allowed      1   1850.5 1884.5
## + Lock_on_bedroom_door         1   1851.7 1885.7
## + Essentials                   1   1851.9 1885.9
## + Carbon_monoxide_alarm        1   1852.0 1886.0
## + Luggage_dropoff_allowed      1   1852.3 1886.3
## + Private_entrance             1   1852.3 1886.3
## <none>                         1854.4 1886.4
## + Room_darkening_shades        1   1853.0 1887.0
## + Stove                        1   1853.4 1887.4
## + Microwave                    1   1853.8 1887.8
## + Bed_linens                   1   1854.0 1888.0
## + Washer                       1   1854.3 1888.3
## + Shower_gel                   1   1854.3 1888.3
## + Host_greets_you              1   1854.3 1888.3
## + Wifi                         1   1854.4 1888.4
## + Smoke_alarm                  1   1854.4 1888.4
## + Heating                      1   1854.4 1888.4

```

```

##
## Step: AIC=1880.54
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics
##
##
##           Df Deviance    AIC
## + Hair_dryer           1  1840.7 1876.7
## + Refrigerator          1  1840.9 1876.9
## + Hangers               1  1841.3 1877.3
## + Air_conditioning      1  1841.8 1877.8
## + Long_term_stays_allowed 1  1843.2 1879.2
## + Essentials            1  1843.4 1879.4
## + Lock_on_bedroom_door  1  1843.7 1879.7
## + Carbon_monoxide_alarm 1  1844.5 1880.5
## <none>                  1846.5 1880.5
## + Private_entrance      1  1844.5 1880.5
## + Luggage_dropoff_allowed 1  1844.7 1880.7
## + Room_darkening_shades 1  1845.2 1881.2
## + Microwave             1  1845.4 1881.4
## + Heating               1  1846.2 1882.2
## + Bed_linens            1  1846.2 1882.2
## + Shower_gel            1  1846.3 1882.3
## + Washer                1  1846.4 1882.4
## + Host_greets_you       1  1846.4 1882.4
## + Smoke_alarm           1  1846.5 1882.5
## + Wifi                  1  1846.5 1882.5
## + Stove                 1  1846.5 1882.5
##
## Step: AIC=1876.72
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics + Hair_dryer
##
##
##           Df Deviance    AIC
## + Refrigerator          1  1835.3 1873.3
## + Air_conditioning      1  1835.7 1873.7
## + Essentials            1  1836.4 1874.4
## + Hangers               1  1837.0 1875.0
## + Long_term_stays_allowed 1  1837.1 1875.1
## + Lock_on_bedroom_door  1  1838.5 1876.5
## + Luggage_dropoff_allowed 1  1838.6 1876.6
## + Carbon_monoxide_alarm 1  1838.6 1876.6
## <none>                  1840.7 1876.7
## + Private_entrance      1  1839.2 1877.2
## + Room_darkening_shades 1  1839.4 1877.4
## + Microwave             1  1839.7 1877.7
## + Bed_linens            1  1840.3 1878.3
## + Shower_gel            1  1840.4 1878.4
## + Heating               1  1840.5 1878.5
## + Washer                1  1840.5 1878.5
## + Wifi                  1  1840.7 1878.7

```

```

## + Host_greets_you          1  1840.7 1878.7
## + Stove                    1  1840.7 1878.7
## + Smoke_alarm              1  1840.7 1878.7
##
## Step: AIC=1873.29
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics + Hair_dryer + Refrigerator
##
##
##              Df Deviance    AIC
## + Air_conditioning      1  1830.1 1870.1
## + Essentials            1  1831.0 1871.0
## + Hangers               1  1831.7 1871.7
## + Long_term_stays_allowed 1  1832.0 1872.0
## <none>                  1835.3 1873.3
## + Carbon_monoxide_alarm 1  1833.5 1873.5
## + Lock_on_bedroom_door  1  1833.6 1873.6
## + Luggage_dropoff_allowed 1  1833.7 1873.7
## + Private_entrance      1  1833.7 1873.7
## + Room_darkening_shades 1  1833.9 1873.9
## + Shower_gel            1  1834.6 1874.6
## + Heating               1  1834.8 1874.8
## + Stove                 1  1835.0 1875.0
## + Bed_linens            1  1835.2 1875.2
## + Host_greets_you       1  1835.2 1875.2
## + Wifi                  1  1835.3 1875.3
## + Smoke_alarm           1  1835.3 1875.3
## + Microwave             1  1835.3 1875.3
## + Washer                1  1835.3 1875.3
##
## Step: AIC=1870.14
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics + Hair_dryer + Refrigerator +
##     Air_conditioning
##
##
##              Df Deviance    AIC
## + Essentials            1  1825.8 1867.8
## + Hangers               1  1826.4 1868.4
## + Long_term_stays_allowed 1  1827.2 1869.2
## + Lock_on_bedroom_door  1  1827.8 1869.8
## <none>                  1830.1 1870.1
## + Carbon_monoxide_alarm 1  1828.2 1870.2
## + Private_entrance      1  1828.7 1870.7
## + Luggage_dropoff_allowed 1  1828.9 1870.9
## + Room_darkening_shades 1  1829.3 1871.3
## + Heating               1  1829.7 1871.7
## + Stove                 1  1829.7 1871.7
## + Shower_gel            1  1829.8 1871.8
## + Wifi                  1  1830.0 1872.0
## + Smoke_alarm           1  1830.0 1872.0
## + Washer                1  1830.0 1872.0

```

