Identifying Potential Clients

### Identifying Potential Clients Using C5.0 Decision Trees

The increasing number of marketing campaigns over time has reduced their effects on the general public. First, due to competition, positive response rate to mass campaigns are typically very low, according to a recent study, less than 1% of the contacts will subscribe a term deposit. Second, direct marketing has drawbacks, such as causing negative attitude towards banks due to intrusion of privacy and frequent promotional contacts. In order to save costs and time and improve customer satisfaction, it is important to filter the contacts but keep a certain success rate. Machine learning has been applied widely to help enterprises to identify potential clients, targets. Nowadays, target marketing is becoming popular, and machine learning is playing a crucial role in its success. In a wide variety of algorithms, Decision tree is widely used in the banking industry or the marketing feild due to their high accuracy and ability to formulate a statistical model in plain language. My goal of analysis is to develop a classifier using C5.0 decision trees to predict whether or not a client will subscribe a term deposit with high accuracy but also with high sensitivity.

## Step 1 - Collecting data ----

I will utilize the Bank Marketing Dataset bank-full.csv from the UCI Machine Learning Repository at <http://archive.ics.uci.edu/ml>. The data is related with direct marketing campaigns (phone calls) of a Portuguese banking institution. It includes 45,211 examples, 17 variables: a class variable indicating whether a client subscribes a term deposit and 16 features. The 17 variables are discribed as following:

# Demographic and financial information:

1 - age (numeric) 2 - job : type of job (categorical:'admin.','blue-collar','entrepreneur','housemaid','management','retired','self-employed','services','student','technician','unemployed','unknown') 3 - marital : marital status (categorical: 'divorced','married','single','unknown'; note: 'divorced' means divorced or widowed) 4 - education (categorical:'basic.4y','basic.6y','basic.9y','high.school','illiterate','professional.course','university.degree','unknown') 5 - default: has credit in default? (categorical: 'no','yes','unknown') 6 - balance (numeric) 7 - housing: has housing loan? (categorical: 'no','yes','unknown') 8 - loan: has personal loan? (categorical: 'no','yes','unknown')

# Related with the last contact of the current campaign:

9 - contact: contact communication type (categorical: 'cellular','telephone') 10 - month: last contact month of year (categorical: 'jan', 'feb', 'mar', ..., 'nov', 'dec') 11 - day: last contact day of the month (categorical) 12 - duration: last contact duration, in seconds (numeric). # Contact history: 13 - campaign: number of contacts performed during this campaign and for this client (numeric, includes last contact) 14 - pdays: number of days that passed by after the client was last contacted from a previous campaign (numeric; 999 means client was not previously contacted) 15 - previous: number of contacts performed before this campaign and for this client (numeric) 16 - poutcome: outcome of the previous marketing campaign (categorical: 'failure', 'nonexistent', 'success')

# Output variable (desired target):

17 - y : has the client subscribed a term deposit? (binary: 'yes','no')

## Step 2: Exploring and preparing the data ----

Explore the data to see whether we can use the data to classify and prepare the data for modeling.

# Import data

Import the data into R

#Import the CSV file.  
bank <- read.table("bank-full.csv", sep=";", header=T)  
str(bank)

## 'data.frame': 45211 obs. of 17 variables:  
## $ age : int 58 44 33 47 33 35 28 42 58 43 ...  
## $ job : Factor w/ 12 levels "admin.","blue-collar",..: 5 10 3 2 12 5 5 3 6 10 ...  
## $ marital : Factor w/ 3 levels "divorced","married",..: 2 3 2 2 3 2 3 1 2 3 ...  
## $ education: Factor w/ 4 levels "primary","secondary",..: 3 2 2 4 4 3 3 3 1 2 ...  
## $ default : Factor w/ 2 levels "no","yes": 1 1 1 1 1 1 1 2 1 1 ...  
## $ balance : int 2143 29 2 1506 1 231 447 2 121 593 ...  
## $ housing : Factor w/ 2 levels "no","yes": 2 2 2 2 1 2 2 2 2 2 ...  
## $ loan : Factor w/ 2 levels "no","yes": 1 1 2 1 1 1 2 1 1 1 ...  
## $ contact : Factor w/ 3 levels "cellular","telephone",..: 3 3 3 3 3 3 3 3 3 3 ...  
## $ day : int 5 5 5 5 5 5 5 5 5 5 ...  
## $ month : Factor w/ 12 levels "apr","aug","dec",..: 9 9 9 9 9 9 9 9 9 9 ...  
## $ duration : int 261 151 76 92 198 139 217 380 50 55 ...  
## $ campaign : int 1 1 1 1 1 1 1 1 1 1 ...  
## $ pdays : int -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 ...  
## $ previous : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ poutcome : Factor w/ 4 levels "failure","other",..: 4 4 4 4 4 4 4 4 4 4 ...  
## $ y : Factor w/ 2 levels "no","yes": 1 1 1 1 1 1 1 1 1 1 ...

# Data undersanding and cleaning

summary(bank)

## age job marital education   
## Min. :18.00 blue-collar:9732 divorced: 5207 primary : 6851   
## 1st Qu.:33.00 management :9458 married :27214 secondary:23202   
## Median :39.00 technician :7597 single :12790 tertiary :13301   
## Mean :40.94 admin. :5171 unknown : 1857   
## 3rd Qu.:48.00 services :4154   
## Max. :95.00 retired :2264   
## (Other) :6835   
## default balance housing loan contact   
## no :44396 Min. : -8019 no :20081 no :37967 cellular :29285   
## yes: 815 1st Qu.: 72 yes:25130 yes: 7244 telephone: 2906   
## Median : 448 unknown :13020   
## Mean : 1362   
## 3rd Qu.: 1428   
## Max. :102127   
##   
## day month duration campaign   
## Min. : 1.00 may :13766 Min. : 0.0 Min. : 1.000   
## 1st Qu.: 8.00 jul : 6895 1st Qu.: 103.0 1st Qu.: 1.000   
## Median :16.00 aug : 6247 Median : 180.0 Median : 2.000   
## Mean :15.81 jun : 5341 Mean : 258.2 Mean : 2.764   
## 3rd Qu.:21.00 nov : 3970 3rd Qu.: 319.0 3rd Qu.: 3.000   
## Max. :31.00 apr : 2932 Max. :4918.0 Max. :63.000   
## (Other): 6060   
## pdays previous poutcome y   
## Min. : -1.0 Min. : 0.0000 failure: 4901 no :39922   
## 1st Qu.: -1.0 1st Qu.: 0.0000 other : 1840 yes: 5289   
## Median : -1.0 Median : 0.0000 success: 1511   
## Mean : 40.2 Mean : 0.5803 unknown:36959   
## 3rd Qu.: -1.0 3rd Qu.: 0.0000   
## Max. :871.0 Max. :275.0000   
##

# convert day from numeric to factor  
bank$day=factor(bank$day)

# Data exploration

Let's take a look at outputs for a couple of features that seem likely to predict if a client is going to subscribes a term deposit. From the results, features of education, job, durtion are likely to help to identify potential clients, but age and campaign seem not. The higher the education level is, the more likely a client will subscribe. The students are most likely to response with 28.7% response rate, and retired people, 22.8%,and bule-collars are the least likely to response with 7.3% response rate. The term deposit subscribers talked much longer, with average 537 seconds, than nonsubscriber with 221 seconds in the last contact. The distributions of age and campaign by target variable y seem same.

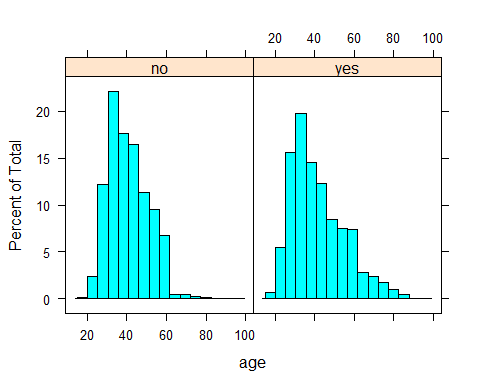
# look at characteristics of the clients  
prop.table(table(bank$education, bank$y),1)

##   
## no yes  
## primary 0.91373522 0.08626478  
## secondary 0.89440565 0.10559435  
## tertiary 0.84993610 0.15006390  
## unknown 0.86429725 0.13570275

prop.table(table(bank$job , bank$y),1)

##   
## no yes  
## admin. 0.87797331 0.12202669  
## blue-collar 0.92725031 0.07274969  
## entrepreneur 0.91728312 0.08271688  
## housemaid 0.91209677 0.08790323  
## management 0.86244449 0.13755551  
## retired 0.77208481 0.22791519  
## self-employed 0.88157061 0.11842939  
## services 0.91116996 0.08883004  
## student 0.71321962 0.28678038  
## technician 0.88943004 0.11056996  
## unemployed 0.84497314 0.15502686  
## unknown 0.88194444 0.11805556

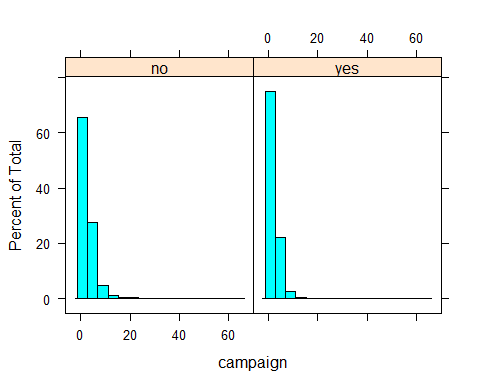
library('lattice')  
histogram(~ age | y, data = bank)



# look at two characteristics of the contact  
tapply(bank$duration,bank$y,summary)

## $no  
## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## 0.0 95.0 164.0 221.2 279.0 4918.0   
##   
## $yes  
## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## 8.0 244.0 426.0 537.3 725.0 3881.0

histogram(~ campaign | y, data = bank)

 look at the class variable. A total of 11.7% of the clients in this dataset subscribed the term deposit. This is a very imbalanced data!

# look at the class variable  
table(bank$y)/45211

##   
## no yes   
## 0.8830152 0.1169848

# Data preparation - creating training and test datasets

Create training and test data to build models.

# split the data frames to training and test data  
index=sample(1:nrow(bank),as.integer(.8\*nrow(bank)))  
bank\_train <- bank[index, ]  
bank\_test <- bank[-index, ]

check the proportion of class variable in training and test datasets. They are close, this appears to be a fairly even split.

# check the proportion of class variable  
prop.table(table(bank\_train$y))

##   
## no yes   
## 0.8823822 0.1176178

prop.table(table(bank\_test$y))

##   
## no yes   
## 0.8855468 0.1144532

## Step 3: Training a model on the data ----

This time, we train a simplest decision tree model on the data.

# build the simplest decision tree  
  
library(C50)  
bank\_model <- C5.0(bank\_train[-17], bank\_train$y)

# display simple facts about the tree  
bank\_model

##   
## Call:  
## C5.0.default(x = bank\_train[-17], y = bank\_train$y)  
##   
## Classification Tree  
## Number of samples: 36168   
## Number of predictors: 16   
##   
## Tree size: 338   
##   
## Non-standard options: attempt to group attributes