```

## + Host_greets_you          1  1830.1 1872.1
## + Bed_linens                1  1830.1 1872.1
## + Microwave                 1  1830.1 1872.1
##
## Step: AIC=1867.75
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics + Hair_dryer + Refrigerator +
##     Air_conditioning + Essentials
##
##
##              Df Deviance    AIC
## + Hangers          1  1821.1 1865.1
## + Long_term_stays_allowed  1  1823.1 1867.1
## + Carbon_monoxide_alarm  1  1823.6 1867.6
## + Lock_on_bedroom_door  1  1823.7 1867.7
## <none>              1825.8 1867.8
## + Private_entrance    1  1823.9 1867.9
## + Luggage_dropoff_allowed  1  1824.4 1868.4
## + Room_darkening_shades  1  1824.9 1868.9
## + Stove               1  1825.3 1869.3
## + Heating             1  1825.4 1869.4
## + Shower_gel          1  1825.5 1869.5
## + Wifi                1  1825.6 1869.6
## + Host_greets_you     1  1825.6 1869.6
## + Washer              1  1825.6 1869.6
## + Bed_linens          1  1825.7 1869.7
## + Smoke_alarm         1  1825.7 1869.7
## + Microwave           1  1825.7 1869.7
##
## Step: AIC=1865.12
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics + Hair_dryer + Refrigerator +
##     Air_conditioning + Essentials + Hangers
##
##
##              Df Deviance    AIC
## + Long_term_stays_allowed  1  1818.9 1864.9
## + Carbon_monoxide_alarm  1  1819.1 1865.1
## + Luggage_dropoff_allowed  1  1819.1 1865.1
## <none>              1821.1 1865.1
## + Lock_on_bedroom_door  1  1819.3 1865.3
## + Private_entrance    1  1819.5 1865.5
## + Room_darkening_shades  1  1820.4 1866.4
## + Stove               1  1820.4 1866.4
## + Heating             1  1820.7 1866.7
## + Bed_linens          1  1820.9 1866.9
## + Shower_gel          1  1820.9 1866.9
## + Wifi                1  1821.0 1867.0
## + Host_greets_you     1  1821.0 1867.0
## + Microwave           1  1821.0 1867.0
## + Smoke_alarm         1  1821.0 1867.0
## + Washer              1  1821.1 1867.1

```



```

##
## Step: AIC=1864.91
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics + Hair_dryer + Refrigerator +
##     Air_conditioning + Essentials + Hangers + Long_term_stays_allowed
##
##
##           Df Deviance    AIC
## + Luggage_dropoff_allowed  1   1816.8 1864.8
## <none>                      1818.9 1864.9
## + Carbon_monoxide_alarm    1   1817.0 1865.0
## + Lock_on_bedroom_door     1   1817.0 1865.0
## + Private_entrance         1   1817.1 1865.1
## + Room_darkening_shades    1   1818.0 1866.0
## + Stove                    1   1818.0 1866.0
## + Heating                  1   1818.6 1866.6
## + Bed_linens               1   1818.7 1866.7
## + Shower_gel               1   1818.7 1866.7
## + Wifi                     1   1818.7 1866.7
## + Host_greets_you          1   1818.8 1866.8
## + Microwave                1   1818.8 1866.8
## + Smoke_alarm              1   1818.8 1866.8
## + Washer                   1   1818.9 1866.9
##
## Step: AIC=1864.84
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics + Hair_dryer + Refrigerator +
##     Air_conditioning + Essentials + Hangers + Long_term_stays_allowed +
##     Luggage_dropoff_allowed
##
##
##           Df Deviance    AIC
## + Carbon_monoxide_alarm    1   1814.2 1864.2
## + Lock_on_bedroom_door     1   1814.5 1864.5
## <none>                      1816.8 1864.8
## + Private_entrance         1   1814.9 1864.9
## + Room_darkening_shades    1   1815.9 1865.9
## + Stove                    1   1815.9 1865.9
## + Heating                  1   1816.4 1866.4
## + Shower_gel               1   1816.5 1866.5
## + Host_greets_you          1   1816.6 1866.6
## + Smoke_alarm              1   1816.7 1866.7
## + Wifi                     1   1816.7 1866.7
## + Bed_linens               1   1816.7 1866.7
## + Washer                   1   1816.8 1866.8
## + Microwave                1   1816.8 1866.8
##
## Step: AIC=1864.21
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##     Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##     Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##     Fire_extinguisher + Cooking_basics + Hair_dryer + Refrigerator +

```

```

##      Air_conditioning + Essentials + Hangers + Long_term_stays_allowed +
##      Luggage_dropoff_allowed + Carbon_monoxide_alarm
##
##              Df Deviance    AIC
## + Lock_on_bedroom_door    1   1811.7 1863.7
## <none>                      1814.2 1864.2
## + Private_entrance        1   1812.4 1864.4
## + Room_darkening_shades   1   1813.3 1865.3
## + Stove                    1   1813.4 1865.4
## + Heating                  1   1813.7 1865.7
## + Shower_gel               1   1813.9 1865.9
## + Host_greets_you         1   1813.9 1865.9
## + Wifi                     1   1814.0 1866.0
## + Bed_linens               1   1814.1 1866.1
## + Smoke_alarm              1   1814.2 1866.2
## + Washer                   1   1814.2 1866.2
## + Microwave                1   1814.2 1866.2
##
## Step:  AIC=1863.74
## host_is_superhost ~ Shampoo + Iron + Hot_water_kettle + First_aid_kit +
##      Elevator + Coffee_maker + TV + Cable_TV + Dedicated_workspace +
##      Kitchen + Dryer + Dishes_and_silverware + Hot_water + Extra_pillows_and_blankets +
##      Fire_extinguisher + Cooking_basics + Hair_dryer + Refrigerator +
##      Air_conditioning + Essentials + Hangers + Long_term_stays_allowed +
##      Luggage_dropoff_allowed + Carbon_monoxide_alarm + Lock_on_bedroom_door
##
##              Df Deviance    AIC
## <none>                      1811.7 1863.7
## + Private_entrance        1   1810.3 1864.3
## + Room_darkening_shades   1   1810.7 1864.7
## + Stove                    1   1811.1 1865.1
## + Heating                  1   1811.3 1865.3
## + Shower_gel               1   1811.4 1865.4
## + Wifi                     1   1811.6 1865.6
## + Smoke_alarm              1   1811.6 1865.6
## + Bed_linens               1   1811.6 1865.6
## + Host_greets_you         1   1811.7 1865.7
## + Washer                   1   1811.7 1865.7
## + Microwave                1   1811.7 1865.7
##
##
## Call:  glm(formula = host_is_superhost ~ Shampoo + Iron + Hot_water_kettle +
##      First_aid_kit + Elevator + Coffee_maker + TV + Cable_TV +
##      Dedicated_workspace + Kitchen + Dryer + Dishes_and_silverware +
##      Hot_water + Extra_pillows_and_blankets + Fire_extinguisher +
##      Cooking_basics + Hair_dryer + Refrigerator + Air_conditioning +
##      Essentials + Hangers + Long_term_stays_allowed + Luggage_dropoff_allowed +
##      Carbon_monoxide_alarm + Lock_on_bedroom_door, family = binomial,
##      data = train_set_a)
##
## Coefficients:
##              (Intercept)                Shampoo
##                -5.0002                  1.5118
##                 Iron                Hot_water_kettle

```

```
##           1.1144           1.0168
##       First_aid_kit       Elevator
##           0.5247       -1.0677
##       Coffee_maker           TV
##           0.8538           1.3629
##       Cable_TV       Dedicated_workspace
##           0.9937           0.6587
##       Kitchen           Dryer
##       -1.0841           0.5350
##       Dishes_and_silverware       Hot_water
##           1.0415       -0.5142
## Extra_pillows_and_blankets       Fire_extinguisher
##       -0.4842           0.3839
##       Cooking_basics       Hair_dryer
##           0.5260           0.5452
##       Refrigerator       Air_conditioning
##       -0.4006       -0.5259
##       Essentials       Hangers
##       -0.5483           0.4118
## Long_term_stays_allowed       Luggage_dropoff_allowed
##           0.5372       -0.3111
##       Carbon_monoxide_alarm       Lock_on_bedroom_door
##           0.2508           0.2347
##
## Degrees of Freedom: 4049 Total (i.e. Null);  4024 Residual
## Null Deviance:      2607
## Residual Deviance: 1812  AIC: 1864
```

```
# Based on the AIC-suggested variables, the chosen model is as below:
fit_a2=glm(formula = host_is_superhost ~ Shampoo + Iron + Hot_water_kettle +
  First_aid_kit + Elevator + Coffee_maker + TV + Cable_TV +
  Dedicated_workspace + Kitchen + Dryer + Dishes_and_silverware +
  Hot_water + Extra_pillows_and_blankets + Fire_extinguisher +
  Cooking_basics + Hair_dryer + Refrigerator + Air_conditioning +
  Essentials + Hangers + Long_term_stays_allowed +
  Luggage_dropoff_allowed +
  Carbon_monoxide_alarm + Lock_on_bedroom_door, family = binomial,
  data = train_set_a)
summary(fit_a2)
```

```
##
## Call:
## glm(formula = host_is_superhost ~ Shampoo + Iron + Hot_water_kettle +
##       First_aid_kit + Elevator + Coffee_maker + TV + Cable_TV +
##       Dedicated_workspace + Kitchen + Dryer + Dishes_and_silverware +
##       Hot_water + Extra_pillows_and_blankets + Fire_extinguisher +
##       Cooking_basics + Hair_dryer + Refrigerator + Air_conditioning +
##       Essentials + Hangers + Long_term_stays_allowed + Luggage_dropoff_allowed +
##       Carbon_monoxide_alarm + Lock_on_bedroom_door, family = binomial,
##       data = train_set_a)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.8667  -0.4059  -0.1757  -0.0959   3.5292
```

```
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -5.0002     0.5173  -9.666 < 2e-16 ***
## Shampoo         1.5118     0.2457   6.153 7.62e-10 ***
## Iron            1.1144     0.1611   6.919 4.56e-12 ***
## Hot_water_kettle 1.0168     0.2252   4.515 6.33e-06 ***
## First_aid_kit    0.5247     0.1454   3.608 0.000308 ***
## Elevator       -1.0677     0.1378  -7.748 9.31e-15 ***
## Coffee_maker     0.8538     0.1933   4.418 9.97e-06 ***
## TV              1.3629     0.2067   6.595 4.25e-11 ***
## Cable_TV         0.9937     0.2394   4.151 3.30e-05 ***
## Dedicated_workspace 0.6587     0.1881   3.501 0.000463 ***
## Kitchen        -1.0841     0.1760  -6.159 7.30e-10 ***
## Dryer           0.5350     0.1393   3.842 0.000122 ***
## Dishes_and_silverware 1.0415     0.2428   4.290 1.79e-05 ***
## Hot_water       -0.5142     0.1772  -2.903 0.003700 **
## Extra_pillows_and_blankets -0.4842     0.1869  -2.591 0.009564 **
## Fire_extinguisher 0.3839     0.1580   2.430 0.015089 *
## Cooking_basics   0.5260     0.1801   2.920 0.003495 **
## Hair_dryer       0.5452     0.2412   2.260 0.023812 *
## Refrigerator    -0.4006     0.2107  -1.901 0.057246 .
## Air_conditioning -0.5259     0.2273  -2.314 0.020678 *
## Essentials      -0.5483     0.2377  -2.307 0.021082 *
## Hangers          0.4118     0.1951   2.111 0.034812 *
## Long_term_stays_allowed 0.5372     0.3761   1.428 0.153178
## Luggage_dropoff_allowed -0.3111     0.1711  -1.819 0.068949 .
## Carbon_monoxide_alarm 0.2508     0.1517   1.653 0.098317 .
## Lock_on_bedroom_door 0.2347     0.1490   1.575 0.115289
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 2606.7  on 4049  degrees of freedom
## Residual deviance: 1811.7  on 4024  degrees of freedom
## AIC: 1863.7
##
## Number of Fisher Scoring iterations: 7
```

```
vif (fit_a2)
```

VIF check

```
##           Shampoo           Iron
##           1.582137           1.439537
## Hot_water_kettle First_aid_kit
##           1.510249           1.353470
##           Elevator           Coffee_maker
##           1.252219           1.552488
##           TV           Cable_TV
```