# display detailed information about the tree  
summary(bank\_model)

##   
## Call:  
## C5.0.default(x = bank\_train[-17], y = bank\_train$y)  
##   
##   
## C5.0 [Release 2.07 GPL Edition] Mon Nov 13 16:18:53 2017  
## -------------------------------  
##   
## Class specified by attribute `outcome'  
##   
## Read 36168 cases (17 attributes) from undefined.data  
##   
## Decision tree:  
##   
## poutcome = success:  
## :...duration <= 161: no (289/91)  
## : duration > 161:  
## : :...housing = no: yes (647/128)  
## : housing = yes:  
## : :...month in {aug,dec,jun,mar,oct,sep}:  
## : :...campaign <= 3: yes (89/10)  
## : : campaign > 3: no (7/3)  
## : month in {apr,feb,jan,jul,may,nov}:  
## : :...day in {1,3,5,7,17,26,28,29}: no (33/8)  
## : day in {4,9,10,11,14,16,21,22,23,24,25,27,31}: yes (54/15)  
## : day = 2:  
## : :...month in {apr,feb,jan,may,nov}: no (3)  
## : : month = jul: yes (2)  
## : day = 6:  
## : :...previous <= 2: yes (6/1)  
## : : previous > 2: no (3)  
## : day = 8:  
## : :...education in {primary,secondary,unknown}: no (5/1)  
## : : education = tertiary: yes (2)  
## : day = 15:  
## : :...previous <= 3: no (5)  
## : : previous > 3: yes (2)  
## : day = 18:  
## : :...duration <= 451: no (11)  
## : : duration > 451: yes (7/2)  
## : day = 20:  
## : :...contact in {cellular,unknown}: no (4)  
## : : contact = telephone: yes (1)  
## : day = 30:  
## : :...age <= 30: no (2)  
## : : age > 30: yes (5)  
## : day = 12:  
## : :...month = apr: no (1)  
## : : month in {feb,jan,jul,nov}: yes (5)  
## : : month = may:  
## : : :...balance <= 1194: yes (4/1)  
## : : balance > 1194: no (4)  
## : day = 13:  
## : :...contact = unknown: yes (0)  
## : : contact = telephone: no (2)  
## : : contact = cellular:  
## : : :...balance <= 4527: yes (10)  
## : : balance > 4527: no (2)  
## : day = 19:  
## : :...month in {apr,jan,jul}: no (0)  
## : month in {feb,may}: yes (3)  
## : month = nov:  
## : :...duration <= 397: no (5)  
## : duration > 397: yes (2)  
## poutcome in {failure,other,unknown}:  
## :...duration <= 410:  
## :...age > 60:  
## : :...duration <= 126: no (166/10)  
## : : duration > 126:  
## : : :...duration <= 298: no (341/118)  
## : : duration > 298:  
## : : :...poutcome in {failure,other}: no (23/9)  
## : : poutcome = unknown:  
## : : :...marital in {divorced,married}: yes (79/25)  
## : : marital = single: no (3)  
## : age <= 60:  
## : :...month in {aug,jan,jul,jun,may,nov}:  
## : :...duration <= 159: no (13269/94)  
## : : duration > 159:  
## : : :...contact = unknown:  
## : : :...month in {jan,jul,jun,may}: no (4138/10)  
## : : : month in {aug,nov}:  
## : : : :...day in {5,8,13,14}: yes (5)  
## : : : day in {1,2,3,4,6,7,9,10,11,12,15,16,17,18,19,20,  
## : : : 21,22,23,24,25,26,27,28,29,30,31}: no (12)  
## : : contact in {cellular,telephone}:  
## : : :...pdays > 374:  
## : : :...loan = no: yes (47/11)  
## : : : loan = yes: no (4)  
## : : pdays <= 374:  
## : : :...month = jun:  
## : : :...contact = cellular: yes (217/101)  
## : : : contact = telephone: no (24/7)  
## : : month in {aug,jan,jul,may,nov}:  
## : : :...day in {4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,  
## : : : 19,20,21,22,23,24,25,26,27,28,29,30,  
## : : : 31}: no (6670/340)  
## : : day in {1,2,3}:  
## : : :...previous <= 2: yes (46/19)  
## : : previous > 2: no (8)  
## : month in {dec,mar,oct,sep}:  
## : :...duration <= 94: no (197/11)  
## : : duration > 94:  
## : : :...contact = unknown:  
## : : :...job in {admin.,entrepreneur,housemaid,management,  
## : : : : retired,self-employed,services,technician,  
## : : : : unemployed,unknown}: yes (18)  
## : : : job in {blue-collar,student}: no (4)  
## : : contact in {cellular,telephone}:  
## : : :...duration <= 199:  
## : : :...contact = cellular: no (291/85)  
## : : : contact = telephone:  
## : : : :...campaign <= 3: yes (26/9)  
## : : : campaign > 3: no (6)  
## : : duration > 199:  
## : : :...day in {2,5,9,10,12,16,17,22,23,27,  
## : : : 29}: yes (131/37)  
## : : day in {11,14,19,25}: no (36/12)  
## : : day = 3:  
## : : :...duration <= 276: no (4)  
## : : : duration > 276: yes (3)  
## : : day = 4:  
## : : :...education in {primary,secondary,  
## : : : : unknown}: no (7/2)  
## : : : education = tertiary: yes (3)  
## : : day = 6:  
## : : :...job in {admin.,retired,technician}: no (4)  
## : : : job in {blue-collar,entrepreneur,housemaid,  
## : : : management,self-employed,services,  
## : : : student,unemployed,unknown}: yes (6)  
## : : day = 7:  
## : : :...marital in {divorced,single}: no (8/1)  
## : : : marital = married: yes (8/1)  
## : : day = 8:  
## : : :...contact = cellular: no (10/2)  
## : : : contact = telephone: yes (3)  
## : : day = 13:  
## : : :...marital in {divorced,single}: yes (4)  
## : : : marital = married: no (4)  
## : : day = 15:  
## : : :...month in {dec,sep}: yes (7/1)  
## : : : month in {mar,oct}: no (6)  
## : : day = 21:  
## : : :...housing = no: no (3)  
## : : : housing = yes: yes (2)  
## : : day = 24:  
## : : :...education = secondary: yes (3)  
## : : : education in {primary,tertiary,  
## : : : unknown}: no (3)  
## : : day = 28:  
## : : :...education = secondary: no (1)  
## : : : education in {primary,tertiary,  
## : : : unknown}: yes (3)  
## : : day = 30:  
## : : :...pdays <= 110: yes (10/2)  
## : : : pdays > 110: no (2)  
## : : day = 31:  
## : : :...age <= 37: no (4)  
## : : : age > 37: yes (2)  
## : : day = 1:  
## : : :...balance > 1250: no (6)  
## : : : balance <= 1250:  
## : : : :...campaign <= 1: yes (3)  
## : : : campaign > 1: no (2)  
## : : day = 18:  
## : : :...housing = yes: yes (4)  
## : : : housing = no:  
## : : : :...age <= 45: no (6/1)  
## : : : age > 45: yes (2)  
## : : day = 20:  
## : : :...housing = yes: no (2)  
## : : : housing = no:  
## : : : :...contact = cellular: yes (3)  
## : : : contact = telephone: no (1)  
## : : day = 26:  
## : : :...age > 44: no (4/1)  
## : : age <= 44:  
## : : :...campaign <= 1: yes (4)  
## : : campaign > 1: no (3/1)  
## : month in {apr,feb}:  
## : :...day in {2,3,4,5,6,7,9,16,17,20,25,31}: no (2602/115)  
## : day in {1,8,10,11,12,13,14,15,18,19,21,22,23,24,26,27,28,29,30}:  
## : :...duration > 203:  
## : :...housing = no: yes (154/57)  
## : : housing = yes:  
## : : :...month = apr: no (108/26)  
## : : month = feb: yes (21/5)  
## : duration <= 203:  
## : :...month = apr:  
## : :...contact in {cellular,telephone}: no (305/44)  
## : : contact = unknown: yes (3)  
## : month = feb:  
## : :...duration <= 60: no (18)  
## : duration > 60:  
## : :...day in {1,8,14,19,21,22,24,26,28,29,  
## : : 30}: no (28/5)  
## : day in {13,15,18,23}: yes (20/4)  
## : day = 11:  
## : :...balance <= 1050: no (4)  
## : : balance > 1050: yes (2)  
## : day = 12:  
## : :...marital = divorced: no (1)  
## : : marital in {married,single}: yes (3)  
## : day = 27:  
## : :...balance <= 445: no (2)  
## : : balance > 445: yes (11/4)  
## : day = 10:  
## : :...duration <= 136: no (10/2)  
## : duration > 136:  
## : :...duration <= 178: yes (5)  
## : duration > 178: no (2)  
## duration > 410:  
## :...duration > 633:  
## :...duration > 836:  
## : :...contact in {telephone,unknown}:  
## : : :...day in {1,5,7,10,13,18,22,23,24,27}: no (115/44)  
## : : : day in {4,6,19,20,25,31}: yes (87/28)  
## : : : day = 3:  
## : : : :...education in {primary,tertiary,unknown}: yes (3)  
## : : : : education = secondary: no (12/5)  
## : : : day = 8:  
## : : : :...campaign <= 1: no (5/1)  
## : : : : campaign > 1: yes (5)  
## : : : day = 9:  
## : : : :...contact = telephone: yes (3)  
## : : : : contact = unknown: no (15/6)  
## : : : day = 11:  
## : : : :...housing = no: yes (8/1)  
## : : : : housing = yes: no (2)  
## : : : day = 12:  
## : : : :...month in {apr,aug,dec,feb,jan,jul,mar,may,nov,oct,  
## : : : : : sep}: no (10)  
## : : : : month = jun: yes (7/1)  
## : : : day = 16:  
## : : : :...age <= 52: yes (19/5)  
## : : : : age > 52: no (7)  
## : : : day = 17:  
## : : : :...age <= 37: yes (3)  
## : : : : age > 37: no (13/1)  
## : : : day = 26:  
## : : : :...duration <= 1166: no (10/2)  
## : : : : duration > 1166: yes (5)  
## : : : day = 28:  
## : : : :...marital in {divorced,married}: no (5/1)  
## : : : : marital = single: yes (10/2)  
## : : : day = 29:  
## : : : :...marital = divorced: yes (2)  
## : : : : marital in {married,single}: no (9/2)  
## : : : day = 2:  
## : : : :...campaign <= 1: yes (3)  
## : : : : campaign > 1:  
## : : : : :...contact = telephone: yes (3/1)  
## : : : : contact = unknown: no (5)  
## : : : day = 30:  
## : : : :...education in {secondary,tertiary}: yes (11)  
## : : : : education = unknown: no (2)  
## : : : : education = primary:  
## : : : : :...marital = divorced: no (2)  
## : : : : marital in {married,single}: yes (3)  
## : : : day = 14:  
## : : : :...campaign > 3: no (4)  
## : : : : campaign <= 3:  
## : : : : :...age > 46: yes (7)  
## : : : : age <= 46:  
## : : : : :...marital in {divorced,single}: yes (2)  
## : : : : marital = married: no (5/1)  
## : : : day = 15:  
## : : : :...marital = single: yes (3)  
## : : : : marital in {divorced,married}:  
## : : : : :...age > 45: no (13)  
## : : : : age <= 45:  
## : : : : :...age <= 35: no (3)  
## : : : : age > 35: yes (3)  
## : : : day = 21:  
## : : : :...balance <= 758:  
## : : : :...contact = telephone: yes (2)  
## : : : : contact = unknown: no (8)  
## : : : balance > 758:  
## : : : :...marital in {divorced,married}: yes (7)  
## : : : marital = single:  
## : : : :...job in {admin.,blue-collar,entrepreneur,  
## : : : : housemaid,management,retired,  
## : : : : self-employed,services,student,  
## : : : : unemployed,unknown}: no (5/1)  
## : : : job = technician: yes (2)  
## : : contact = cellular:  
## : : :...day in {2,24}: no (37/14)  
## : : day in {4,5,8,9,10,11,12,13,14,15,16,22,23,26,  
## : : : 29}: yes (385/116)  
## : : day = 1:  
## : : :...previous <= 1: yes (5)  
## : : : previous > 1: no (3)  
## : : day = 3:  
## : : :...education in {primary,secondary}: yes (13/4)  
## : : : education in {tertiary,unknown}: no (5)  
## : : day = 19:  
## : : :...education in {primary,tertiary,unknown}: no (18/5)  
## : : : education = secondary: yes (13/2)  
## : : day = 27:  
## : : :...month in {apr,aug,dec,feb,jan,jul,jun,mar,nov,  
## : : : : oct}: yes (5/1)  
## : : : month in {may,sep}: no (2)  
## : : day = 28:  
## : : :...education in {primary,tertiary}: no (12/3)  
## : : : education in {secondary,unknown}: yes (13/3)  
## : : day = 31:  
## : : :...duration <= 927: no (3)  
## : : : duration > 927: yes (10/2)  
## : : day = 17:  
## : : :...balance > 351: no (29/10)  
## : : : balance <= 351:  
## : : : :...poutcome = failure: no (3)  
## : : : poutcome in {other,unknown}: yes (24/7)  
## : : day = 20:  
## : : :...month in {apr,dec,feb,jan,jul,jun,mar,may,oct,  
## : : : : sep}: yes (13/3)  
## : : : month = aug: no (7/2)  
## : : : month = nov:  
## : : : :...job in {admin.,blue-collar,management,retired,  
## : : : : self-employed}: no (20/6)  
## : : : job in {entrepreneur,housemaid,services,student,  
## : : : technician,unemployed,  
## : : : unknown}: yes (13/2)  
## : : day = 30:  
## : : :...campaign <= 3:  
## : : : :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : : : management,services,student,technician,  
## : : : : : unknown}: yes (17)  
## : : : : job in {retired,self-employed,unemployed}: no (5)  
## : : : campaign > 3:  
## : : : :...loan = no: no (7/1)  
## : : : loan = yes: yes (3)  
## : : day = 6:  
## : : :...loan = yes: yes (9/1)  
## : : : loan = no:  
## : : : :...balance > 485: yes (19/6)  
## : : : balance <= 485:  
## : : : :...campaign <= 1: yes (2)  
## : : : campaign > 1: no (8/1)  
## : : day = 7:  
## : : :...duration > 1048:  
## : : : :...previous <= 1: no (21/5)  
## : : : : previous > 1: yes (3)  
## : : : duration <= 1048:  
## : : : :...loan = no: yes (11)  
## : : : loan = yes:  
## : : : :...age <= 46: no (2)  
## : : : age > 46: yes (2)  
## : : day = 18:  
## : : :...education = primary: no (10/3)  
## : : : education in {secondary,unknown}: yes (24/7)  
## : : : education = tertiary:  
## : : : :...marital in {divorced,single}: yes (6/1)  
## : : : marital = married:  
## : : : :...balance <= 1966: yes (2)  
## : : : balance > 1966: no (3)  
## : : day = 25:  
## : : :...marital in {divorced,single}: yes (9/1)  
## : : : marital = married:  
## : : : :...education = primary: yes (3/1)  
## : : : education in {tertiary,unknown}: no (3)  
## : : : education = secondary:  
## : : : :...balance <= 556: no (2)  
## : : : balance > 556: yes (5)  
## : : day = 21:  
## : : :...duration > 1361: yes (7)  
## : : duration <= 1361:  
## : : :...duration > 1145: no (8)  
## : : duration <= 1145:  
## : : :...job in {admin.,housemaid,retired,self-employed,  
## : : : services,student,technician,unemployed,  
## : : : unknown}: yes (17/3)  
## : : job in {entrepreneur,management}: no (13/3)  
## : : job = blue-collar:  
## : : :...age <= 40: yes (3)  
## : : age > 40: no (2)  
## : duration <= 836:  
## : :...contact in {telephone,unknown}: no (425/131)  
## : contact = cellular:  
## : :...month in {dec,jun,oct}: yes (35/12)  
## : month = apr:  
## : :...default = no: no (95/28)  
## : : default = yes: yes (5/1)  
## : month = jan:  
## : :...poutcome in {failure,unknown}: no (27/9)  
## : : poutcome = other: yes (2)  
## : month = mar:  
## : :...age <= 38: yes (2)  
## : : age > 38: no (4)  
## : month = sep:  
## : :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : retired,self-employed,services,technician,  
## : : : unemployed,unknown}: no (8/1)  
## : : job in {management,student}: yes (7/1)  
## : month = nov:  
## : :...pdays > 161: no (11)  
## : : pdays <= 161:  
## : : :...poutcome = failure: yes (6/1)  
## : : poutcome in {other,unknown}: no (88/32)  
## : month = aug:  
## : :...day in {1,2,3,6,8,9,10,11,15,16,17,23,24,27,30,  
## : : : 31}: yes (27/3)  
## : : day in {4,14,25,26,28,29}: no (24/5)  
## : : day = 5:  
## : : :...education = secondary: yes (2)  
## : : : education in {primary,tertiary,unknown}: no (3)  
## : : day = 7:  
## : : :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : : retired,self-employed,services,student,  
## : : : : technician,unemployed,unknown}: yes (4)  
## : : : job = management: no (2)  
## : : day = 12:  
## : : :...balance <= 6913: yes (8)  
## : : : balance > 6913: no (2)  
## : : day = 18:  
## : : :...balance <= 2056: yes (7/2)  
## : : : balance > 2056: no (3)  
## : : day = 19:  
## : : :...marital in {divorced,married}: no (6/1)  
## : : : marital = single: yes (4)  
## : : day = 20:  
## : : :...housing = no: yes (2)  
## : : : housing = yes: no (3/1)  
## : : day = 22:  
## : : :...campaign <= 3: yes (5/1)  
## : : : campaign > 3: no (3)  
## : : day = 13:  
## : : :...loan = yes: yes (2)  
## : : : loan = no:  
## : : : :...duration <= 677: yes (3)  
## : : : duration > 677: no (9/1)  
## : : day = 21:  
## : : :...job in {entrepreneur,housemaid,retired,  
## : : : self-employed,services,student,unemployed,  
## : : : unknown}: no (0)  
## : : job in {admin.,blue-collar}: yes (2)  
## : : job = management:  
## : : :...age <= 38: yes (2)  
## : : : age > 38: no (2)  
## : : job = technician:  
## : : :...marital = married: yes (1)  
## : : marital in {divorced,single}: no (3)  
## : month = feb:  
## : :...age > 58: yes (7)  
## : : age <= 58:  
## : : :...job in {admin.,self-employed,  
## : : : student}: yes (9/1)  
## : : job in {blue-collar,entrepreneur,housemaid,retired,  
## : : : services,unknown}: no (14/4)  
## : : job = management:  
## : : :...marital = married: yes (5/2)  
## : : : marital in {divorced,single}: no (4)  
## : : job = technician:  
## : : :...campaign <= 5: yes (7/1)  
## : : : campaign > 5: no (2)  
## : : job = unemployed:  
## : : :...poutcome = failure: yes (1)  
## : : poutcome in {other,unknown}: no (7)  
## : month = jul:  
## : :...day in {2,3,8,10,16}: yes (34/8)  
## : : day in {1,4,5,6,12,13,17,19,20,22,24,26,  
## : : : 27}: no (34/8)  
## : : day = 7:  
## : : :...age <= 39: yes (4)  
## : : : age > 39: no (3)  
## : : day = 9:  
## : : :...marital in {divorced,married}: yes (5/1)  
## : : : marital = single: no (4)  
## : : day = 11:  
## : : :...marital = divorced: yes (1)  
## : : : marital in {married,single}: no (4)  
## : : day = 14:  
## : : :...poutcome = other: yes (1)  
## : : : poutcome in {failure,unknown}: no (6)  
## : : day = 15:  
## : : :...education in {primary,tertiary}: yes (5)  
## : : : education in {secondary,unknown}: no (8/1)  
## : : day = 18:  
## : : :...loan = no: yes (7/1)  
## : : : loan = yes: no (4)  
## : : day = 21:  
## : : :...balance <= 636: no (3)  
## : : : balance > 636: yes (2)  
## : : day = 25:  
## : : :...age <= 38: yes (8/1)  
## : : : age > 38: no (4)  
## : : day = 28:  
## : : :...duration <= 745: yes (4)  
## : : : duration > 745: no (5/1)  
## : : day = 29:  
## : : :...loan = no: no (5/1)  
## : : : loan = yes: yes (2)  
## : : day = 30:  
## : : :...campaign <= 3: no (12/5)  
## : : : campaign > 3: yes (6/1)  
## : : day = 31:  
## : : :...balance <= 255: yes (4)  
## : : : balance > 255: no (7/1)  
## : : day = 23:  
## : : :...education in {primary,unknown}: no (0)  
## : : education = tertiary: yes (1)  
## : : education = secondary:  
## : : :...duration <= 742: no (7)  
## : : duration > 742: yes (4/1)  
## : month = may:  
## : :...default = yes: no (4)  
## : default = no:  
## : :...job in {housemaid,retired}: no (11/5)  
## : job in {entrepreneur,management,self-employed,  
## : : student,unknown}: yes (38/10)  
## : job = services:  
## : :...day in {1,2,3,4,5,6,7,9,10,11,13,14,15,16,17,  
## : : : 19,20,21,22,23,24,25,26,27,28,29,30,  
## : : : 31}: yes (12)  
## : : day in {8,12,18}: no (3)  
## : job = unemployed:  
## : :...marital = married: yes (2)  
## : : marital in {divorced,single}: no (3)  
## : job = admin.:  
## : :...education in {primary,unknown}: yes (1)  
## : : education = tertiary: no (1)  
## : : education = secondary:  
## : : :...duration <= 686: no (4/1)  
## : : duration > 686: yes (7)  
## : job = blue-collar:  
## : :...day in {4,5,8,15,18}: yes (19/4)  
## : : day in {1,2,3,6,7,9,10,11,16,17,19,20,21,22,23,  
## : : : 24,25,26,27,28,29,30,31}: no (11/2)  
## : : day = 12:  
## : : :...balance <= 257: yes (2)  
## : : : balance > 257: no (2)  
## : : day = 13:  
## : : :...poutcome = failure: yes (2)  
## : : : poutcome in {other,unknown}: no (9/2)  
## : : day = 14:  
## : : :...education in {primary,tertiary,  
## : : : unknown}: no (3)  
## : : education = secondary: yes (1)  
## : job = technician:  
## : :...previous > 1: no (6)  
## : previous <= 1:  
## : :...balance <= 261: yes (7/2)  
## : balance > 261:  
## : :...education in {primary,secondary,  
## : : unknown}: no (4)  
## : education = tertiary: yes (6/2)  
## duration <= 633:  
## :...month in {dec,mar,oct,sep}: yes (132/45)  
## month in {apr,aug,feb,jan,jul,jun,may,nov}:  
## :...pdays > 369: yes (26/5)  
## pdays <= 369:  
## :...contact = unknown:  
## :...default = no:  
## : :...month in {apr,aug}: yes (3)  
## : : month in {feb,jan,jul,jun,may,nov}: no (874/78)  
## : default = yes:  
## : :...marital in {divorced,married}: no (16/1)  
## : marital = single: yes (7/1)  
## contact in {cellular,telephone}:  
## :...age <= 25:  
## :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : retired,self-employed,services,technician,  
## : : unemployed,unknown}: no (43/10)  
## : job in {management,student}: yes (31/10)  
## age > 25:  
## :...month = jun: yes (50/16)  
## month = jan:  
## :...day in {11,18,26,28,29,30}: no (112/5)  
## : day in {1,2,3,4,5,6,7,8,9,10,12,13,14,15,16,17,  
## : 19,20,21,22,23,24,25,27,  
## : 31}: yes (8)  
## month in {apr,aug,feb,jul,may,nov}:  
## :...housing = no:  
## :...month in {apr,may}:  
## : :...day in {1,2,3,6,7,9,10,11,12,13,14,15,  
## : : : 17,18,19,23,24,28,29,  
## : : : 31}: no (49/13)  
## : : day in {5,8,16,20,21,25,27,  
## : : : 30}: yes (63/19)  
## : : day = 4:  
## : : :...marital in {divorced,  
## : : : : married}: yes (4)  
## : : : marital = single: no (1)  
## : : day = 22:  
## : : :...duration <= 558: yes (3)  
## : : : duration > 558: no (2)  
## : : day = 26:  
## : : :...age <= 33: yes (3)  
## : : age > 33: no (2)  
## : month in {aug,feb,jul,nov}:  
## : :...poutcome in {failure,  
## : : unknown}: no (737/173)  
## : poutcome = other:  
## : :...duration <= 470: yes (13/2)  
## : duration > 470:  
## : :...month = aug: yes (4/1)  
## : month in {feb,jul,  
## : nov}: no (14/1)  
## housing = yes:  
## :...month in {apr,aug,feb,jul}: no (530/71)  
## month in {may,nov}:  
## :...duration <= 600: no (402/85)  
## duration > 600:  
## :...campaign > 3: yes (5)  
## campaign <= 3: [S1]  
##   
## SubTree [S1]  
##   
## job in {entrepreneur,technician}: yes (10/1)  
## job in {housemaid,retired,self-employed,student,unemployed,  
## : unknown}: no (3)  
## job = admin.:  
## :...duration <= 610: yes (3)  
## : duration > 610: no (2)  
## job = blue-collar:  
## :...previous <= 1: yes (11/4)  
## : previous > 1: no (6)  
## job = management:  
## :...campaign <= 2: no (9/1)  
## : campaign > 2: yes (2)  
## job = services:  
## :...balance <= 176: yes (2)  
## balance > 176: no (2)  
##   
##   
## Evaluation on training data (36168 cases):  
##   
## Decision Tree   
## ----------------   
## Size Errors   
##   
## 334 2585( 7.1%) <<  
##   
##   
## (a) (b) <-classified as  
## ---- ----  
## 31123 791 (a): class no  
## 1794 2460 (b): class yes  
##   
##   
## Attribute usage:  
##   
## 100.00% duration  
## 100.00% poutcome  
## 91.14% month  
## 87.13% age  
## 49.06% contact  
## 34.51% day  
## 28.16% pdays  
## 8.65% housing  
## 3.20% default  
## 1.35% job  
## 0.86% campaign  
## 0.79% marital  
## 0.69% education  
## 0.64% balance  
## 0.40% loan  
## 0.39% previous  
##   
##   
## Time: 0.4 secs

## Step 4: Evaluating model performance ----

I use confusion matrix, accuracy, KAPPA, sensitivity and ROC curve to evaluating model performance. From the results, the accuracy is 90.3%, which is good if we see it alone. However,since there is 88.3% of nos in class variable y, the performance is actually fair. KAPPA is 0.466, there is moderate agreement between the classifier's predictions and the actual values. AUC is 0.853, which indicates the classifier is excellent. The sensitivity is 0.448, the model only correctly identified 44.8 percent of true subscribers. Unfortunately, this type of error is a potentially very costly mistake, as the bank loses money on each term deposit client. We need to improve the result with a bit more effort.

# create a factor vector of predictions on test data  
bank\_pred <- predict(bank\_model, bank\_test)  
predicted\_prob <- predict(bank\_model, bank\_test, type = "prob")  
  
# confusion matrix  
library(gmodels)  
CrossTable(bank\_test$y, bank\_pred,  
 prop.chisq = FALSE, prop.c = FALSE, prop.r = FALSE,  
 dnn = c('actual subscriber', 'predicted subscriber'))

##   
##   
## Cell Contents  
## |-------------------------|  
## | N |  
## | N / Table Total |  
## |-------------------------|  
##   
##   
## Total Observations in Table: 9043   
##   
##   
## | predicted subscriber   
## actual subscriber | no | yes | Row Total |   
## ------------------|-----------|-----------|-----------|  
## no | 7674 | 334 | 8008 |   
## | 0.849 | 0.037 | |   
## ------------------|-----------|-----------|-----------|  
## yes | 552 | 483 | 1035 |   
## | 0.061 | 0.053 | |   
## ------------------|-----------|-----------|-----------|  
## Column Total | 8226 | 817 | 9043 |   
## ------------------|-----------|-----------|-----------|  
##   
##

# compute accuracy  
accuracy <- mean(bank\_test$y==bank\_pred)  
accuracy

## [1] 0.9020237

# KAPPA  
library(vcd)

## Loading required package: grid

Kappa(table(bank\_test$y, bank\_pred))

## value ASE z Pr(>|z|)  
## Unweighted 0.4679 0.01515 30.87 2.628e-209  
## Weighted 0.4679 0.01515 30.87 2.628e-209

# sensitivity  
sens <- sum(bank\_test$y=="yes" & bank\_pred=="yes")/sum(bank\_test$y=="yes")  
sens

## [1] 0.4666667

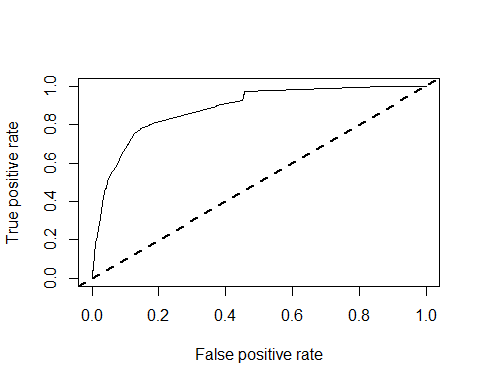
# ROC Curve  
  
library(ROCR)

## Loading required package: gplots

##   
## Attaching package: 'gplots'

## The following object is masked from 'package:stats':  
##   
## lowess

library(gplots)  
pred <- prediction( predicted\_prob[,2], bank\_test$y)  
perf <- performance(pred, measure = "tpr", x.measure = "fpr")  
plot(perf)  
abline(a = 0, b = 1, lwd = 2, lty = 2)



perf.auc <- performance(pred, measure = "auc")  
unlist(perf.auc@y.values)

## [1] 0.8838752

## Step 5: Improving model performance ----

I will attempt two ways to improve model performance. First, I will employ boosting. This is a process in which many decision trees are built and the trees vote on the best class for each example. Second, we will assign a penalty to different types of errors, in order to discourage a tree from making more costly mistakes. The penalties are designated in a cost matrix, which specifies how much costlier each error is, relative to any other prediction.

# Boosting the accuracy of decision trees

Boosted decision tree with 10 trials, a number that has become the de facto standard. The accuracy is 90.2%, KAPPA is 0.465, AUC is 0.853, and sensitivity is 0.458. These are almost same with the original model's performance.

# boosted decision tree with 10 trials  
bank\_boost10 <- C5.0(bank\_train[-17], bank\_train$y,  
 trials = 10)  
bank\_boost10

##   
## Call:  
## C5.0.default(x = bank\_train[-17], y = bank\_train$y, trials = 10)  
##   
## Classification Tree  
## Number of samples: 36168   
## Number of predictors: 16   
##   
## Number of boosting iterations: 10   
## Average tree size: 331.1   
##   
## Non-standard options: attempt to group attributes

summary(bank\_boost10)