```
##          2.492977          2.311236
##      Dedicated_workspace          Kitchen
##          1.385132          2.058970
##          Dryer      Dishes_and_silverware
##          1.148278          3.753905
##      Hot_water Extra_pillows_and_blankets
##          2.024743          1.629106
##      Fire_extinguisher      Cooking_basics
##          1.591068          2.058291
##      Hair_dryer      Refrigerator
##          1.479360          2.935869
##      Air_conditioning      Essentials
##          1.360411          1.527308
##      Hangers      Long_term_stays_allowed
##          1.317836          1.034929
##      Luggage_dropoff_allowed      Carbon_monoxide_alarm
##          1.505553          1.345080
##      Lock_on_bedroom_door
##          1.322900
```

Comment: Based on the AIC-suggested model, we decided to remove air conditioning to highlight the key amenities to take into consideration.

```
fit_a3=glm(formula = host_is_superhost ~ Shampoo + Iron + Hot_water_kettle +
  First_aid_kit + Elevator + Coffee_maker + TV + Cable_TV +
  Dedicated_workspace + Kitchen + Dryer + Dishes_and_silverware +
  Hot_water + Extra_pillows_and_blankets + Fire_extinguisher +
  Cooking_basics + Hair_dryer + Refrigerator +
  Essentials + Hangers + Long_term_stays_allowed +
  Luggage_dropoff_allowed +
  Carbon_monoxide_alarm + Lock_on_bedroom_door, family = binomial,
  data = train_set_a)
summary(fit_a3)
```

Fitted model

```
##
## Call:
## glm(formula = host_is_superhost ~ Shampoo + Iron + Hot_water_kettle +
##      First_aid_kit + Elevator + Coffee_maker + TV + Cable_TV +
##      Dedicated_workspace + Kitchen + Dryer + Dishes_and_silverware +
##      Hot_water + Extra_pillows_and_blankets + Fire_extinguisher +
##      Cooking_basics + Hair_dryer + Refrigerator + Essentials +
##      Hangers + Long_term_stays_allowed + Luggage_dropoff_allowed +
##      Carbon_monoxide_alarm + Lock_on_bedroom_door, family = binomial,
##      data = train_set_a)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.9330  -0.4061  -0.1764  -0.0967   3.5091
```

```
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -5.5054     0.4749 -11.592 < 2e-16 ***
## Shampoo         1.5441     0.2457   6.285 3.27e-10 ***
## Iron            1.0876     0.1603   6.785 1.16e-11 ***
## Hot_water_kettle 1.1049     0.2210   5.001 5.72e-07 ***
## First_aid_kit    0.5257     0.1450   3.625 0.000288 ***
## Elevator        -1.0597     0.1374  -7.714 1.22e-14 ***
## Coffee_maker     0.9249     0.1900   4.867 1.13e-06 ***
## TV              1.3079     0.2046   6.394 1.62e-10 ***
## Cable_TV         0.9910     0.2381   4.163 3.14e-05 ***
## Dedicated_workspace 0.7614     0.1818   4.188 2.81e-05 ***
## Kitchen          -1.0776     0.1760  -6.122 9.27e-10 ***
## Dryer            0.5011     0.1383   3.624 0.000290 ***
## Dishes_and_silverware 1.0519     0.2424   4.340 1.42e-05 ***
## Hot_water        -0.5155     0.1765  -2.921 0.003493 **
## Extra_pillows_and_blankets -0.4780     0.1863  -2.566 0.010290 *
## Fire_extinguisher 0.3937     0.1577   2.496 0.012557 *
## Cooking_basics   0.5145     0.1796   2.865 0.004173 **
## Hair_dryer       0.5341     0.2405   2.221 0.026373 *
## Refrigerator     -0.3957     0.2099  -1.885 0.059422 .
## Essentials       -0.5431     0.2378  -2.284 0.022359 *
## Hangers          0.4058     0.1942   2.089 0.036679 *
## Long_term_stays_allowed 0.5788     0.3780   1.531 0.125751
## Luggage_dropoff_allowed -0.3358     0.1705  -1.969 0.048903 *
## Carbon_monoxide_alarm 0.2481     0.1517   1.635 0.101982
## Lock_on_bedroom_door 0.2066     0.1485   1.392 0.164033
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 2606.7  on 4049  degrees of freedom
## Residual deviance: 1816.9  on 4025  degrees of freedom
## AIC: 1866.9
##
## Number of Fisher Scoring iterations: 7
```

```
prob_a <- predict(fit_a3,newdata=test_set_a, type = 'response')

# Confusion Table
table(test_set_a$host_is_superuser, prob_a > 0.5)
```

Estimated probabilities - initial attempt at cut-off level of 0.5