##   
## Call:  
## C5.0.default(x = bank\_train[-17], y = bank\_train$y, trials = 10)  
##   
##   
## C5.0 [Release 2.07 GPL Edition] Mon Nov 13 16:18:55 2017  
## -------------------------------  
##   
## Class specified by attribute `outcome'  
##   
## Read 36168 cases (17 attributes) from undefined.data  
##   
## ----- Trial 0: -----  
##   
## Decision tree:  
##   
## poutcome = success:  
## :...duration <= 161: no (289/91)  
## : duration > 161:  
## : :...housing = no: yes (647/128)  
## : housing = yes:  
## : :...month in {aug,dec,jun,mar,oct,sep}:  
## : :...campaign <= 3: yes (89/10)  
## : : campaign > 3: no (7/3)  
## : month in {apr,feb,jan,jul,may,nov}:  
## : :...day in {1,3,5,7,17,26,28,29}: no (33/8)  
## : day in {4,9,10,11,14,16,21,22,23,24,25,27,31}: yes (54/15)  
## : day = 2:  
## : :...month in {apr,feb,jan,may,nov}: no (3)  
## : : month = jul: yes (2)  
## : day = 6:  
## : :...previous <= 2: yes (6/1)  
## : : previous > 2: no (3)  
## : day = 8:  
## : :...education in {primary,secondary,unknown}: no (5/1)  
## : : education = tertiary: yes (2)  
## : day = 15:  
## : :...previous <= 3: no (5)  
## : : previous > 3: yes (2)  
## : day = 18:  
## : :...duration <= 451: no (11)  
## : : duration > 451: yes (7/2)  
## : day = 20:  
## : :...contact in {cellular,unknown}: no (4)  
## : : contact = telephone: yes (1)  
## : day = 30:  
## : :...age <= 30: no (2)  
## : : age > 30: yes (5)  
## : day = 12:  
## : :...month = apr: no (1)  
## : : month in {feb,jan,jul,nov}: yes (5)  
## : : month = may:  
## : : :...balance <= 1194: yes (4/1)  
## : : balance > 1194: no (4)  
## : day = 13:  
## : :...contact = unknown: yes (0)  
## : : contact = telephone: no (2)  
## : : contact = cellular:  
## : : :...balance <= 4527: yes (10)  
## : : balance > 4527: no (2)  
## : day = 19:  
## : :...month in {apr,jan,jul}: no (0)  
## : month in {feb,may}: yes (3)  
## : month = nov:  
## : :...duration <= 397: no (5)  
## : duration > 397: yes (2)  
## poutcome in {failure,other,unknown}:  
## :...duration <= 410:  
## :...age > 60:  
## : :...duration <= 126: no (166/10)  
## : : duration > 126:  
## : : :...duration <= 298: no (341/118)  
## : : duration > 298:  
## : : :...poutcome in {failure,other}: no (23/9)  
## : : poutcome = unknown:  
## : : :...marital in {divorced,married}: yes (79/25)  
## : : marital = single: no (3)  
## : age <= 60:  
## : :...month in {aug,jan,jul,jun,may,nov}:  
## : :...duration <= 159: no (13269/94)  
## : : duration > 159:  
## : : :...contact = unknown:  
## : : :...month in {jan,jul,jun,may}: no (4138/10)  
## : : : month in {aug,nov}:  
## : : : :...day in {5,8,13,14}: yes (5)  
## : : : day in {1,2,3,4,6,7,9,10,11,12,15,16,17,18,19,20,  
## : : : 21,22,23,24,25,26,27,28,29,30,31}: no (12)  
## : : contact in {cellular,telephone}:  
## : : :...pdays > 374:  
## : : :...loan = no: yes (47/11)  
## : : : loan = yes: no (4)  
## : : pdays <= 374:  
## : : :...month = jun:  
## : : :...contact = cellular: yes (217/101)  
## : : : contact = telephone: no (24/7)  
## : : month in {aug,jan,jul,may,nov}:  
## : : :...day in {4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,  
## : : : 19,20,21,22,23,24,25,26,27,28,29,30,  
## : : : 31}: no (6670/340)  
## : : day in {1,2,3}:  
## : : :...previous <= 2: yes (46/19)  
## : : previous > 2: no (8)  
## : month in {dec,mar,oct,sep}:  
## : :...duration <= 94: no (197/11)  
## : : duration > 94:  
## : : :...contact = unknown:  
## : : :...job in {admin.,entrepreneur,housemaid,management,  
## : : : : retired,self-employed,services,technician,  
## : : : : unemployed,unknown}: yes (18)  
## : : : job in {blue-collar,student}: no (4)  
## : : contact in {cellular,telephone}:  
## : : :...duration <= 199:  
## : : :...contact = cellular: no (291/85)  
## : : : contact = telephone:  
## : : : :...campaign <= 3: yes (26/9)  
## : : : campaign > 3: no (6)  
## : : duration > 199:  
## : : :...day in {2,5,9,10,12,16,17,22,23,27,  
## : : : 29}: yes (131/37)  
## : : day in {11,14,19,25}: no (36/12)  
## : : day = 3:  
## : : :...duration <= 276: no (4)  
## : : : duration > 276: yes (3)  
## : : day = 4:  
## : : :...education in {primary,secondary,  
## : : : : unknown}: no (7/2)  
## : : : education = tertiary: yes (3)  
## : : day = 6:  
## : : :...job in {admin.,retired,technician}: no (4)  
## : : : job in {blue-collar,entrepreneur,housemaid,  
## : : : management,self-employed,services,  
## : : : student,unemployed,unknown}: yes (6)  
## : : day = 7:  
## : : :...marital in {divorced,single}: no (8/1)  
## : : : marital = married: yes (8/1)  
## : : day = 8:  
## : : :...contact = cellular: no (10/2)  
## : : : contact = telephone: yes (3)  
## : : day = 13:  
## : : :...marital in {divorced,single}: yes (4)  
## : : : marital = married: no (4)  
## : : day = 15:  
## : : :...month in {dec,sep}: yes (7/1)  
## : : : month in {mar,oct}: no (6)  
## : : day = 21:  
## : : :...housing = no: no (3)  
## : : : housing = yes: yes (2)  
## : : day = 24:  
## : : :...education = secondary: yes (3)  
## : : : education in {primary,tertiary,  
## : : : unknown}: no (3)  
## : : day = 28:  
## : : :...education = secondary: no (1)  
## : : : education in {primary,tertiary,  
## : : : unknown}: yes (3)  
## : : day = 30:  
## : : :...pdays <= 110: yes (10/2)  
## : : : pdays > 110: no (2)  
## : : day = 31:  
## : : :...age <= 37: no (4)  
## : : : age > 37: yes (2)  
## : : day = 1:  
## : : :...balance > 1250: no (6)  
## : : : balance <= 1250:  
## : : : :...campaign <= 1: yes (3)  
## : : : campaign > 1: no (2)  
## : : day = 18:  
## : : :...housing = yes: yes (4)  
## : : : housing = no:  
## : : : :...age <= 45: no (6/1)  
## : : : age > 45: yes (2)  
## : : day = 20:  
## : : :...housing = yes: no (2)  
## : : : housing = no:  
## : : : :...contact = cellular: yes (3)  
## : : : contact = telephone: no (1)  
## : : day = 26:  
## : : :...age > 44: no (4/1)  
## : : age <= 44:  
## : : :...campaign <= 1: yes (4)  
## : : campaign > 1: no (3/1)  
## : month in {apr,feb}:  
## : :...day in {2,3,4,5,6,7,9,16,17,20,25,31}: no (2602/115)  
## : day in {1,8,10,11,12,13,14,15,18,19,21,22,23,24,26,27,28,29,30}:  
## : :...duration > 203:  
## : :...housing = no: yes (154/57)  
## : : housing = yes:  
## : : :...month = apr: no (108/26)  
## : : month = feb: yes (21/5)  
## : duration <= 203:  
## : :...month = apr:  
## : :...contact in {cellular,telephone}: no (305/44)  
## : : contact = unknown: yes (3)  
## : month = feb:  
## : :...duration <= 60: no (18)  
## : duration > 60:  
## : :...day in {1,8,14,19,21,22,24,26,28,29,  
## : : 30}: no (28/5)  
## : day in {13,15,18,23}: yes (20/4)  
## : day = 11:  
## : :...balance <= 1050: no (4)  
## : : balance > 1050: yes (2)  
## : day = 12:  
## : :...marital = divorced: no (1)  
## : : marital in {married,single}: yes (3)  
## : day = 27:  
## : :...balance <= 445: no (2)  
## : : balance > 445: yes (11/4)  
## : day = 10:  
## : :...duration <= 136: no (10/2)  
## : duration > 136:  
## : :...duration <= 178: yes (5)  
## : duration > 178: no (2)  
## duration > 410:  
## :...duration > 633:  
## :...duration > 836:  
## : :...contact in {telephone,unknown}:  
## : : :...day in {1,5,7,10,13,18,22,23,24,27}: no (115/44)  
## : : : day in {4,6,19,20,25,31}: yes (87/28)  
## : : : day = 3:  
## : : : :...education in {primary,tertiary,unknown}: yes (3)  
## : : : : education = secondary: no (12/5)  
## : : : day = 8:  
## : : : :...campaign <= 1: no (5/1)  
## : : : : campaign > 1: yes (5)  
## : : : day = 9:  
## : : : :...contact = telephone: yes (3)  
## : : : : contact = unknown: no (15/6)  
## : : : day = 11:  
## : : : :...housing = no: yes (8/1)  
## : : : : housing = yes: no (2)  
## : : : day = 12:  
## : : : :...month in {apr,aug,dec,feb,jan,jul,mar,may,nov,oct,  
## : : : : : sep}: no (10)  
## : : : : month = jun: yes (7/1)  
## : : : day = 16:  
## : : : :...age <= 52: yes (19/5)  
## : : : : age > 52: no (7)  
## : : : day = 17:  
## : : : :...age <= 37: yes (3)  
## : : : : age > 37: no (13/1)  
## : : : day = 26:  
## : : : :...duration <= 1166: no (10/2)  
## : : : : duration > 1166: yes (5)  
## : : : day = 28:  
## : : : :...marital in {divorced,married}: no (5/1)  
## : : : : marital = single: yes (10/2)  
## : : : day = 29:  
## : : : :...marital = divorced: yes (2)  
## : : : : marital in {married,single}: no (9/2)  
## : : : day = 2:  
## : : : :...campaign <= 1: yes (3)  
## : : : : campaign > 1:  
## : : : : :...contact = telephone: yes (3/1)  
## : : : : contact = unknown: no (5)  
## : : : day = 30:  
## : : : :...education in {secondary,tertiary}: yes (11)  
## : : : : education = unknown: no (2)  
## : : : : education = primary:  
## : : : : :...marital = divorced: no (2)  
## : : : : marital in {married,single}: yes (3)  
## : : : day = 14:  
## : : : :...campaign > 3: no (4)  
## : : : : campaign <= 3:  
## : : : : :...age > 46: yes (7)  
## : : : : age <= 46:  
## : : : : :...marital in {divorced,single}: yes (2)  
## : : : : marital = married: no (5/1)  
## : : : day = 15:  
## : : : :...marital = single: yes (3)  
## : : : : marital in {divorced,married}:  
## : : : : :...age > 45: no (13)  
## : : : : age <= 45:  
## : : : : :...age <= 35: no (3)  
## : : : : age > 35: yes (3)  
## : : : day = 21:  
## : : : :...balance <= 758:  
## : : : :...contact = telephone: yes (2)  
## : : : : contact = unknown: no (8)  
## : : : balance > 758:  
## : : : :...marital in {divorced,married}: yes (7)  
## : : : marital = single:  
## : : : :...job in {admin.,blue-collar,entrepreneur,  
## : : : : housemaid,management,retired,  
## : : : : self-employed,services,student,  
## : : : : unemployed,unknown}: no (5/1)  
## : : : job = technician: yes (2)  
## : : contact = cellular:  
## : : :...day in {2,24}: no (37/14)  
## : : day in {4,5,8,9,10,11,12,13,14,15,16,22,23,26,  
## : : : 29}: yes (385/116)  
## : : day = 1:  
## : : :...previous <= 1: yes (5)  
## : : : previous > 1: no (3)  
## : : day = 3:  
## : : :...education in {primary,secondary}: yes (13/4)  
## : : : education in {tertiary,unknown}: no (5)  
## : : day = 19:  
## : : :...education in {primary,tertiary,unknown}: no (18/5)  
## : : : education = secondary: yes (13/2)  
## : : day = 27:  
## : : :...month in {apr,aug,dec,feb,jan,jul,jun,mar,nov,  
## : : : : oct}: yes (5/1)  
## : : : month in {may,sep}: no (2)  
## : : day = 28:  
## : : :...education in {primary,tertiary}: no (12/3)  
## : : : education in {secondary,unknown}: yes (13/3)  
## : : day = 31:  
## : : :...duration <= 927: no (3)  
## : : : duration > 927: yes (10/2)  
## : : day = 17:  
## : : :...balance > 351: no (29/10)  
## : : : balance <= 351:  
## : : : :...poutcome = failure: no (3)  
## : : : poutcome in {other,unknown}: yes (24/7)  
## : : day = 20:  
## : : :...month in {apr,dec,feb,jan,jul,jun,mar,may,oct,  
## : : : : sep}: yes (13/3)  
## : : : month = aug: no (7/2)  
## : : : month = nov:  
## : : : :...job in {admin.,blue-collar,management,retired,  
## : : : : self-employed}: no (20/6)  
## : : : job in {entrepreneur,housemaid,services,student,  
## : : : technician,unemployed,  
## : : : unknown}: yes (13/2)  
## : : day = 30:  
## : : :...campaign <= 3:  
## : : : :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : : : management,services,student,technician,  
## : : : : : unknown}: yes (17)  
## : : : : job in {retired,self-employed,unemployed}: no (5)  
## : : : campaign > 3:  
## : : : :...loan = no: no (7/1)  
## : : : loan = yes: yes (3)  
## : : day = 6:  
## : : :...loan = yes: yes (9/1)  
## : : : loan = no:  
## : : : :...balance > 485: yes (19/6)  
## : : : balance <= 485:  
## : : : :...campaign <= 1: yes (2)  
## : : : campaign > 1: no (8/1)  
## : : day = 7:  
## : : :...duration > 1048:  
## : : : :...previous <= 1: no (21/5)  
## : : : : previous > 1: yes (3)  
## : : : duration <= 1048:  
## : : : :...loan = no: yes (11)  
## : : : loan = yes:  
## : : : :...age <= 46: no (2)  
## : : : age > 46: yes (2)  
## : : day = 18:  
## : : :...education = primary: no (10/3)  
## : : : education in {secondary,unknown}: yes (24/7)  
## : : : education = tertiary:  
## : : : :...marital in {divorced,single}: yes (6/1)  
## : : : marital = married:  
## : : : :...balance <= 1966: yes (2)  
## : : : balance > 1966: no (3)  
## : : day = 25:  
## : : :...marital in {divorced,single}: yes (9/1)  
## : : : marital = married:  
## : : : :...education = primary: yes (3/1)  
## : : : education in {tertiary,unknown}: no (3)  
## : : : education = secondary:  
## : : : :...balance <= 556: no (2)  
## : : : balance > 556: yes (5)  
## : : day = 21:  
## : : :...duration > 1361: yes (7)  
## : : duration <= 1361:  
## : : :...duration > 1145: no (8)  
## : : duration <= 1145:  
## : : :...job in {admin.,housemaid,retired,self-employed,  
## : : : services,student,technician,unemployed,  
## : : : unknown}: yes (17/3)  
## : : job in {entrepreneur,management}: no (13/3)  
## : : job = blue-collar:  
## : : :...age <= 40: yes (3)  
## : : age > 40: no (2)  
## : duration <= 836:  
## : :...contact in {telephone,unknown}: no (425/131)  
## : contact = cellular:  
## : :...month in {dec,jun,oct}: yes (35/12)  
## : month = apr:  
## : :...default = no: no (95/28)  
## : : default = yes: yes (5/1)  
## : month = jan:  
## : :...poutcome in {failure,unknown}: no (27/9)  
## : : poutcome = other: yes (2)  
## : month = mar:  
## : :...age <= 38: yes (2)  
## : : age > 38: no (4)  
## : month = sep:  
## : :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : retired,self-employed,services,technician,  
## : : : unemployed,unknown}: no (8/1)  
## : : job in {management,student}: yes (7/1)  
## : month = nov:  
## : :...pdays > 161: no (11)  
## : : pdays <= 161:  
## : : :...poutcome = failure: yes (6/1)  
## : : poutcome in {other,unknown}: no (88/32)  
## : month = aug:  
## : :...day in {1,2,3,6,8,9,10,11,15,16,17,23,24,27,30,  
## : : : 31}: yes (27/3)  
## : : day in {4,14,25,26,28,29}: no (24/5)  
## : : day = 5:  
## : : :...education = secondary: yes (2)  
## : : : education in {primary,tertiary,unknown}: no (3)  
## : : day = 7:  
## : : :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : : retired,self-employed,services,student,  
## : : : : technician,unemployed,unknown}: yes (4)  
## : : : job = management: no (2)  
## : : day = 12:  
## : : :...balance <= 6913: yes (8)  
## : : : balance > 6913: no (2)  
## : : day = 18:  
## : : :...balance <= 2056: yes (7/2)  
## : : : balance > 2056: no (3)  
## : : day = 19:  
## : : :...marital in {divorced,married}: no (6/1)  
## : : : marital = single: yes (4)  
## : : day = 20:  
## : : :...housing = no: yes (2)  
## : : : housing = yes: no (3/1)  
## : : day = 22:  
## : : :...campaign <= 3: yes (5/1)  
## : : : campaign > 3: no (3)  
## : : day = 13:  
## : : :...loan = yes: yes (2)  
## : : : loan = no:  
## : : : :...duration <= 677: yes (3)  
## : : : duration > 677: no (9/1)  
## : : day = 21:  
## : : :...job in {entrepreneur,housemaid,retired,  
## : : : self-employed,services,student,unemployed,  
## : : : unknown}: no (0)  
## : : job in {admin.,blue-collar}: yes (2)  
## : : job = management:  
## : : :...age <= 38: yes (2)  
## : : : age > 38: no (2)  
## : : job = technician:  
## : : :...marital = married: yes (1)  
## : : marital in {divorced,single}: no (3)  
## : month = feb:  
## : :...age > 58: yes (7)  
## : : age <= 58:  
## : : :...job in {admin.,self-employed,  
## : : : student}: yes (9/1)  
## : : job in {blue-collar,entrepreneur,housemaid,retired,  
## : : : services,unknown}: no (14/4)  
## : : job = management:  
## : : :...marital = married: yes (5/2)  
## : : : marital in {divorced,single}: no (4)  
## : : job = technician:  
## : : :...campaign <= 5: yes (7/1)  
## : : : campaign > 5: no (2)  
## : : job = unemployed:  
## : : :...poutcome = failure: yes (1)  
## : : poutcome in {other,unknown}: no (7)  
## : month = jul:  
## : :...day in {2,3,8,10,16}: yes (34/8)  
## : : day in {1,4,5,6,12,13,17,19,20,22,24,26,  
## : : : 27}: no (34/8)  
## : : day = 7:  
## : : :...age <= 39: yes (4)  
## : : : age > 39: no (3)  
## : : day = 9:  
## : : :...marital in {divorced,married}: yes (5/1)  
## : : : marital = single: no (4)  
## : : day = 11:  
## : : :...marital = divorced: yes (1)  
## : : : marital in {married,single}: no (4)  
## : : day = 14:  
## : : :...poutcome = other: yes (1)  
## : : : poutcome in {failure,unknown}: no (6)  
## : : day = 15:  
## : : :...education in {primary,tertiary}: yes (5)  
## : : : education in {secondary,unknown}: no (8/1)  
## : : day = 18:  
## : : :...loan = no: yes (7/1)  
## : : : loan = yes: no (4)  
## : : day = 21:  
## : : :...balance <= 636: no (3)  
## : : : balance > 636: yes (2)  
## : : day = 25:  
## : : :...age <= 38: yes (8/1)  
## : : : age > 38: no (4)  
## : : day = 28:  
## : : :...duration <= 745: yes (4)  
## : : : duration > 745: no (5/1)  
## : : day = 29:  
## : : :...loan = no: no (5/1)  
## : : : loan = yes: yes (2)  
## : : day = 30:  
## : : :...campaign <= 3: no (12/5)  
## : : : campaign > 3: yes (6/1)  
## : : day = 31:  
## : : :...balance <= 255: yes (4)  
## : : : balance > 255: no (7/1)  
## : : day = 23:  
## : : :...education in {primary,unknown}: no (0)  
## : : education = tertiary: yes (1)  
## : : education = secondary:  
## : : :...duration <= 742: no (7)  
## : : duration > 742: yes (4/1)  
## : month = may:  
## : :...default = yes: no (4)  
## : default = no:  
## : :...job in {housemaid,retired}: no (11/5)  
## : job in {entrepreneur,management,self-employed,  
## : : student,unknown}: yes (38/10)  
## : job = services:  
## : :...day in {1,2,3,4,5,6,7,9,10,11,13,14,15,16,17,  
## : : : 19,20,21,22,23,24,25,26,27,28,29,30,  
## : : : 31}: yes (12)  
## : : day in {8,12,18}: no (3)  
## : job = unemployed:  
## : :...marital = married: yes (2)  
## : : marital in {divorced,single}: no (3)  
## : job = admin.:  
## : :...education in {primary,unknown}: yes (1)  
## : : education = tertiary: no (1)  
## : : education = secondary:  
## : : :...duration <= 686: no (4/1)  
## : : duration > 686: yes (7)  
## : job = blue-collar:  
## : :...day in {4,5,8,15,18}: yes (19/4)  
## : : day in {1,2,3,6,7,9,10,11,16,17,19,20,21,22,23,  
## : : : 24,25,26,27,28,29,30,31}: no (11/2)  
## : : day = 12:  
## : : :...balance <= 257: yes (2)  
## : : : balance > 257: no (2)  
## : : day = 13:  
## : : :...poutcome = failure: yes (2)  
## : : : poutcome in {other,unknown}: no (9/2)  
## : : day = 14:  
## : : :...education in {primary,tertiary,  
## : : : unknown}: no (3)  
## : : education = secondary: yes (1)  
## : job = technician:  
## : :...previous > 1: no (6)  
## : previous <= 1:  
## : :...balance <= 261: yes (7/2)  
## : balance > 261:  
## : :...education in {primary,secondary,  
## : : unknown}: no (4)  
## : education = tertiary: yes (6/2)  
## duration <= 633:  
## :...month in {dec,mar,oct,sep}: yes (132/45)  
## month in {apr,aug,feb,jan,jul,jun,may,nov}:  
## :...pdays > 369: yes (26/5)  
## pdays <= 369:  
## :...contact = unknown:  
## :...default = no:  
## : :...month in {apr,aug}: yes (3)  
## : : month in {feb,jan,jul,jun,may,nov}: no (874/78)  
## : default = yes:  
## : :...marital in {divorced,married}: no (16/1)  
## : marital = single: yes (7/1)  
## contact in {cellular,telephone}:  
## :...age <= 25:  
## :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : retired,self-employed,services,technician,  
## : : unemployed,unknown}: no (43/10)  
## : job in {management,student}: yes (31/10)  
## age > 25:  
## :...month = jun: yes (50/16)  
## month = jan:  
## :...day in {11,18,26,28,29,30}: no (112/5)  
## : day in {1,2,3,4,5,6,7,8,9,10,12,13,14,15,16,17,  
## : 19,20,21,22,23,24,25,27,  
## : 31}: yes (8)  
## month in {apr,aug,feb,jul,may,nov}:  
## :...housing = no:  
## :...month in {apr,may}:  
## : :...day in {1,2,3,6,7,9,10,11,12,13,14,15,  
## : : : 17,18,19,23,24,28,29,  
## : : : 31}: no (49/13)  
## : : day in {5,8,16,20,21,25,27,  
## : : : 30}: yes (63/19)  
## : : day = 4:  
## : : :...marital in {divorced,  
## : : : : married}: yes (4)  
## : : : marital = single: no (1)  
## : : day = 22:  
## : : :...duration <= 558: yes (3)  
## : : : duration > 558: no (2)  
## : : day = 26:  
## : : :...age <= 33: yes (3)  
## : : age > 33: no (2)  
## : month in {aug,feb,jul,nov}:  
## : :...poutcome in {failure,  
## : : unknown}: no (737/173)  
## : poutcome = other:  
## : :...duration <= 470: yes (13/2)  
## : duration > 470:  
## : :...month = aug: yes (4/1)  
## : month in {feb,jul,  
## : nov}: no (14/1)  
## housing = yes:  
## :...month in {apr,aug,feb,jul}: no (530/71)  
## month in {may,nov}:  
## :...duration <= 600: no (402/85)  
## duration > 600:  
## :...campaign > 3: yes (5)  
## campaign <= 3: [S1]  
##   
## SubTree [S1]  
##   
## job in {entrepreneur,technician}: yes (10/1)  
## job in {housemaid,retired,self-employed,student,unemployed,  
## : unknown}: no (3)  
## job = admin.:  
## :...duration <= 610: yes (3)  
## : duration > 610: no (2)  
## job = blue-collar:  
## :...previous <= 1: yes (11/4)  
## : previous > 1: no (6)  
## job = management:  
## :...campaign <= 2: no (9/1)  
## : campaign > 2: yes (2)  
## job = services:  
## :...balance <= 176: yes (2)  
## balance > 176: no (2)  
##   
## ----- Trial 1: -----  
##   
## Decision tree:  
##   
## duration > 405:  
## :...duration <= 472:  
## : :...contact = unknown:  
## : : :...balance <= -361: yes (24.5/8.5)  
## : : : balance > -361: no (322.1/38.3)  
## : : contact in {cellular,telephone}:  
## : : :...campaign > 5: no (51.2/11.8)  
## : : campaign <= 5:  
## : : :...job in {admin.,retired,self-employed}: yes (289.9/132.1)  
## : : job in {entrepreneur,housemaid,services,student,unemployed,  
## : : : unknown}: no (222.1/81.2)  
## : : job = blue-collar:  
## : : :...marital = divorced: yes (11.1/3.1)  
## : : : marital in {married,single}:  
## : : : :...age <= 25: yes (18.9/6.2)  
## : : : age > 25: no (163.4/34.9)  
## : : job = technician:  
## : : :...pdays > 275: no (12.5/0.8)  
## : : : pdays <= 275:  
## : : : :...previous > 3: yes (20.5/3.1)  
## : : : previous <= 3:  
## : : : :...previous <= 1: yes (189.9/88.8)  
## : : : previous > 1: no (14.1/2.3)  
## : : job = management:  
## : : :...balance <= 46: no (31.8/0.8)  
## : : balance > 46:  
## : : :...age > 62: yes (13.5)  
## : : age <= 62:  
## : : :...month in {jul,jun,oct}: no (60/8.6)  
## : : month in {apr,aug,dec,feb,jan,mar,may,nov,sep}:  
## : : :...age <= 51: yes (147/55.7)  
## : : age > 51: no (27.4/4.6)  
## : duration > 472:  
## : :...default = yes:  
## : :...contact in {cellular,unknown}: yes (151.9/50.1)  
## : : contact = telephone: no (4)  
## : default = no:  
## : :...month in {oct,sep}:  
## : :...day in {1,3,5,6,7,8,9,11,12,13,14,15,16,17,18,19,23,24,25,27,  
## : : : 29,30}: no (232.8/54.9)  
## : : day in {2,4,10,20,21,22,26,28,31}: yes (48.6/11.1)  
## : month in {apr,dec,feb,jan,jul,may}:  
## : :...day in {1,2,7,9,13,18,21,24,26,27,28,30}:  
## : : :...previous > 5: no (39.1/13.8)  
## : : : previous <= 5:  
## : : : :...loan = yes:  
## : : : :...poutcome in {other,success}: no (10.2/0.8)  
## : : : : poutcome in {failure,unknown}:  
## : : : : :...age > 55: yes (11.8/0.8)  
## : : : : age <= 55:  
## : : : : :...marital in {divorced,  
## : : : : : single}: yes (122.4/48.8)  
## : : : : marital = married: no (99.1/33.2)  
## : : : loan = no:  
## : : : :...contact = telephone: yes (79.4/16.9)  
## : : : contact in {cellular,unknown}:  
## : : : :...marital in {divorced,single}:  
## : : : :...poutcome = failure: no (24.1/8.5)  
## : : : : poutcome in {other,  
## : : : : : success}: yes (52.4/22.9)  
## : : : : poutcome = unknown:  
## : : : : :...balance <= -11: no (32.9/11.8)  
## : : : : balance > -11: yes (616.2/181.1)  
## : : : marital = married:  
## : : : :...month = jan: no (28.8/6.3)  
## : : : month in {apr,dec,feb,jul,may}:  
## : : : :...poutcome in {failure,  
## : : : : other}: yes (69.4/18.6)  
## : : : poutcome = success: no (20.6/7.8)  
## : : : poutcome = unknown:  
## : : : :...campaign > 4: no (45.5/15.1)  
## : : : campaign <= 4:  
## : : : :...campaign > 2: yes (102.6/28.6)  
## : : : campaign <= 2:  
## : : : :...duration <= 537: no (66.9/15.1)  
## : : : duration > 537:  
## : : : :...age <= 55: yes (283.8/99.8)  
## : : : age > 55: no (18/1.5)  
## : : day in {3,4,5,6,8,10,11,12,14,15,16,17,19,20,22,23,25,29,31}:  
## : : :...age > 60: yes (68.4/17.2)  
## : : age <= 60:  
## : : :...duration > 839:  
## : : :...contact = telephone: no (26.5/11.7)  
## : : : contact = unknown:  
## : : : :...day in {5,6,8,14,23,29}: yes (85.7/27.1)  
## : : : : day in {3,4,10,11,12,15,16,17,19,20,22,25,  
## : : : : 31}: no (89.5/22.3)  
## : : : contact = cellular:  
## : : : :...poutcome in {failure,other}: no (118.4/32.3)  
## : : : poutcome = success: yes (27.7/13.5)  
## : : : poutcome = unknown:  
## : : : :...housing = no: no (180.2/46.9)  
## : : : housing = yes:  
## : : : :...job = unknown: no (0)  
## : : : job in {services,  
## : : : : student}: yes (18.6/1.5)  
## : : : job in {admin.,blue-collar,  
## : : : : entrepreneur,housemaid,  
## : : : : management,retired,  
## : : : : self-employed,technician,  
## : : : : unemployed}:  
## : : : :...duration > 1410: yes (17.2/4)  
## : : : duration <= 1410:  
## : : : :...balance <= 3463: no (240.5/60.2)  
## : : : balance > 3463: yes (15.7/5.5)  
## : : duration <= 839:  
## : : :...day in {11,20}: no (119.7/24.5)  
## : : day in {3,4,5,6,8,10,12,14,15,16,17,19,22,23,25,29,  
## : : : 31}:  
## : : :...duration <= 527:  
## : : :...previous > 3: yes (31.5/8.5)  
## : : : previous <= 3:  
## : : : :...balance > 2516: no (29.4)  
## : : : balance <= 2516:  
## : : : :...education = unknown: yes (16.6/4.6)  
## : : : education in {primary,secondary,  
## : : : : tertiary}:  
## : : : :...balance > 1640: yes (38/11.7)  
## : : : balance <= 1640:  
## : : : :...month = apr: yes (21.2/7.7)  
## : : : month in {dec,feb,jan,jul,  
## : : : may}: no (182.3/39.8)  
## : : duration > 527:  
## : : :...duration > 800: yes (103/25.5)  
## : : duration <= 800:  
## : : :...marital = married:  
## : : :...month in {apr,dec,feb,  
## : : : : jan}: no (140.9/60.4)  
## : : : month = jul:  
## : : : :...day in {3,4,10,12,15,16,17,19,  
## : : : : : 22,25,29,  
## : : : : : 31}: yes (138.9/66.5)  
## : : : : day in {5,6,8,14,  
## : : : : 23}: no (38.3/2.3)  
## : : : month = may: [S1]  
## : : marital in {divorced,single}:  
## : : :...job = unknown: yes (0)  
## : : job in {blue-collar,management,  
## : : : retired,self-employed,  
## : : : student,unemployed}:  
## : : :...month in {apr,feb,jul,  
## : : : : may}: yes (263.6/75.8)  
## : : : month in {dec,  
## : : : jan}: no (10.2/1.5)  
## : : job in {admin.,entrepreneur,  
## : : : housemaid,services,  
## : : : technician}:  
## : : :...age > 47: no (22.5/1.5)  
## : : age <= 47: [S2]  
## : month in {aug,jun,mar,nov}:  
## : :...age <= 24: no (40.4/11.1)  
## : age > 24:  
## : :...balance <= -140: no (56.4/15.7)  
## : balance > -140:  
## : :...marital = divorced:  
## : :...day in {2,8,10,11,12,17,18,19,22,23,26,29,  
## : : : 31}: no (93.8/43.4)  
## : : day in {1,3,4,5,6,7,9,13,14,15,16,20,21,24,25,27,  
## : : 28,30}: yes (183.8/22.3)  
## : marital in {married,single}:  
## : :...age <= 35:  
## : :...housing = yes: yes (289.4/82.6)  
## : : housing = no:  
## : : :...pdays > 158: yes (18.1/1.5)  
## : : pdays <= 158:  
## : : :...age <= 27: no (22.9/5.4)  
## : : age > 27: yes (309.6/114)  
## : age > 35:  
## : :...job in {housemaid,services}: no (140.7/48.1)  
## : job in {admin.,blue-collar,entrepreneur,  
## : : management,retired,self-employed,  
## : : student,technician,unemployed,unknown}:  
## : :...marital = single:  
## : :...balance <= 234: no (24.8/6.2)  
## : : balance > 234:  
## : : :...pdays <= 97: yes (146.9/35.7)  
## : : pdays > 97: no (7.8/1.5)  
## : marital = married:  
## : :...campaign > 7: no (28.1/7.8)  
## : campaign <= 7:  
## : :...education in {secondary,unknown}:  
## : :...day = 29: yes (0)  
## : : day in {1,3,4,6,8,13,14,15,18,  
## : : : 19,20,24,25,26,27,  
## : : : 31}: no (212.5/62.3)  
## : : day in {2,5,7,9,10,11,12,16,17,  
## : : : 21,22,23,28,30}: [S3]  
## : education in {primary,tertiary}:  
## : :...campaign > 5: yes (42.8/8.5)  
## : campaign <= 5: [S4]  
## duration <= 405:  
## :...age > 60:  
## :...campaign > 5: no (25.7/2.3)  
## : campaign <= 5:  
## : :...contact = unknown: no (10.8)  
## : contact in {cellular,telephone}:  
## : :...duration <= 126:  
## : :...day in {1,2,3,5,6,7,8,9,12,14,16,18,19,20,23,24,26,28,30,  
## : : : 31}: no (70.8)  
## : : day in {4,10,11,13,15,17,21,22,25,27,29}: yes (103/43.1)  
## : duration > 126:  
## : :...duration > 315:  
## : :...duration <= 321: no (25.5)  
## : : duration > 321:  
## : : :...previous <= 1: no (123/36.9)  
## : : previous > 1: yes (60.9/16.6)  
## : duration <= 315:  
## : :...pdays <= 91: yes (558.4/118.5)  
## : pdays > 91:  
## : :...housing = yes: yes (18.9/2.3)  
## : housing = no:  
## : :...balance <= 4381: yes (171.2/73.1)  
## : balance > 4381: no (33.1/5.5)  
## age <= 60:  
## :...contact = unknown: no (6788.5/123)  
## contact in {cellular,telephone}:  
## :...poutcome = success:  
## :...duration <= 158:  
## : :...month in {jan,may}: no (39.5/8)  
## : : month in {apr,aug,dec,feb,jul,jun,mar,nov,oct,sep}:  
## : : :...duration > 125: yes (206.1/26.2)  
## : : duration <= 125:  
## : : :...contact = telephone: no (3.1)  
## : : contact = cellular:  
## : : :...day in {1,2,3,4,5,6,8,9,11,12,15,16,20,22,25,  
## : : : 27,29,30,31}: yes (155/43.1)  
## : : day in {7,10,13,14,17,18,19,21,23,24,26,  
## : : 28}: no (23.1)  
## : duration > 158:  
## : :...age <= 25: yes (39.8/12)  
## : age > 25:  
## : :...pdays > 185: no (217/64.6)  
## : pdays <= 185:  
## : :...day in {11,17,23,24,31}: yes (36.5)  
## : day in {1,2,3,4,5,6,7,8,9,10,12,13,14,15,16,18,19,  
## : : 20,21,22,25,26,27,28,29,30}:  
## : :...month = mar: yes (13.2)  
## : month in {apr,aug,dec,feb,jan,jul,jun,may,nov,  
## : : oct,sep}:  
## : :...marital in {divorced,  
## : : single}: no (262.7/83.2)  
## : marital = married:  
## : :...pdays <= 86: no (54.6/10.8)  
## : pdays > 86: yes (147.4/52.6)  
## poutcome in {failure,other,unknown}:  
## :...duration <= 94: no (4271.4/132.5)  
## duration > 94:  
## :...month in {mar,oct,sep}:  
## :...contact = telephone: no (99.4/27.8)  
## : contact = cellular:  
## : :...balance > 10469: no (28.3/6.3)  
## : balance <= 10469:  
## : :...loan = yes: no (46.3/18.3)  
## : loan = no:  
## : :...duration <= 213:  
## : :...day in {1,2,3,4,5,6,8,9,10,11,12,15,16,  
## : : : 17,18,19,20,21,22,23,24,25,26,  
## : : : 27,29,31}: yes (441.1/104.8)  
## : : day in {7,13,14,28,30}: no (22.3/1.5)  
## : duration > 213:  
## : :...age > 55: yes (18.8/2.3)  
## : age <= 55:  
## : :...age > 50: no (18.9/2.3)  
## : age <= 50:  
## : :...campaign > 2: yes (33.7/7.8)  
## : campaign <= 2:  
## : :...previous > 3: no (30.6/6.9)  
## : previous <= 3:  
## : :...housing = no: yes (127.2/58.3)  
## : housing = yes: no (48.8/17.1)  
## month in {apr,dec,feb,jun}:  
## :...balance <= -116: no (67.8/0.8)  
## : balance > -116:  
## : :...housing = yes:  
## : :...day in {1,2,4,5,6,7,12,16,17,19,20,28,  
## : : : 31}: no (971.6/97)  
## : : day in {3,8,9,10,11,13,14,15,18,21,22,23,24,25,  
## : : : 26,27,29,30}:  
## : : :...duration > 314: yes (102.6/32.5)  
## : : duration <= 314:  
## : : :...previous > 6: yes (34/12.5)  
## : : previous <= 6:  
## : : :...job in {entrepreneur,housemaid,  
## : : : retired,self-employed,  
## : : : services,  
## : : : unknown}: no (52.6/0.8)  
## : : job in {admin.,blue-collar,  
## : : : management,student,  
## : : : technician,unemployed}:  
## : : :...campaign > 2: no (95.1/15.1)  
## : : campaign <= 2:  
## : : :...balance > 4798: no (15.7)  
## : : balance <= 4798:  
## : : :...balance <= 2046: no (177.5/63.7)  
## : : balance > 2046: yes (44.9/11.5)  
## : housing = no:  
## : :...month in {apr,dec}:  
## : :...contact = telephone: no (29.7/3.8)  
## : : contact = cellular:  
## : : :...day in {25,31}: yes (0)  
## : : day in {1,10,12,13,18,24,  
## : : : 30}: no (184.4/42)  
## : : day in {2,3,4,5,6,7,8,9,11,14,15,16,17,  
## : : : 19,20,21,22,23,26,27,28,29}:  
## : : :...poutcome in {failure,  
## : : : other}: no (70.3/22.1)  
## : : poutcome = unknown: yes (403.5/106.3)  
## : month in {feb,jun}:  
## : :...campaign > 5: yes (67.1/24)  
## : campaign <= 5:  
## : :...job in {housemaid,services,unemployed,  
## : : unknown}: no (197.3/21.1)  
## : job in {admin.,blue-collar,  
## : : entrepreneur,management,  
## : : retired,self-employed,student,  
## : : technician}:  
## : :...loan = yes: no (84.4/15.8)  
## : loan = no:  
## : :...education in {primary,  
## : : secondary}:  
## : :...day in {1,2,3,4,5,6,7,8,9,  
## : : : 11,12,13,14,15,16,  
## : : : 18,19,20,21,22,23,  
## : : : 24,25,26,27,28,29,  
## : : : 30,  
## : : : 31}: no (369.8/85.2)  
## : : day in {10,  
## : : 17}: yes (15.8)  
## : education in {tertiary,unknown}:  
## : :...month = jun: [S5]  
## : month = feb:  
## : :...duration <= 118: no (20.8/0.8)  
## : duration > 118: [S6]  
## month in {aug,jan,jul,may,nov}:  
## :...job = student:  
## :...age > 30: no (29.4/0.8)  
## : age <= 30:  
## : :...loan = yes: no (3.1)  
## : loan = no:  
## : :...housing = yes: no (25.5/4)  
## : housing = no:  