```
##
##      FALSE TRUE
## 0      800   74
## 1       75   57
```

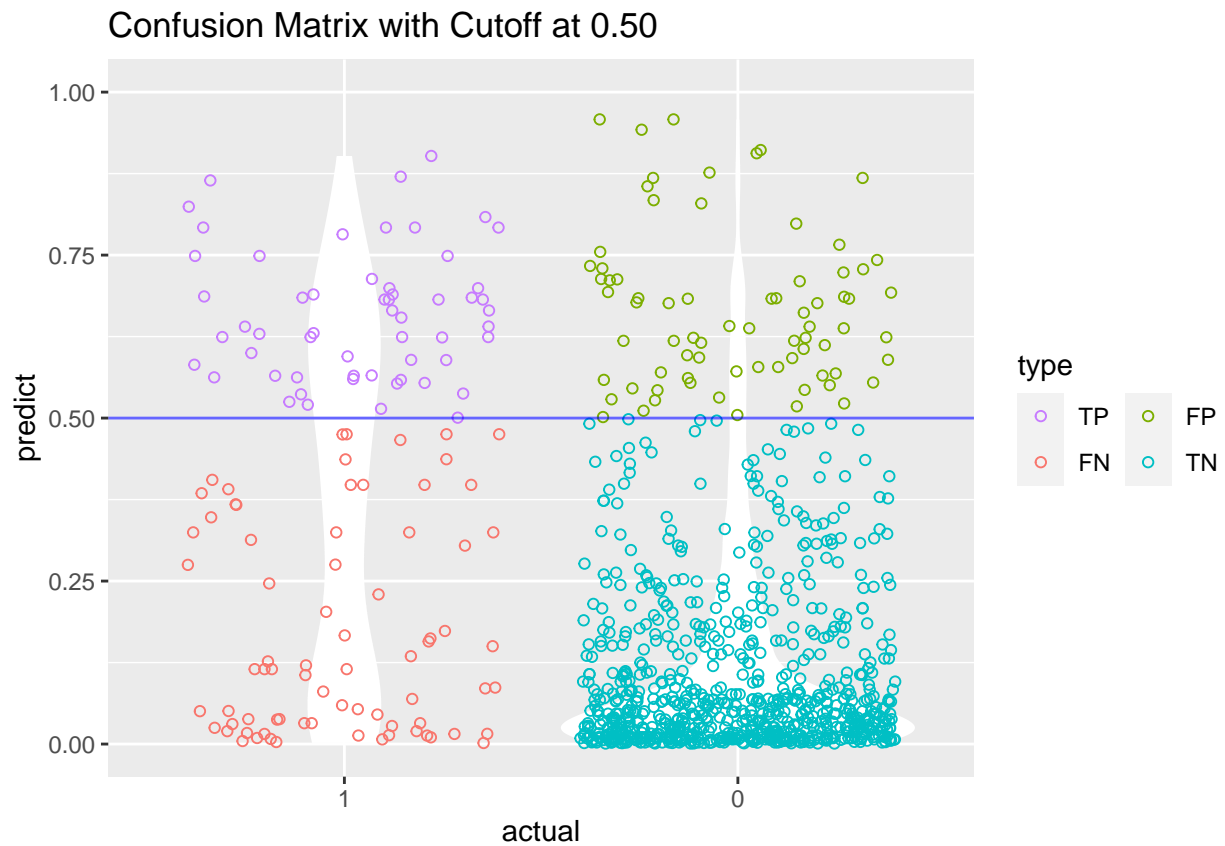
```

# Confusion Matrix plot
p_a=predict(fit_a3,type='response')
temp_train_a=cbind(train_set_a,p_a)

p_a=prob_a
temp_test_a=cbind(test_set_a,p_a)

cm_info_a <- ConfusionMatrixInfo( data = temp_test_a, predict = "p_a",
                                  actual = "host_is_superuser", cutoff = 0.5 )
cm_info_a$plot

```

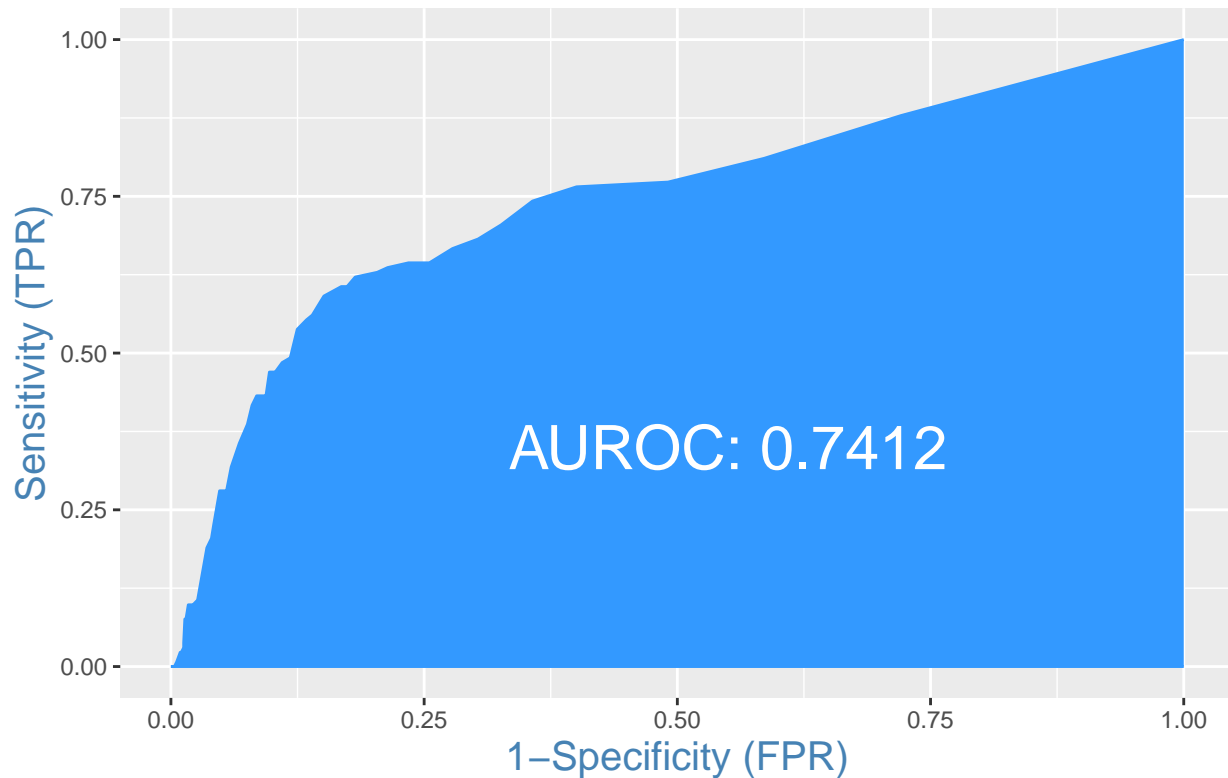