## : :...day in {1,2,4,6,7,11,22,23,25,26,27,28,  
## : : 29,30}: no (64.6/20)  
## : day in {3,5,8,9,10,12,13,14,15,16,17,  
## : 18,19,20,21,24,  
## : 31}: yes (150.2/21.5)  
## job in {admin.,blue-collar,entrepreneur,housemaid,  
## : management,retired,self-employed,services,  
## : technician,unemployed,unknown}:  
## :...duration <= 171:  
## :...poutcome = unknown: no (3087.5/112.7)  
## : poutcome in {failure,other}:  
## : :...pdays <= 104: yes (142.3/62.3)  
## : pdays > 104: no (597.1/41.5)  
## duration > 171:  
## :...balance <= 65: no (1354.4/118.2)  
## balance > 65:  
## :...housing = yes:  
## :...age > 59: yes (25.2/8.5)  
## : age <= 59:  
## : :...month in {jan,jul,may,  
## : : nov}: no (1733.5/194.8)  
## : month = aug:  
## : :...pdays <= 89: no (158/28)  
## : pdays > 89: yes (58.7/10.2)  
## housing = no:  
## :...month = may:  
## :...day in {1,2,3,9,10,16,19,23,29,  
## : : 30}: yes (0)  
## : day in {11,14,15,17,18,24,28,  
## : : 31}: no (26.2)  
## : day in {4,5,6,7,8,12,13,20,21,22,  
## : : 25,26,27}:  
## : :...pdays > 283: no (14.8/4)  
## : pdays <= 283:  
## : :...age <= 54: yes (210.1/46.2)  
## : age > 54: no (14/4)  
## month in {aug,jan,jul,nov}:  
## :...poutcome in {failure,other}: [S7]  
## poutcome = unknown:  
## :...age <= 25: yes (38/9.2)  
## age > 25:  
## :...loan = yes: no (238/8.8)  
## loan = no:  
## :...duration <= 313: [S8]  
## duration > 313: [S9]  
##   
## SubTree [S1]  
##   
## education in {primary,unknown}: no (75.8/22.9)  
## education in {secondary,tertiary}: yes (208.9/89.2)  
##   
## SubTree [S2]  
##   
## contact in {telephone,unknown}: no (37.4/12)  
## contact = cellular:  
## :...balance <= 696: yes (99/31.1)  
## balance > 696: no (66.4/21.2)  
##   
## SubTree [S3]  
##   
## poutcome in {failure,success,unknown}: yes (227.2/64.5)  
## poutcome = other: no (11.8/2.3)  
##   
## SubTree [S4]  
##   
## poutcome in {failure,other}: yes (44.8/14)  
## poutcome = success: no (13.4/5.4)  
## poutcome = unknown:  
## :...balance <= 1: no (31.8/8.6)  
## balance > 1: yes (374.6/136)  
##   
## SubTree [S5]  
##   
## previous <= 1: no (202.4/59.5)  
## previous > 1: yes (36.3/13.4)  
##   
## SubTree [S6]  
##   
## previous > 1: no (37.1/11.8)  
## previous <= 1:  
## :...balance <= 3154: no (144/65.2)  
## balance > 3154: yes (41.4/3.1)  
##   
## SubTree [S7]  
##   
## education in {primary,secondary}: no (139.5/57.4)  
## education in {tertiary,unknown}: yes (174.2/48.1)  
##   
## SubTree [S8]  
##   
## day in {1,4,15,22,23,26,27,29,30,31}: no (192.5)  
## day in {2,3,5,6,7,8,9,10,11,12,13,14,16,17,18,19,20,21,24,25,28}:  
## :...campaign > 1: no (522.9/90.3)  
## campaign <= 1:  
## :...job in {entrepreneur,retired,self-employed,unknown}: no (27.1)  
## job in {admin.,blue-collar,housemaid,management,services,technician,  
## : unemployed}:  
## :...contact = telephone: yes (24.6/4.6)  
## contact = cellular:  
## :...day in {2,6,10,18,19,20,21,24,28}: no (92.4/13.5)  
## day in {3,5,7,8,9,11,12,13,14,16,17,25}: yes (121.2/46.9)  
##   
## SubTree [S9]  
##   
## day in {1,9,10,11,23,27,29,30}: no (50)  
## day in {2,3,4,5,6,7,8,12,13,14,15,16,17,18,19,20,21,22,24,25,26,28,31}:  
## :...job in {blue-collar,entrepreneur,unknown}: no (38.6/4.8)  
## job in {admin.,housemaid,management,retired,self-employed,services,  
## : technician,unemployed}:  
## :...marital = divorced: yes (63.4/15.4)  
## marital in {married,single}:  
## :...campaign <= 1: yes (87.2/36.2)  
## campaign > 1:  
## :...day in {2,4,5,16,17,19,24,26,28}: no (32.3)  
## day in {3,6,7,8,12,13,14,15,18,20,21,22,25,31}:  
## :...balance <= 897: no (61.5/20)  
## balance > 897: yes (95.4/34.6)  
##   
## ----- Trial 2: -----  
##   
## Decision tree:  
##   
## duration <= 124:  
## :...poutcome in {failure,other,unknown}:  
## : :...month in {aug,jan,jul,jun,may,nov}:  
## : : :...pdays <= 390: no (6312.8/174.1)  
## : : : pdays > 390: yes (33.2/11.6)  
## : : month in {apr,dec,feb,mar,oct,sep}:  
## : : :...duration <= 60: no (340.4/8.6)  
## : : duration > 60:  
## : : :...month in {apr,dec,feb,oct,sep}:  
## : : :...day in {2,3,4,6,28,30,31}: no (249.9/6.4)  
## : : : day in {1,5,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,  
## : : : : 23,24,25,26,27,29}:  
## : : : :...marital = married: no (400.1/99.5)  
## : : : marital in {divorced,single}:  
## : : : :...education = unknown: no (11)  
## : : : education in {primary,secondary,tertiary}:  
## : : : :...day in {1,5,7,10,12,14,15,17,19,  
## : : : : 25}: no (94.7/14.9)  
## : : : day in {8,9,11,13,16,18,20,21,22,23,24,26,27,  
## : : : 29}: yes (241.4/103.1)  
## : : month = mar:  
## : : :...previous > 2: no (10.1)  
## : : previous <= 2:  
## : : :...education = unknown: no (9.3)  
## : : education in {primary,secondary,tertiary}:  
## : : :...contact = telephone: no (2.4)  
## : : contact = unknown: yes (4.3)  
## : : contact = cellular:  
## : : :...day in {1,2,3,5,6,7,8,9,10,11,12,14,17,18,19,  
## : : : 21,22,25,27,28,29,31}: yes (135.9/37.5)  
## : : day in {4,13,15,16,20,23,24,26,  
## : : 30}: no (19.4)  
## : poutcome = success:  
## : :...contact = telephone: no (5.8)  
## : contact = unknown: yes (15.1/4.3)  
## : contact = cellular:  
## : :...month in {jan,jul,may}: no (27.9)  
## : month in {apr,aug,dec,feb,jun,mar,nov,oct,sep}:  
## : :...loan = yes: no (23.5/3.2)  
## : loan = no:  
## : :...pdays <= 67: yes (14.9/2.2)  
## : pdays > 67:  
## : :...pdays <= 84: no (13.6)  
## : pdays > 84:  
## : :...job in {admin.,entrepreneur,housemaid,unemployed,  
## : : unknown}: no (28.5/3.2)  
## : job in {blue-collar,management,retired,  
## : : self-employed,services,student,technician}:  
## : :...month in {apr,aug,oct}: no (65.9/19.1)  
## : month in {dec,feb,jun,mar,nov,  
## : sep}: yes (97.2/30.5)  
## duration > 124:  
## :...poutcome = success:  
## :...job in {blue-collar,management,self-employed,services,unemployed}:  
## : :...duration > 634: yes (72.9/8.6)  
## : : duration <= 634:  
## : : :...month in {jan,may,nov}:  
## : : :...campaign > 4: no (12.5/0.6)  
## : : : campaign <= 4:  
## : : : :...marital = divorced: no (29.2/6.2)  
## : : : marital in {married,single}:  
## : : : :...balance <= 5380: yes (168.2/63.7)  
## : : : balance > 5380: no (17.4/1.2)  
## : : month in {apr,aug,dec,feb,jul,jun,mar,oct,sep}:  
## : : :...day in {2,9,11,12,13,16,18,19,21,23,24,25,26,28,  
## : : : 31}: yes (184.3/9.4)  
## : : day in {1,3,4,5,6,7,8,10,14,15,17,20,22,27,29,30}:  
## : : :...contact = unknown: yes (0)  
## : : contact = telephone: no (12.8/4.3)  
## : : contact = cellular:  
## : : :...campaign > 2: yes (49.9/9.7)  
## : : campaign <= 2:  
## : : :...loan = yes: yes (18.9/3.8)  
## : : loan = no:  
## : : :...marital = divorced: yes (26/3.2)  
## : : marital in {married,single}:  
## : : :...age <= 49: yes (240.9/94.8)  
## : : age > 49: no (47.7/13.5)  
## : job in {admin.,entrepreneur,housemaid,retired,student,technician,  
## : : unknown}:  
## : :...contact = telephone: no (103/44.5)  
## : contact = unknown: yes (2.2)  
## : contact = cellular:  
## : :...job = entrepreneur: no (34.6/4.6)  
## : job in {admin.,housemaid,retired,student,technician,unknown}:  
## : :...pdays > 366: yes (43.9/5.9)  
## : pdays <= 366:  
## : :...previous > 7: yes (29.4/6.6)  
## : previous <= 7:  
## : :...marital = divorced: yes (63.8/21.4)  
## : marital = married:  
## : :...education = unknown: no (31.9/6.2)  
## : : education in {primary,secondary,tertiary}:  
## : : :...month in {apr,aug,jan,jul,jun,mar,may,nov,  
## : : : oct,sep}: no (332.5/143.1)  
## : : month in {dec,feb}: yes (47.9/8.1)  
## : marital = single:  
## : :...job in {housemaid,retired,  
## : : unknown}: yes (18.1)  
## : job in {admin.,student,technician}:  
## : :...day in {1,9,10,11,17,21,22,23,28,  
## : : 31}: yes (52.8/0.6)  
## : day in {2,3,4,5,6,7,8,12,13,14,15,16,18,19,  
## : : 20,24,25,26,27,29,30}:  
## : :...loan = yes: no (5.9)  
## : loan = no:  
## : :...duration <= 168: no (44.5/5.4)  
## : duration > 168:  
## : :...campaign > 3: yes (10.5)  
## : campaign <= 3:  
## : :...age <= 23: yes (8.9)  
## : age > 23: [S1]  
## poutcome in {failure,other,unknown}:  
## :...duration <= 364:  
## :...contact = unknown:  
## : :...month in {apr,aug,feb,mar,nov,oct,sep}: yes (74.7/11)  
## : : month in {dec,jan,jul,jun,may}: no (3056.9/21.6)  
## : contact in {cellular,telephone}:  
## : :...default = yes: no (121.4/4.3)  
## : default = no:  
## : :...month in {apr,dec,feb,jun,mar,oct,sep}:  
## : :...housing = yes:  
## : : :...day in {10,11,18,21,22,23,24,27,29,30,31}:  
## : : : :...poutcome in {failure,unknown}: yes (216.5/68.1)  
## : : : : poutcome = other: no (32.2/10.9)  
## : : : day in {1,2,3,4,5,6,7,8,9,12,13,14,15,16,17,19,20,  
## : : : : 25,26,28}:  
## : : : :...pdays > 348: yes (25.5/9.2)  
## : : : pdays <= 348:  
## : : : :...month in {apr,dec,feb,jun,oct,  
## : : : : sep}: no (1051.2/217.6)  
## : : : month = mar: yes (46.3/16.4)  
## : : housing = no:  
## : : :...campaign > 4:  
## : : :...age <= 25: yes (18.7/2.8)  
## : : : age > 25:  
## : : : :...loan = yes: no (14.5)  
## : : : loan = no:  
## : : : :...poutcome in {failure,  
## : : : : unknown}: no (151.3/39.7)  
## : : : poutcome = other: yes (15.7/3.4)  
## : : campaign <= 4:  
## : : :...poutcome = failure:  
## : : :...day in {1,2,5,6,7,8,10,11,12,17,18,19,20,  
## : : : : 21,22,23,24,25,28,29,  
## : : : : 30}: no (263.1/56.1)  
## : : : day in {3,4,9,13,14,15,16,26,27,  
## : : : 31}: yes (186.3/61.6)  
## : : poutcome in {other,unknown}:  
## : : :...balance <= 30:  
## : : :...day in {1,2,3,4,5,6,7,8,9,10,11,12,13,  
## : : : : 15,18,19,22,23,24,26,  
## : : : : 31}: no (124.6/18.9)  
## : : : day in {14,16,17,20,21,25,27,28,29,  
## : : : 30}: yes (79/27.1)  
## : : balance > 30:  
## : : :...balance <= 329:  
## : : :...poutcome = other: yes (22.9/1.8)  
## : : : poutcome = unknown:  
## : : : :...month in {apr,feb,jun,mar,  
## : : : : oct}: yes (394.5/141.8)  
## : : : month in {dec,  
## : : : sep}: no (39.2/13.1)  
## : : balance > 329:  
## : : :...loan = yes: no (35.7/10.9)  
## : : loan = no:  
## : : :...contact = telephone:  
## : : :...day in {1,2,4,6,7,9,10,13,  
## : : : : 16,18,19,21,24,25,  
## : : : : 29,  
## : : : : 31}: no (55.9)  
## : : : day in {3,5,8,11,12,14,15,  
## : : : 17,20,22,23,26,27,  
## : : : 28,  
## : : : 30}: yes (142.3/59.6)  
## : : contact = cellular: [S2]  
## : month in {aug,jan,jul,may,nov}:  
## : :...age <= 27:  
## : :...month in {aug,nov}:  
## : : :...loan = yes: no (4)  
## : : : loan = no:  
## : : : :...balance <= 63: no (24.4/8.6)  
## : : : balance > 63: yes (134.9/29.6)  
## : : month in {jan,jul,may}:  
## : : :...day in {7,10,11,17,19,20,21,22,27,28,  
## : : : 31}: no (73.5)  
## : : day in {1,2,3,4,5,6,8,9,12,13,14,15,16,18,23,  
## : : : 24,25,26,29,30}:  
## : : :...housing = yes: no (140.3/29.1)  
## : : housing = no:  
## : : :...duration > 315: yes (30.3/3.7)  
## : : duration <= 315:  
## : : :...day in {1,2,3,5,8,12,13,14,16,24,  
## : : : 25,26,29}: yes (131.2/59.3)  
## : : day in {4,6,9,15,18,23,  
## : : 30}: no (32.6)  
## : age > 27:  
## : :...age > 60:  
## : :...balance > 5705: no (26.8)  
## : : balance <= 5705:  
## : : :...day in {1,2,4,5,7,8,9,10,11,12,18,19,22,23,  
## : : : 25,27,28,31}: no (194.1/49.4)  
## : : day in {3,6,13,14,15,16,17,20,21,24,26,29,  
## : : 30}: yes (144.8/40)  
## : age <= 60:  
## : :...previous > 1:  
## : :...month in {jan,may,nov}:  
## : : :...day in {1,2,3,4,5,6,7,8,11,12,13,14,15,  
## : : : : 17,18,19,20,21,22,23,24,25,28,  
## : : : : 29,30,31}: no (658.1/95.8)  
## : : : day in {9,10,16,26,  
## : : : 27}: yes (73.4/19.8)  
## : : month in {aug,jul}:  
## : : :...loan = yes: no (12.4/3.2)  
## : : loan = no:  
## : : :...day in {1,24,25,  
## : : : 27}: yes (0)  
## : : day in {2,9,13,14,16,17,26,  
## : : : 30}: no (53.1/11.4)  
## : : day in {3,4,5,6,7,8,10,11,12,15,18,  
## : : : 19,20,21,22,23,28,29,31}:  
## : : :...pdays <= 474: yes (223.4/49.8)  
## : : pdays > 474: no (12/1.2)  
## : previous <= 1:  
## : :...loan = yes:  
## : :...day in {3,6,8,9,10,11,13,14,15,17,18,  
## : : : 19,20,21,22,23,24,25,26,28,29,  
## : : : 30}: no (615.1)  
## : : day in {1,2,4,5,7,12,16,27,31}:  
## : : :...month in {aug,jan,jul,  
## : : : may}: no (172.8/36.5)  
## : : month = nov: yes (7.6)  
## : loan = no:  
## : :...duration <= 214:  
## : :...campaign > 2: no (738.3/30.1)  
## : : campaign <= 2:  
## : : :...day in {3,  
## : : : 27}: yes (33.8/8.9)  
## : : day in {1,4,6,16,17,21,23,24,  
## : : : 26,30,  
## : : : 31}: no (316.8)  
## : : day in {2,5,7,8,9,10,11,12,13,  
## : : : 14,15,18,19,20,22,25,  
## : : : 28,29}:  
## : : :...balance > 6718: no (70.6/32)  
## : : balance <= 6718:  
## : : :...housing = no: no (520.5/109.6)  
## : : housing = yes: [S3]  
## : duration > 214:  
## : :...education = primary: no (244.9/23.5)  
## : education = unknown: yes (84.7/42.3)  
## : education in {secondary,tertiary}:  
## : :...day in {1,8,9,10,11,14,17,19,  
## : : 20,21,22,23,24,26,28,  
## : : 29,  
## : : 30}: no (944.6/152.2)  
## : day in {2,3,4,5,6,7,12,13,15,  
## : : 16,18,25,27,31}:  
## : :...month = jan: yes (17.3/4.6)  
## : month in {aug,jul,may,nov}:  
## : :...age <= 29: yes (68/27.2)  
## : age > 29:  
## : :...campaign <= 1: [S4]  
## : campaign > 1: [S5]  
## duration > 364:  
## :...pdays > 411: yes (67.8/15.5)  
## pdays <= 411:  
## :...duration > 647:  
## :...marital = single:  
## : :...education = unknown: no (67.2/21)  
## : : education in {primary,secondary,tertiary}:  
## : : :...campaign > 6: no (68.3/23.1)  
## : : campaign <= 6:  
## : : :...job in {admin.,entrepreneur,housemaid,retired,  
## : : : self-employed,services,student,  
## : : : unknown}: yes (418/168.2)  
## : : job = unemployed: no (77.2/29.8)  
## : : job = technician:  
## : : :...pdays > 155: no (25.3/2.8)  
## : : : pdays <= 155:  
## : : : :...loan = no: yes (233.9/94.5)  
## : : : loan = yes: no (32.5/11.8)  
## : : job = management:  
## : : :...duration <= 684: no (26.5/4.4)  
## : : : duration > 684:  
## : : : :...age <= 27: yes (22.9/0.6)  
## : : : age > 27:  
## : : : :...day in {1,2,3,4,5,6,7,8,10,11,12,  
## : : : : 13,15,16,18,19,20,21,22,25,  
## : : : : 26,27,29,30,  
## : : : : 31}: yes (171.1/58.5)  
## : : : day in {9,14,17,23,24,  
## : : : 28}: no (43.5/2.4)  
## : : job = blue-collar:  
## : : :...month in {mar,sep}: no (0)  
## : : month in {aug,dec,feb,jan,  
## : : : oct}: yes (13.1)  
## : : month in {apr,jul,jun,may,nov}:  
## : : :...loan = yes: yes (41.6/13)  
## : : loan = no:  
## : : :...balance <= -10: yes (24.9/3.4)  
## : : balance > -10:  
## : : :...age <= 23: no (12.9)  
## : : age > 23:  
## : : :...duration > 1812: no (13.5/0.6)  
## : : duration <= 1812: [S6]  
## : marital = married:  
## : :...loan = yes:  
## : : :...month in {dec,oct,sep}: yes (0)  
## : : : month = feb: no (11.4)  
## : : : month in {apr,aug,jan,jul,jun,mar,may,nov}:  
## : : : :...poutcome = other: yes (14.7/1.8)  
## : : : poutcome in {failure,unknown}:  
## : : : :...duration <= 806: no (119.4/45.9)  
## : : : duration > 806: yes (225.7/76.6)  
## : : loan = no:  
## : : :...contact = telephone:  
## : : :...default = yes: no (3.2)  
## : : : default = no:  
## : : : :...job in {admin.,blue-collar,entrepreneur,  
## : : : : housemaid,management,retired,  
## : : : : services,student,unemployed,  
## : : : : unknown}: yes (150.7/50.8)  
## : : : job in {self-employed,  
## : : : technician}: no (19.7/0.6)  
## : : contact in {cellular,unknown}:  
## : : :...age > 40:  
## : : :...age > 65: no (64.9/16.7)  
## : : : age <= 65:  
## : : : :...education = secondary:  
## : : : :...campaign <= 1:  
## : : : : :...month in {apr,aug,dec,jan,jun,  
## : : : : : : mar,may,nov,oct,  
## : : : : : : sep}: yes (167.7/41.7)  
## : : : : : month in {feb,  
## : : : : : jul}: no (27.2/8.3)  
## : : : : campaign > 1:  
## : : : : :...default = yes: no (2.2)  
## : : : : default = no: [S7]  
## : : : education in {primary,tertiary,unknown}:  
## : : : :...day in {1,4,8,9,10,12,16,21,24,  
## : : : : 26}: no (114.8/13.6)  
## : : : day in {2,3,5,6,7,11,13,14,15,17,  
## : : : : 18,19,20,22,23,25,27,28,29,  
## : : : : 30,31}:  
## : : : :...poutcome = other: yes (24.2/4.3)  
## : : : poutcome in {failure,unknown}:  
## : : : :...duration <= 713: yes (111.2/36.8)  
## : : : duration > 713:  
## : : : :...pdays > 172: no (16.8)  
## : : : pdays <= 172: [S8]  
## : : age <= 40:  
## : : :...pdays > 183: yes (58.7/21.1)  
## : : pdays <= 183:  
## : : :...duration > 1792: no (29.6/1.2)  
## : : duration <= 1792:  
## : : :...month = dec: no (0)  
## : : month in {feb,mar,  
## : : : sep}: yes (28.5/5.2)  
## : : month in {apr,aug,jan,jul,jun,may,  
## : : : nov,oct}: [S9]  
## : marital = divorced:  
## : :...poutcome = other: no (19.5/5.5)  
## : poutcome in {failure,unknown}:  
## : :...campaign > 5: yes (33.9/7.1)  
## : campaign <= 5:  
## : :...age > 58: yes (44.3/8.2)  
## : age <= 58:  
## : :...age > 52: no (103.7/40.1)  
## : age <= 52:  
## : :...default = yes: no (7.7/1.2)  
## : default = no:  
## : :...month in {aug,dec,jun,mar,oct,  
## : : sep}: yes (58.4/5.5)  
## : month in {apr,feb,jan,jul,may,nov}:  
## : :...balance <= -147: yes (17.2)  
## : balance > -147: [S10]  
## duration <= 647:  
## :...contact = unknown:  
## :...month in {apr,aug,feb,mar}: yes (13.7)  
## : month in {dec,jan,jul,may,nov,oct,  
## : : sep}: no (929.8/174.8)  
## : month = jun:  
## : :...housing = no:  
## : :...balance > 1790: no (94.2/3.2)  
## : : balance <= 1790:  
## : : :...balance <= 1434: no (167.2/43.1)  
## : : balance > 1434: yes (10.8/1.2)  
## : housing = yes:  
## : :...day in {1,3,7,8,10,11,13,14,15,21,22,23,25,27,  
## : : 28,29,30,31}: no (49/0.6)  
## : day in {2,4,5,6,9,12,16,17,18,19,20,24,26}:  
## : :...loan = yes: no (35.3/8.6)  
## : loan = no:  
## : :...marital = married: no (98.7/39.4)  
## : marital in {divorced,  
## : single}: yes (115.9/43)  
## contact in {cellular,telephone}:  
## :...default = yes: yes (85.5/36.6)  
## default = no:  
## :...age > 59:  
## :...loan = yes: no (9.3/0.6)  
## : loan = no:  
## : :...marital = single: no (9.3/0.6)  
## : marital in {divorced,married}:  
## : :...job = student: yes (0)  
## : job in {admin.,services,  
## : : unknown}: no (22/2.2)  
## : job in {blue-collar,entrepreneur,  
## : : housemaid,management,retired,  
## : : self-employed,technician,  
## : : unemployed}:  
## : :...duration <= 417: yes (126.5/27.4)  
## : duration > 417:  
## : :...housing = yes: yes (11.9/2.8)  
## : housing = no: [S11]  
## age <= 59:  
## :...day in {1,7,17,19,20,22,23,24,29,  
## : 31}: no (1397/390.9)  
## day in {2,3,4,5,6,8,9,10,11,12,13,14,15,16,18,  
## : 21,25,26,27,28,30}:  
## :...loan = yes:  
## :...marital = divorced: no (39.5/0.6)  
## : marital in {married,single}:  
## : :...day in {2,4,10,12,14,16,26,  
## : : 27}: no (109.2/7.6)  
## : day in {3,5,6,8,9,11,13,15,18,21,  
## : : 25,28,30}:  
## : :...month in {apr,aug,may,  
## : : oct}: yes (139.8/57.2)  
## : month in {dec,feb,jan,jul,jun,  
## : mar,nov,  
## : sep}: no (167/47.8)  
## loan = no:  
## :...pdays > 334: no (137.9/31)  
## pdays <= 334:  
## :...campaign > 4:  
## :...job in {housemaid,services,  
## : : student,  
## : : unknown}: no (18)  
## : job in {admin.,blue-collar,  
## : : entrepreneur,  
## : : management,retired,  
## : : self-employed,  
## : : technician,unemployed}: [S12]  
## campaign <= 4:  
## :...campaign > 1:  
## :...housing = no:  
## : :...day in {3,4,5,6,10,13,  
## : : : 14,21,25,26,27,  
## : : : 30}: [S13]  
## : : day in {2,8,9,11,12,15,  
## : : : 16,18,28}: [S14]  
## : housing = yes:  
## : :...pdays > 313: yes (25.1/8)  
## : pdays <= 313: [S15]  
## campaign <= 1: [S16]  
##   
## SubTree [S1]  
##   
## job in {admin.,technician}: yes (118.1/57.3)  
## job = student: no (37/4.9)  
##   
## SubTree [S2]  
##   
## job in {admin.,blue-collar,housemaid,self-employed,services,student,  
## : unknown}: no (463.7/196.1)  
## job in {entrepreneur,unemployed}: yes (82.3/40.2)  
## job = technician:  
## :...balance <= 996: no (59.2/13.7)  
## : balance > 996: yes (137.4/49.3)  
## job = retired:  
## :...age <= 57: no (15.1/2.2)  
## : age > 57:  
## : :...age <= 79: yes (185.9/66.3)  
## : age > 79: no (21.1/5.9)  
## job = management:  
## :...balance <= 468: no (34.9/8.1)  
## balance > 468:  
## :...balance <= 617: yes (47.8/7.4)  
## balance > 617:  
## :...education = primary: no (6.8/2.2)  
## education in {secondary,unknown}: yes (22.2/5.6)  
## education = tertiary:  
## :...duration > 216: no (102.1/40.6)  
## duration <= 216:  
## :...previous <= 2: yes (159.4/56)  
## previous > 2: no (10.3/0.6)  
##   
## SubTree [S3]  
##   
## day in {2,5,7,9,10,12,18,19,20,22,28,29}: no (271.8)  
## day in {8,11,13,14,15,25}:  
## :...month in {aug,jul,may}: no (195.6/25.3)  
## month in {jan,nov}: yes (22.8/1.2)  
##   
## SubTree [S4]  
##   
## contact = telephone: yes (16/4.3)  
## contact = cellular:  
## :...job in {admin.,blue-collar,entrepreneur,management,retired,self-employed,  
## : student,technician,unemployed,unknown}: no (291.4/95)  
## job in {housemaid,services}: yes (37.6/11.9)  
##   
## SubTree [S5]  
##   
## day in {2,3,4,27}: yes (70.9/29.5)  
## day in {5,6,7,12,13,15,16,18,25,31}:  
## :...balance > 2313: no (63.5/1.2)  
## balance <= 2313:  
## :...duration <= 360: no (302.2/77.3)  
## duration > 360: yes (10.4/1.8)  
##   
## SubTree [S6]  
##   
## campaign <= 1: yes (80.7/33.3)  
## campaign > 1: no (99.8/30.8)  
##   
## SubTree [S7]  
##   
## contact = unknown: no (104.3/42.3)  
## contact = cellular:  
## :...pdays <= 182: yes (149.9/52.5)  
## pdays > 182: no (15.3/4)  
##   
## SubTree [S8]  
##   
## contact = cellular: yes (199.7/93.6)  
## contact = unknown: no (92.4/30.8)  
##   
## SubTree [S9]  
##   
## education in {primary,unknown}: no (153.7/69)  
## education = tertiary:  
## :...age > 39: no (23/0.6)  
## : age <= 39:  
## : :...day in {1,2,3,4,8,9,10,11,13,19,20,21,23,24,27,29,31}: no (117/12.7)  
## : day in {5,6,7,12,14,15,16,17,18,22,25,26,28,30}: yes (103.6/44.1)  
## education = secondary:  
## :...day in {1,5,7,8,10,12,13,15,17,19,21,22,24,29}: no (230.4/38.8)  
## day in {2,3,4,6,9,11,14,16,18,20,23,25,26,27,28,30,31}:  
## :...default = yes: yes (3.2)  
## default = no:  
## :...balance > 2101: yes (32.1/3.8)  
## balance <= 2101:  
## :...age <= 38: no (163.6/66.4)  
## age > 38: yes (34.4/9.5)  
##   
## SubTree [S10]  
##   
## job in {retired,self-employed,student,unemployed,unknown}: yes (19.4/0.6)  
## job in {admin.,blue-collar,entrepreneur,housemaid,management,services,  
## : technician}:  
## :...previous > 2: yes (16.1/2.2)  
## previous <= 2:  
## :...duration > 1083: yes (78.8/24.8)  
## duration <= 1083:  
## :...duration <= 651: yes (10.7)  
## duration > 651:  
## :...pdays > 125: no (9.3/0.6)  
## pdays <= 125:  
## :...age <= 35: yes (48.8/19.5)  
## age > 35: no (120.6/33.6)  
##   
## SubTree [S11]  
##   
## marital = divorced: yes (49.7/17.9)  
## marital = married:  
## :...education in {primary,tertiary}: yes (105.6/44.2)  
## education in {secondary,unknown}: no (78.5/17.8)  
##   
## SubTree [S12]  
##   
## contact = telephone: no (20.8/6.4)  
## contact = cellular:  
## :...campaign <= 9: yes (203.6/68.4)  
## campaign > 9: no (19.6/6.4)  
##   
## SubTree [S13]  
##   
## marital = divorced: no (60/28.8)  
## marital in {married,single}:  
## :...job in {admin.,blue-collar,management,retired,self-employed,services,  
## : technician,unknown}: no (352.4/87.2)  
## job in {entrepreneur,housemaid,student,unemployed}: yes (96/43.4)  
##   
## SubTree [S14]  
##   
## education = unknown: no (6.8)  
## education in {primary,secondary,tertiary}:  
## :...month in {dec,mar,sep}: yes (24.7)  
## month in {apr,aug,feb,jan,jul,jun,may,nov,oct}:  
## :...job = unknown: yes (0)  
## job in {entrepreneur,retired}: no (11.2)  
## job in {admin.,blue-collar,housemaid,management,self-employed,services,  
## : student,technician,unemployed}:  
## :...marital in {divorced,single}: yes (152.9/59.5)  
## marital = married: no (143.9/68.6)  
##   
## SubTree [S15]  
##   
## day in {3,5,9,10,16,26,27,28}: no (97/5)  
## day in {2,4,6,8,11,12,13,14,15,18,21,25,30}:  
## :...month in {dec,jan,oct,sep}: no (7.7)  
## month in {jun,mar}: yes (6.2)  
## month in {apr,aug,jul,nov}:  
## :...age <= 28: yes (13.5/3.4)  
## : age > 28: no (168.7/34.2)  
## month in {feb,may}:  
## :...previous > 2: yes (30.2/6.2)  
## previous <= 2:  
## :...duration <= 607: no (166.6/59.9)  
## duration > 607: yes (13.9/1.2)  
##   
## SubTree [S16]  
##   
## job in {housemaid,retired}: no (35.5/2.8)  
## job in {admin.,blue-collar,entrepreneur,management,self-employed,services,  
## : student,technician,unemployed,unknown}:  
## :...day in {3,12,13,14,16,26,27,30}:  
## :...previous > 2: no (21.4/4.9)  
## : previous <= 2:  
## : :...contact = telephone: yes (11.9)  
## : contact = cellular:  
## : :...month in {apr,aug,dec,feb,jul,may,nov,oct}: yes (292.6/80)  
## : month in {jan,jun,mar,sep}: no (54.5/15.9)  
## day in {2,4,5,6,8,9,10,11,15,18,21,25,28}:  
## :...age > 54: yes (50.8/16.3)  
## age <= 54:  
## :...marital = divorced: no (75.9/13.4)  
## marital in {married,single}:  
## :...contact = telephone: no (27.4/5.9)  
## contact = cellular:  
## :...duration > 475: yes (318.4/149.9)  
## duration <= 475:  
## :...month in {apr,dec,jan,jul}: no (71.2/1.8)  
## month in {aug,feb,jun,mar,may,nov,oct,sep}:  
## :...pdays <= 178: no (170.3/67.4)  
## pdays > 178: yes (27.6/5.2)  
##   
## ----- Trial 3: -----  
##   
## Decision tree:  
##   
## duration <= 129:  
## :...poutcome = success:  
## : :...duration <= 23: no (17.2)  
## : : duration > 23:  
## : : :...contact = telephone: no (6.4)  
## : : contact = unknown: yes (10.9/2.2)  
## : : contact = cellular:  
## : : :...month in {jan,jul,may}: no (23.3)  
## : : month in {apr,aug,dec,feb,jun,mar,nov,oct,sep}:  
## : : :...previous > 6: no (18.7/2.6)  
## : : previous <= 6:  
## : : :...previous <= 4: no (220.9/89.9)  
## : : previous > 4: yes (30.5/8.2)  
## : poutcome in {failure,other,unknown}:  
## : :...month in {aug,dec,jan,jul,jun,may,nov}:  
## : :...age > 29: no (4984.5/182.2)  
## : : age <= 29:  
## : : :...housing = yes: no (326.4/13.9)  
## : : housing = no:  
## : : :...loan = yes: no (39.2)  
## : : loan = no:  
## : : :...day in {1,3,6,7,8,11,16,17,18,19,20,22,23,24,26,27,29,  
## : : : 30,31}: no (67.5)  
## : : day in {2,4,5,9,10,12,13,14,15,21,25,28}:  
## : : :...poutcome = failure: no (10.4)  
## : : poutcome in {other,unknown}:  
## : : :...contact = telephone: no (9.2)  
## : : contact in {cellular,unknown}:  
## : : :...balance <= 102: no (20/2.6)  
## : : balance > 102: yes (128.3/43)  
## : month in {apr,feb,mar,oct,sep}:  
## : :...duration <= 60: no (277.6/11.7)  
## : duration > 60:  
## : :...default = yes: no (7.6)  
## : default = no:  
## : :...balance <= -65: no (30.4)  
## : balance > -65:  
## : :...day in {2,4,6,20,24,26,30,31}: no (382.7/50.4)  
## : day in {1,3,5,7,8,9,10,11,12,13,14,15,16,17,18,19,21,  
## : : 22,23,25,27,28,29}:  
## : :...month in {apr,sep}:  
## : :...contact = telephone: no (33.8)  
## : : contact in {cellular,unknown}:  
## : : :...day in {5,9,10,12,16,17,25,28,  
## : : : 29}: no (113.1/2.6)  
## : : day in {1,3,7,8,11,13,14,15,18,19,21,22,23,  
## : : : 27}:  
## : : :...housing = yes: no (64.5/18.6)  
## : : housing = no:  
## : : :...pdays > 184: no (11.4)  
## : : pdays <= 184: [S1]  
## : month in {feb,mar,oct}:  
## : :...day in {1,10,12,13,16,17,18,22,23,25,28,29}:  
## : :...balance > 2851: no (24.3/3.1)  
## : : balance <= 2851:  
## : : :...job in {admin.,entrepreneur,housemaid,  
## : : : management,retired,services,  
## : : : student,technician,unemployed,  
## : : : unknown}: yes (191/51.8)  
## : : job in {blue-collar,  
## : : self-employed}: no (7.2)  
## : day in {3,5,7,8,9,11,14,15,19,21,27}:  
## : :...pdays > 231: no (19.2)  
## : pdays <= 231:  
## : :...education in {primary,  
## : : unknown}: no (31.9/2.6)  
## : education in {secondary,tertiary}:  
## : :...job in {housemaid,retired,  
## : : unemployed,  
## : : unknown}: no (45.9/2.6)  
## : job in {admin.,blue-collar,  
## : : entrepreneur,management,  
## : : self-employed,services,  
## : : student,technician}: [S2]  
## duration > 129:  
## :...poutcome in {other,success}:  
## :...pdays <= 18: no (85.5/10.7)  
## : pdays > 18:  
## : :...default = yes: no (21.6/3.1)  
## : default = no:  
## : :...month in {apr,feb,jan,may,nov}:  
## : :...pdays <= 94:  
## : : :...education in {primary,secondary,  
## : : : : tertiary}: yes (370.1/120.4)  
## : : : education = unknown: no (20.3/6.5)  
## : : pdays > 94:  
## : : :...duration > 947: yes (98.7/30.8)  
## : : duration <= 947:  
## : : :...balance > 3008:  
## : : :...duration <= 284: no (138.1/57.9)  
## : : : duration > 284: yes (143.1/42)  
## : : balance <= 3008:  
## : : :...housing = no:  
## : : :...job in {blue-collar,entrepreneur,housemaid,  
## : : : : self-employed,  
## : : : : unknown}: no (74/13.7)  
## : : : job = unemployed: yes (16.8/0.5)  
## : : : job in {admin.,management,retired,services,  
## : : : : student,technician}:  
## : : : :...loan = yes: no (22.5/6.1)  
## : : : loan = no:  
## : : : :...balance <= 262: yes (91.6/28.4)  
## : : : balance > 262: [S3]  
## : : housing = yes:  
## : : :...pdays <= 157: no (69.7/3.6)  
## : : pdays > 157:  
## : : :...day in {24,31}: no (0)  
## : : day in {1,4,16,19,21,22,25,26,27,28,  
## : : : 30}: yes (134.8/52)  
## : : day in {2,3,5,6,7,8,9,10,11,12,13,14,  
## : : : 15,17,18,20,23,29}:  
## : : :...duration <= 469: no (276.8/19.6)  
## : : duration > 469: [S4]  
## : month in {aug,dec,jul,jun,mar,oct,sep}:  
## : :...month in {jul,sep}:  
## : :...pdays <= 86: no (24.3/6.6)  
## : : pdays > 86:  
## : : :...day in {3,5,10,11,17,18,19,21,22,25,28,  
## : : : 31}: yes (84.8)  
## : : day in {1,2,4,6,7,8,9,12,13,14,15,16,20,23,24,26,  
## : : : 27,29,30}:  
## : : :...pdays <= 390: yes (299/77.1)  
## : : pdays > 390: no (38.1/13.6)  
## : month in {aug,dec,jun,mar,oct}:  
## : :...pdays <= 65: yes (39.9/4.2)  
## : pdays > 65:  
## : :...day in {3,4,5,6,8,9,11,14,15,16,18,19,20,21,22,23,  
## : : 24,25,28,30,31}: yes (743.2/238.4)  
## : day in {1,2,7,10,12,13,17,26,27,29}:  
## : :...pdays > 363: yes (20.5/2.6)  
## : pdays <= 363:  
## : :...balance <= 312: yes (77.3/30.5)  
## : balance > 312:  
## : :...pdays > 297: no (15.1)  
## : pdays <= 297:  
## : :...pdays > 170: yes (92.9/45.4)  
## : pdays <= 170:  
## : :...balance <= 6290: no (176.2/44.4)  
## : balance > 6290: yes (12.9/3.1)  
## poutcome in {failure,unknown}:  
## :...duration > 452:  
## :...marital = divorced:  
## : :...age <= 29: no (33.5/5.3)  
## : : age > 29:  
## : : :...day in {1,2,7,9,10,11,16,22,23,24,25,26,28,29}:  
## : : :...duration <= 559: no (92/6.5)  
## : : : duration > 559:  
## : : : :...contact = telephone: no (7.2)  
## : : : contact in {cellular,unknown}:  
## : : : :...balance <= 3: no (51.3/12.1)  
## : : : balance > 3:  
## : : : :...campaign > 5: yes (13.8/2.2)  
## : : : campaign <= 5:  
## : : : :...campaign <= 3: yes (189.9/86.7)  
## : : : campaign > 3: no (30.8/7.9)  
## : : day in {3,4,5,6,8,12,13,14,15,17,18,19,20,21,27,30,31}:  
## : : :...age <= 31: yes (35.2/4)  
## : : age > 31:  
## : : :...housing = no: yes (329.3/106.7)  
## : : housing = yes:  
## : : :...contact = telephone: yes (16.4/1)  
## : : contact in {cellular,unknown}:  
## : : :...education = primary: yes (64.7/21.5)  
## : : education in {tertiary,  
## : : : unknown}: no (107/50.7)  
## : : education = secondary:  
## : : :...default = yes: no (3.5)  
## : : default = no:  
## : : :...age > 58: yes (9.9)  
## : : age <= 58:  
## : : :...previous > 3: no (9.8)  
## : : previous <= 3: [S5]  
## : marital in {married,single}:  
## : :...duration > 936:  
## : :...duration <= 946: yes (41.2/4.3)  
## : : duration > 946:  
## : : :...campaign > 5: yes (178.7/69.1)  
## : : campaign <= 5:  
## : : :...month in {apr,aug,dec,feb,jan,  
## : : : oct}: no (440.8/182.1)  
## : : month in {mar,sep}: yes (20.4/2.7)  
## : : month = nov:  
## : : :...pdays <= 165: no (157.3/58)  
## : : : pdays > 165: yes (13.8)  
## : : month = jul:  
## : : :...duration > 1437: yes (24.7/0.5)  
## : : : duration <= 1437:  
## : : : :...day in {1,3,4,5,6,10,11,12,13,14,15,17,18,  
## : : : : 19,20,21,23,25,26,27,30,  
## : : : : 31}: yes (122.5/31)  
## : : : day in {2,7,8,9,16,22,24,28,  
## : : : 29}: no (96.6/22.4)  
## : : month = jun:  
## : : :...loan = yes: yes (15.7)  
## : : : loan = no:  
## : : : :...age <= 24: no (12)  
## : : : age > 24:  
## : : : :...duration <= 972: no (18.4/2.2)  
## : : : duration > 972: yes (176/79.5)  
## : : month = may:  
## : : :...pdays > 347: no (25.4/4)  
## : : pdays <= 347:  
## : : :...poutcome = failure: yes (16.1/3.7)  
## : : poutcome = unknown:  
## : : :...education = primary: yes (64/28.7)  
## : : education in {tertiary,  
## : : : unknown}: no (93.8/29.8)  
## : : education = secondary:  
## : : :...housing = no: no (22/4.4)  
## : : housing = yes:  
## : : :...age > 52: yes (14.9/1.5)  
## : : age <= 52: [S6]  
## : duration <= 936:  
## : :...housing = no:  
## : :...month in {apr,dec,mar}:  
## : : :...balance <= 2149: yes (143.5/32.1)  
## : : : balance > 2149: no (79.9/33.2)  
## : : month in {aug,feb,jan,jul,jun,may,nov,oct,sep}:  