```

# AUC
plotROC(test_set_a$host_is_superuser,prob_a)

```

ROC Curve



```
# Error measurements
```

```
cat(" [1] The sensitivity is",
    formatC(sensitivity(test_set_a$host_is_superhost,prob_a),dig=10),"\\n",
    "[2] The specificity is",
    formatC(specificity(test_set_a$host_is_superhost,prob_a),dig=10),"\\n",
    "[3] The Miss Classification Rate is",
    formatC(misClassError(test_set_a$host_is_superhost,prob_a),dig=10))
```

```
## [1] The sensitivity is 0.43181818
## [2] The specificity is 0.9153318078
## [3] The Miss Classification Rate is      0.1481
```

```
# Confidence Interval for the odds ratio
```

```
OR_CI_a=exp(confint(fit_a3))
```

```
## Waiting for profiling to be done...
```

```
cbind(exp(coef(fit_a3)),OR_CI_a)
```

```
##                2.5 %      97.5 %
## (Intercept)    0.0040648 0.001530377 0.009916647
## Shampoo       4.6839755 2.932079049 7.690807941
## Iron          2.9670312 2.174195396 4.077409986
## Hot_water_kettle 3.0190674 1.955595025 4.653985833
```



```
## First_aid_kit          1.6917123 1.272679823 2.247706388
## Elevator              0.3465710 0.264389049 0.453141554
## Coffee_maker          2.5216020 1.738067153 3.662858869
## TV                   3.6982457 2.498502806 5.576286083
## Cable_TV              2.6940299 1.695556633 4.316315405
## Dedicated_workspace   2.1412549 1.496359343 3.053330442
## Kitchen               0.3403996 0.240324011 0.479395565
## Dryer                 1.6505778 1.257347274 2.162680109
## Dishes_and_silverware 2.8629818 1.786002286 4.620863416
## Hot_water             0.5971863 0.421370976 0.842068385
## Extra_pillows_and_blankets 0.6200307 0.428404908 0.889728095
## Fire_extinguisher     1.4824718 1.088530514 2.020847825
## Cooking_basics        1.6727423 1.176235642 2.379407749
## Hair_dryer            1.7059028 1.075856667 2.767665451
## Refrigerator          0.6732389 0.443892617 1.011266285
## Essentials            0.5809456 0.366804261 0.933094608
## Hangers               1.5005611 1.031240827 2.210938860
## Long_term_stays_allowed 1.7839075 0.889021655 3.958897077
## Luggage_dropoff_allowed 0.7147793 0.510544976 0.996589490
## Carbon_monoxide_alarm 1.2815336 0.950288264 1.722893882
## Lock_on_bedroom_door  1.2294959 0.918221845 1.643865470
```

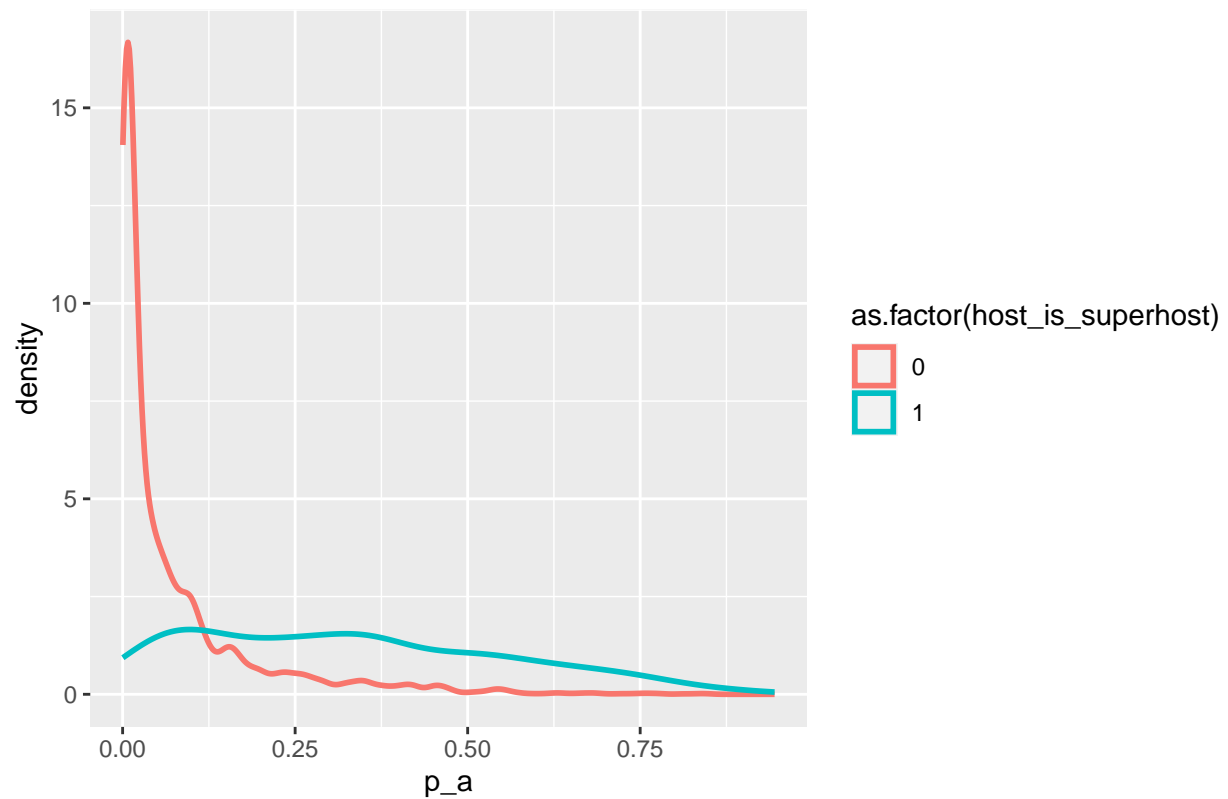
```
# Comment: the Confusion Matrix together with other measurements showed that
# we should decrease the cutoff in order to increase the sensitivity.
```

```
# Double density plot
ggplot(temp_train_a, aes( p_a, color = as.factor(host_is_superhost) )) +
  geom_density( size = 1 ) +
  ggtitle( "Training Set's estimated probabilities" )
```

Determining the optimal cut-off level

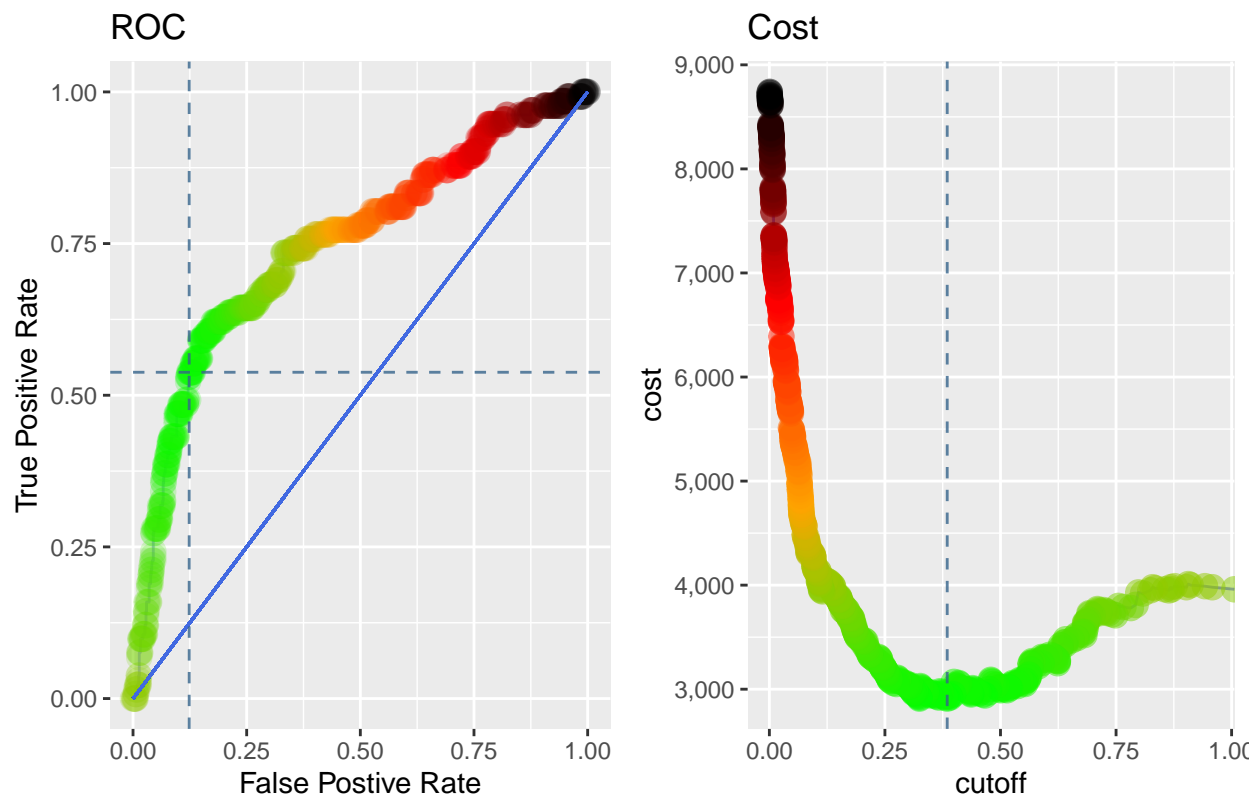
```
## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
```

Training Set's estimated probabilities



```
# Finding optimal cutoff by considering cost through cross-validation
cost_fp_a <- 10
cost_fn_a <- 30
roc_info_a <- ROCInfo( data = cm_info_a$data, predict = "predict",
                        actual = "actual",
                        cost.fp = cost_fp_a, cost.fn = cost_fn_a )
grid.draw(roc_info_a$plot)
```

Cutoff at 0.38 – Total Cost = 2910, AUC = 0.748



```
# Updated Confusion Table
table(test_set_a$host_is_superuser, prob_a > roc_info_a$cutoff)
```

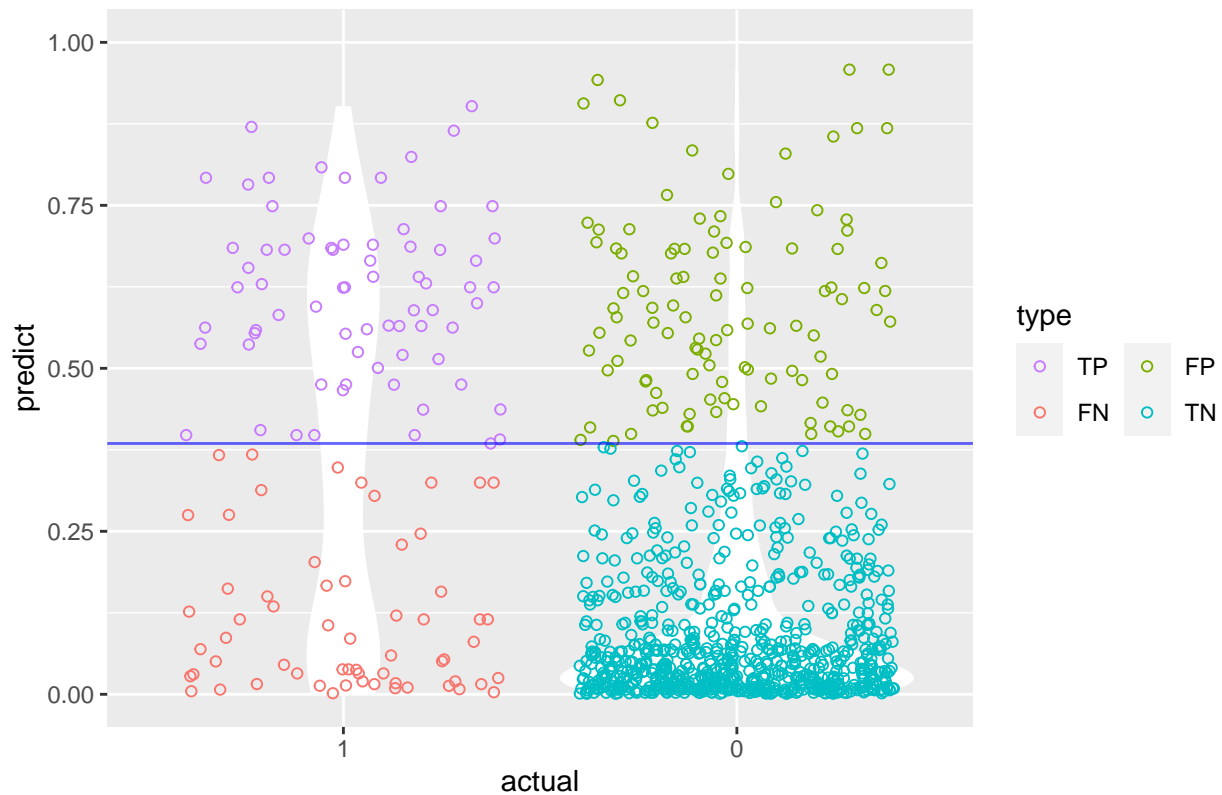
Updated error measurements using the optimal cutoff

```
##
##      FALSE TRUE
##  0    766  108
##  1     62   70
```

```
# Updated Confusion Matrix plot
cm_info_a_new <- ConfusionMatrixInfo( data = temp_test_a, predict = "p_a",
                                     actual = "host_is_superuser",
                                     cutoff = roc_info_a$cutoff)

cm_info_a_new$plot
```

Confusion Matrix with Cutoff at 0.38



```
# Updated Error measurements
cat(" [1] The sensitivity is",
    formatC(sensitivity(test_set_a$host_is_superhost,prob_a,
                        threshold = roc_info_a$cutoff),dig=10),"\\n",
    "[2] The specificity is",
    formatC(specificity(test_set_a$host_is_superhost,prob_a,
                        threshold = roc_info_a$cutoff),dig=10),"\\n",
    "[3] The Miss Classification Rate is",
    formatC(misClassError(test_set_a$host_is_superhost,prob_a,
                        threshold = roc_info_a$cutoff),dig=10))
```

```
## [1] The sensitivity is 0.5378787879
## [2] The specificity is 0.8764302059
## [3] The Miss Classification Rate is 0.168
```

Full Model on Amenities Model

```
fit_a3_full=glm(formula = host_is_superhost ~ Shampoo + Iron +
                Hot_water_kettle + First_aid_kit + Elevator + Coffee_maker +
                TV + Cable_TV + Dedicated_workspace + Kitchen + Dryer +
                Dishes_and_silverware +
                Hot_water + Extra_pillows_and_blankets + Fire_extinguisher +
                Cooking_basics + Hair_dryer + Refrigerator +
```

```

        Essentials + Hangers + Long_term_stays_allowed +
        Luggage_dropoff_allowed + Carbon_monoxide_alarm +
        Lock_on_bedroom_door, family = binomial,
data = top_amenities)

summary(fit_a3_full)

##
## Call:
## glm(formula = host_is_superhost ~ Shampoo + Iron + Hot_water_kettle +
##      First_aid_kit + Elevator + Coffee_maker + TV + Cable_TV +
##      Dedicated_workspace + Kitchen + Dryer + Dishes_and_silverware +
##      Hot_water + Extra_pillows_and_blankets + Fire_extinguisher +
##      Cooking_basics + Hair_dryer + Refrigerator + Essentials +
##      Hangers + Long_term_stays_allowed + Luggage_dropoff_allowed +
##      Carbon_monoxide_alarm + Lock_on_bedroom_door, family = binomial,
##      data = top_amenities)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -2.1334  -0.4389  -0.2283  -0.1281   3.2470
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -4.59069    0.34621  -13.260  < 2e-16 ***
## Shampoo         1.22212    0.17891   6.831 8.43e-12 ***
## Iron            0.86939    0.13063   6.656 2.82e-11 ***
## Hot_water_kettle  0.42634    0.16926   2.519 0.011773 *
## First_aid_kit    0.52451    0.12117   4.329 1.50e-05 ***
## Elevator       -1.03190    0.11540  -8.942  < 2e-16 ***
## Coffee_maker     0.81315    0.15539   5.233 1.67e-07 ***
## TV              0.73328    0.15197   4.825 1.40e-06 ***
## Cable_TV        0.77799    0.18756   4.148 3.35e-05 ***
## Dedicated_workspace 0.57279    0.12882   4.447 8.73e-06 ***
## Kitchen        -0.84495    0.14865  -5.684 1.32e-08 ***
## Dryer           0.22788    0.12283   1.855 0.063562 .
## Dishes_and_silverware 1.03391    0.20241   5.108 3.25e-07 ***
## Hot_water      -0.43959    0.14950  -2.940 0.003277 **
## Extra_pillows_and_blankets -0.34035    0.15217  -2.237 0.025311 *
## Fire_extinguisher 0.47847    0.12999   3.681 0.000232 ***
## Cooking_basics   0.33234    0.15393   2.159 0.030854 *
## Hair_dryer       0.87914    0.20682   4.251 2.13e-05 ***
## Refrigerator    -0.55410    0.16777  -3.303 0.000958 ***
## Essentials      -0.26361    0.20286  -1.299 0.193787
## Hangers          0.12132    0.15942   0.761 0.446626
## Long_term_stays_allowed 0.24154    0.27484   0.879 0.379486
## Luggage_dropoff_allowed -0.09081    0.14125  -0.643 0.520309
## Carbon_monoxide_alarm 0.33936    0.13016   2.607 0.009130 **
## Lock_on_bedroom_door -0.12685    0.12941  -0.980 0.326992
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)

```

```
##
##      Null deviance: 3397.5  on 5055  degrees of freedom
## Residual deviance: 2513.4  on 5031  degrees of freedom
## AIC: 2563.4
##
## Number of Fisher Scoring iterations: 7
```