## : : :...previous > 2: yes (94.3/38.3)  
## : : previous <= 2:  
## : : :...duration > 884: no (138.9/36.2)  
## : : duration <= 884:  
## : : :...duration <= 494:  
## : : :...job in {housemaid,student,  
## : : : : unknown}: no (36.5)  
## : : : job in {admin.,blue-collar,  
## : : : : entrepreneur,management,  
## : : : : retired,self-employed,services,  
## : : : : technician,unemployed}:  
## : : : :...duration > 486: no (62.7/10)  
## : : : duration <= 486:  
## : : : :...contact = unknown: no (34.3/6.5)  
## : : : contact in {cellular,telephone}:  
## : : : :...balance > 2720: yes (78.4/28.5)  
## : : : balance <= 2720:  
## : : : :...day in {4,10,13,14,18,  
## : : : : 19,21,22,23,24,  
## : : : : 31}: no (53.7)  
## : : : day in {1,2,3,5,6,7,8,  
## : : : : 9,11,12,15,16,  
## : : : : 17,20,25,26,27,  
## : : : : 28,29,30}: [S7]  
## : : duration > 494:  
## : : :...balance > 3720:  
## : : :...campaign > 6: yes (20/3.6)  
## : : : campaign <= 6: [S8]  
## : : balance <= 3720:  
## : : :...pdays > 89: yes (63.7/20.9)  
## : : pdays <= 89: [S9]  
## : housing = yes:  
## : :...balance > 6060: no (154.8/31.7)  
## : balance <= 6060:  
## : :...balance > 4096: yes (142/52.2)  
## : balance <= 4096:  
## : :...job in {entrepreneur,housemaid,retired,  
## : : self-employed,student,  
## : : unemployed}: no (421.5/150.4)  
## : job = unknown: yes (6.9)  
## : job = admin.:  
## : :...pdays > 339: yes (16.8/2.2)  
## : : pdays <= 339:  
## : : :...day in {1,2,3,4,5,8,9,10,11,12,14,16,  
## : : : 18,19,20,21,28,30,  
## : : : 31}: no (173.5/30.9)  
## : : day in {6,7,13,15,17,22,23,24,25,26,27,  
## : : 29}: yes (141.5/53.3)  
## : job = management:  
## : :...age > 52: no (31.6/0.5)  
## : : age <= 52:  
## : : :...day in {1,5,9,10,11,12,15,16,17,18,19,  
## : : : 20,21,22,23,24,25,26,27,29,  
## : : : 31}: no (405.9/95.2)  
## : : day in {2,3,4,6,7,8,13,14,28,30}:  
## : : :...loan = no: yes (194.2/70)  
## : : loan = yes: no (34.5/12.7)  
## : job = services:  
## : :...loan = yes: no (43/0.5)  
## : : loan = no:  
## : : :...age <= 30: yes (58.2/16.1)  
## : : age > 30:  
## : : :...education = primary: yes (19.6/4.9)  
## : : education in {secondary,tertiary,  
## : : unknown}: no (144.1/34.7)  
## : job = technician:  
## : :...education = unknown: no (14.5)  
## : : education in {primary,secondary,tertiary}:  
## : : :...day = 1: no (0)  
## : : day in {4,5,6,9,10,18,19,21,25}:  
## : : :...balance <= 799: yes (108.1/19.1)  
## : : : balance > 799: no (62/27.3)  
## : : day in {2,3,7,8,11,12,13,14,15,16,17,  
## : : : 20,22,23,24,26,27,28,29,30,31}:  
## : : :...pdays > 104: no (32.8)  
## : : pdays <= 104: [S10]  
## : job = blue-collar:  
## : :...balance > 3151: no (26.2/2.6)  
## : balance <= 3151:  
## : :...day in {1,4,10,12,15,16,18,20,21,22,23,  
## : : 25,26,29}:  
## : :...month in {dec,mar,  
## : : : sep}: yes (0)  
## : : month in {jan,nov}: no (42.7/5.6)  
## : : month in {apr,aug,feb,jul,jun,may,  
## : : : oct}:  
## : : :...campaign > 2: yes (133.1/36.3)  
## : : campaign <= 2:  
## : : :...duration <= 482: no (20.2/1.7)  
## : : duration > 482: yes (287.3/113.2)  
## : day in {2,3,5,6,7,8,9,11,13,14,17,19,  
## : : 24,27,28,30,31}:  
## : :...duration <= 475: no (29.2)  
## : duration > 475: [S11]  
## duration <= 452:  
## :...contact = unknown:  
## :...month in {apr,feb,mar,oct}: yes (34)  
## : month in {aug,jan,nov,sep}: no (58.1/25.3)  
## : month in {dec,jul,jun,may}:  
## : :...duration <= 368: no (2397.6/27.7)  
## : duration > 368:  
## : :...day in {1,3,4,7,10,11,12,14,15,16,17,19,22,23,24,25,28,  
## : : 29,30,31}: no (175)  
## : day in {2,5,6,8,9,13,18,20,21,26,27}:  
## : :...age <= 30: yes (75.3/27.8)  
## : age > 30: no (173/39.4)  
## contact in {cellular,telephone}:  
## :...month in {apr,dec,feb,jun,mar,oct,sep}:  
## :...day in {8,10,11,12,18,21,23,24,25,29,31}:  
## : :...duration > 391: yes (83.2/14.4)  
## : : duration <= 391:  
## : : :...job in {services,unknown}: yes (49.2/6.6)  
## : : job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : management,retired,self-employed,student,  
## : : : technician,unemployed}:  
## : : :...month in {dec,jun}: no (123.5/36.8)  
## : : month in {apr,feb,mar,oct,sep}:  
## : : :...poutcome = failure: no (180.3/76)  
## : : poutcome = unknown:  
## : : :...contact = telephone: no (69.9/29.7)  
## : : contact = cellular: [S12]  
## : day in {1,2,3,4,5,6,7,9,13,14,15,16,17,19,20,22,26,27,28,  
## : : 30}:  
## : :...age <= 22: yes (73.9/24.8)  
## : age > 22:  
## : :...month in {dec,jun,mar,sep}:  
## : :...loan = yes: yes (66.5/22.7)  
## : : loan = no:  
## : : :...age > 57:  
## : : :...age > 81: no (22.6)  
## : : : age <= 81:  
## : : : :...job in {blue-collar,entrepreneur,  
## : : : : housemaid,self-employed,  
## : : : : services,student,  
## : : : : unemployed,  
## : : : : unknown}: no (24.2)  
## : : : job in {admin.,management,retired,  
## : : : : technician}:  
## : : : :...day in {1,4,7,13,15,16,17,19,  
## : : : : 20,22,26,27,28,  
## : : : : 30}: no (118.3/29.4)  
## : : : day in {2,3,5,6,9,  
## : : : 14}: yes (55.4/7.9)  
## : : age <= 57:  
## : : :...marital = divorced: yes (50.5/15)  
## : : marital in {married,single}:  
## : : :...age <= 24: no (42.5/8.2)  
## : : age > 24:  
## : : :...duration <= 223: [S13]  
## : : duration > 223: [S14]  
## : month in {apr,feb,oct}:  
## : :...balance > 15187: no (33.6)  
## : balance <= 15187:  
## : :...balance <= -115: no (30.1)  
## : balance > -115:  
## : :...job in {blue-collar,entrepreneur,  
## : : services,unemployed}:  
## : :...loan = yes: no (77.1)  
## : : loan = no:  
## : : :...day in {1,2,4,6,14,17,19,  
## : : : 28}: no (185.4/11.8)  
## : : day in {26,  
## : : : 27}: yes (11.3)  
## : : day in {3,5,7,9,13,15,16,20,22,  
## : : : 30}: [S15]  
## : job in {admin.,housemaid,management,  
## : : retired,self-employed,student,  
## : : technician,unknown}:  
## : :...education in {primary,secondary}:  
## : :...day in {1,2,4,5,6,7,9,16,19,26,  
## : : : 28}: no (363.2/62.5)  
## : : day in {3,13,14,15,17,20,22,27,  
## : : : 30}:  
## : : :...duration > 400: no (57/14.5)  
## : : duration <= 400:  
## : : :...housing = yes: no (152/53.5)  
## : : housing = no: [S16]  
## : education in {tertiary,unknown}:  
## : :...loan = yes: no (65.9/21.9)  
## : loan = no:  
## : :...duration <= 191:  
## : :...pdays > 147: no (22.8)  
## : : pdays <= 147: [S17]  
## : duration > 191:  
## : :...housing = yes: [S18]  
## : housing = no: [S19]  
## month in {aug,jan,jul,may,nov}:  
## :...loan = yes:  
## :...day in {1,16,27}: yes (56.3/22.2)  
## : day in {2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,18,19,20,  
## : 21,22,23,24,25,26,28,29,30,  
## : 31}: no (1000.7/102.9)  
## loan = no:  
## :...age > 59:  
## :...campaign > 3: no (70.4/17.5)  
## : campaign <= 3:  
## : :...marital = single: yes (18.6/4.5)  
## : marital in {divorced,married}:  
## : :...contact = telephone: yes (123.4/57.6)  
## : contact = cellular:  
## : :...campaign > 2: yes (47.9/20.3)  
## : campaign <= 2:  
## : :...education = secondary: no (138.9/67.5)  
## : education in {primary,tertiary,  
## : : unknown}:  
## : :...duration <= 424: no (145.4/37.6)  
## : duration > 424: yes (11.2/1.7)  
## age <= 59:  
## :...age <= 24:  
## :...pdays > 198: no (9.8)  
## : pdays <= 198:  
## : :...job in {admin.,entrepreneur,housemaid,  
## : : management,retired,services,  
## : : student,technician,  
## : : unknown}: yes (145.3/50.9)  
## : job in {blue-collar,self-employed,  
## : unemployed}: no (32.3/7.3)  
## age > 24:  
## :...pdays > 374: yes (89.6/39.4)  
## pdays <= 374:  
## :...pdays > 348: no (150.6/10.6)  
## pdays <= 348:  
## :...education in {primary,unknown}:  
## :...campaign > 3: no (148.8)  
## : campaign <= 3:  
## : :...duration <= 171: no (111.9)  
## : duration > 171:  
## : :...day in {1,9,10,13,15,20,23,  
## : : 24,25,26,27,29,  
## : : 30}: no (139.8/4.4)  
## : day in {2,3,4,5,6,7,8,11,  
## : : 12,14,16,17,18,19,  
## : : 21,22,28,31}: [S20]  
## education in {secondary,tertiary}:  
## :...day in {1,4,5,8,9,15,17,19,20,21,  
## : 23,28,29,30,31}:  
## :...pdays > 229: no (53.2)  
## : pdays <= 229: [S21]  
## day in {2,3,6,7,10,11,12,13,14,16,  
## : 18,22,24,25,26,27}:  
## :...month in {jan,nov}:  
## :...day in {7,  
## : : 22}: yes (0)  
## : day in {18,24,  
## : : 26}: no (112.7)  
## : day in {2,3,6,10,11,12,13,  
## : : 14,16,25,27}: [S22]  
## month in {aug,jul,may}:  
## :...pdays > 344: yes (28.2/7.4)  
## pdays <= 344:  
## :...pdays > 287: no (51.2)  
## pdays <= 287: [S23]  
##   
## SubTree [S1]  
##   
## job in {admin.,blue-collar,management,retired,self-employed,student,technician,  
## : unemployed,unknown}: yes (154.2/66.7)  
## job in {entrepreneur,housemaid,services}: no (14.5)  
##   
## SubTree [S2]  
##   
## contact = telephone: yes (11/1.5)  
## contact = unknown: no (2.2)  
## contact = cellular:  
## :...poutcome = failure: yes (45.1/16.3)  
## poutcome in {other,unknown}:  
## :...job = admin.: yes (49.9/18.2)  
## job in {blue-collar,entrepreneur,management,self-employed,services,  
## student,technician}: no (149.1/40.8)  
##   
## SubTree [S3]  
##   
## marital = divorced: yes (31.6/6.2)  
## marital in {married,single}: no (196.2/71.1)  
##   
## SubTree [S4]  
##   
## marital = divorced: yes (14.4/1.5)  
## marital in {married,single}: no (134.4/47.9)  
##   
## SubTree [S5]  
##   
## job in {admin.,entrepreneur,management,self-employed,services,student,  
## : technician,unemployed,unknown}: yes (144.7/48.3)  
## job in {blue-collar,housemaid,retired}: no (33.4/4.8)  
##   
## SubTree [S6]  
##   
## job in {entrepreneur,housemaid,retired,self-employed,unknown}: no (17.4)  
## job in {admin.,blue-collar,management,services,student,technician,unemployed}:  
## :...day in {4,8,11,18,23,28,29,30}: yes (25.6)  
## day in {1,2,3,5,6,7,9,10,12,13,14,15,16,17,19,20,21,22,24,25,26,27,  
## 31}: no (161.1/60.1)  
##   
## SubTree [S7]  
##   
## education = primary: no (24.6/4.4)  
## education in {secondary,tertiary,unknown}:  
## :...job in {admin.,entrepreneur,management,retired,services,  
## : technician}: no (129.2/54.7)  
## job in {blue-collar,self-employed,unemployed}: yes (30.8/2.7)  
##   
## SubTree [S8]  
##   
## contact in {telephone,unknown}: no (44.6/4.4)  
## contact = cellular:  
## :...balance <= 4025: no (22.8/0.5)  
## balance > 4025:  
## :...month in {jun,sep}: yes (12/0.5)  
## month in {aug,feb,jan,jul,may,nov,oct}:  
## :...loan = no: no (156.2/45.9)  
## loan = yes: yes (17.6/5.5)  
##   
## SubTree [S9]  
##   
## job in {entrepreneur,unknown}: no (87.8/20.8)  
## job in {admin.,blue-collar,housemaid,management,retired,self-employed,services,  
## : student,technician,unemployed}:  
## :...balance <= 1584:  
## :...contact = telephone: no (76.7/22.5)  
## : contact in {cellular,unknown}:  
## : :...job in {admin.,housemaid,services,student,technician,  
## : : unemployed}: no (597.9/266.5)  
## : job in {retired,self-employed}: yes (115.3/50.5)  
## : job = blue-collar:  
## : :...day in {1,2,4,5,6,7,10,14,20,25,26,27,28,31}: no (68.8/5)  
## : : day in {3,8,9,11,12,13,15,16,17,18,19,21,22,23,24,29,30}:  
## : : :...balance <= -63: no (14.2/0.5)  
## : : balance > -63: yes (157.4/50.5)  
## : job = management:  
## : :...default = yes: no (11.8)  
## : default = no:  
## : :...day in {1,2,3,5,6,7,10,11,13,14,17,18,19,20,23,24,28,29,  
## : : 30}: no (187.5/42.2)  
## : day in {4,8,9,12,15,16,21,22,25,26,27,31}: yes (99.2/22.7)  
## balance > 1584:  
## :...poutcome = failure: no (1.7)  
## poutcome = unknown:  
## :...balance <= 1704: yes (39.5/4.9)  
## balance > 1704:  
## :...contact = telephone: yes (20/9.2)  
## contact = unknown: no (63.7/24.4)  
## contact = cellular:  
## :...month = jun: no (10/0.5)  
## month in {aug,feb,jan,jul,may,nov,oct,sep}:  
## :...day in {1,5,6,7,9,11,12,14,16,17,18,19,21,22,25,27,  
## : 28}: yes (184/50.5)  
## day in {2,3,4,8,10,13,15,20,23,24,26,29,30,  
## 31}: no (39.4/7.3)  
##   
## SubTree [S10]  
##   
## poutcome = failure: yes (5.2)  
## poutcome = unknown:  
## :...duration <= 567: no (85.4/5.7)  
## duration > 567:  
## :...campaign > 3: no (33.1/7.1)  
## campaign <= 3:  
## :...balance <= 89: no (44.3/8.8)  
## balance > 89: yes (126/55.2)  
##   
## SubTree [S11]  
##   
## education = tertiary: no (0.5)  
## education = unknown: yes (28.9/9.6)  
## education in {primary,secondary}:  
## :...contact = telephone: no (24.3/0.5)  
## contact in {cellular,unknown}:  
## :...poutcome = failure: no (64.4/10.5)  
## poutcome = unknown:  
## :...month in {dec,mar,oct,sep}: no (0)  
## month in {aug,nov}: yes (16.4/2.2)  
## month in {apr,feb,jan,jul,jun,may}:  
## :...day in {3,11,13,19,28,30,31}: no (129.8/19.5)  
## day in {2,5,6,7,8,9,14,17,24,27}:  
## :...age > 40: yes (98.7/40.7)  
## age <= 40:  
## :...age <= 32: yes (109.1/48.3)  
## age > 32: no (72.6/6.9)  
##   
## SubTree [S12]  
##   
## education in {primary,secondary,unknown}: yes (294/106.5)  
## education = tertiary:  
## :...job in {admin.,blue-collar,housemaid,management,retired,self-employed,  
## : technician,unemployed}: yes (185.6/62.7)  
## job in {entrepreneur,student}: no (20.7)  
##   
## SubTree [S13]  
##   
## contact = telephone: no (22.2/4.3)  
## contact = cellular:  
## :...campaign > 2: no (39.3/6.9)  
## campaign <= 2:  
## :...age > 47: yes (61.5/16.2)  
## age <= 47:  
## :...balance <= 19: no (17.2)  
## balance > 19:  
## :...job in {admin.,blue-collar,entrepreneur,  
## : student}: yes (96.2/28.6)  
## job in {housemaid,management,retired,self-employed,services,  
## technician,unemployed,unknown}: no (185.8/54.8)  
##   
## SubTree [S14]  
##   
## job in {admin.,entrepreneur,retired,student,unknown}: yes (113.6/19.8)  
## job in {blue-collar,housemaid,management,self-employed,services,technician,  
## : unemployed}:  
## :...duration <= 246: yes (42.6/5.5)  
## duration > 246:  
## :...age <= 27: yes (23.4/3.5)  
## age > 27:  
## :...job in {self-employed,unemployed}: no (21.7/1.7)  
## job in {blue-collar,housemaid,management,services,technician}:  
## :...duration <= 277: no (67/18.8)  
## duration > 277: yes (181.9/82)  
##   
## SubTree [S15]  
##   
## contact = telephone: no (31.4)  
## contact = cellular:  
## :...month = oct: yes (15.6/4.3)  
## month in {apr,feb}:  
## :...pdays > 256: no (39.7)  
## pdays <= 256:  
## :...age <= 31: no (78.6/9.4)  
## age > 31:  
## :...duration <= 144: yes (32.6/7.4)  
## duration > 144: no (239.8/73.7)  
##   
## SubTree [S16]  
##   
## loan = yes: yes (19.1/2.2)  
## loan = no:  
## :...day in {3,13,14,22,27}: no (131.6/39.3)  
## day in {15,17,20,30}: yes (133.1/44.3)  
##   
## SubTree [S17]  
##   
## pdays <= 107: no (236.8/81.9)  
## pdays > 107: yes (12)  
##   
## SubTree [S18]  
##   
## education = unknown: no (7.4)  
## education = tertiary:  
## :...day in {1,3,5,6,7,9,16,19,28}: no (28.9)  
## day in {2,4,13,14,15,17,20,22,26,27,30}: yes (131.2/52.2)  
##   
## SubTree [S19]  
##   
## poutcome = failure: yes (65.7/22.6)  
## poutcome = unknown:  
## :...job in {housemaid,unknown}: yes (23.9/4.2)  
## job in {admin.,management,retired,self-employed,student,technician}:  
## :...balance <= 53: no (31.7/3.5)  
## balance > 53:  
## :...balance <= 172: yes (31.1/4.8)  
## balance > 172:  
## :...balance <= 2987: no (233.2/99.5)  
## balance > 2987: yes (48.5/10.9)  
##   
## SubTree [S20]  
##   
## job = management: yes (43.4/13.2)  
## job in {admin.,blue-collar,entrepreneur,housemaid,retired,self-employed,  
## : services,student,technician,unemployed,unknown}:  
## :...previous > 2: yes (23.8/9.6)  
## previous <= 2:  
## :...day in {6,8,16,17,19,31}: no (88.8)  
## day in {2,3,4,5,7,11,12,14,18,21,22,28}:  
## :...balance <= 3576: no (226.6/50.5)  
## balance > 3576: yes (27.4/6.7)  
##   
## SubTree [S21]  
##   
## job in {blue-collar,self-employed,student,unemployed,unknown}: no (393.8/28.4)  
## job in {admin.,entrepreneur,housemaid,management,retired,services,technician}:  
## :...previous > 1:  
## :...job = housemaid: yes (10/0.5)  
## : job in {admin.,entrepreneur,management,retired,services,technician}:  
## : :...month in {aug,may,nov}: no (123.2/30.6)  
## : month in {jan,jul}: yes (33.5/12)  
## previous <= 1:  
## :...month in {aug,jan,jul,nov}: no (1343.9/258.3)  
## month = may:  
## :...pdays > 43: no (12.6/2.2)  
## pdays <= 43:  
## :...campaign <= 4: no (166.9/51.8)  
## campaign > 4: yes (22.4/3.5)  
##   
## SubTree [S22]  
##   
## previous > 2: yes (52.1/3.6)  
## previous <= 2:  
## :...pdays <= 133: yes (173.9/36.8)  
## pdays > 133: no (11.5/2.2)  
##   
## SubTree [S23]  
##   
## day = 16: no (49.9)  
## day in {2,3,6,7,10,11,12,13,14,18,22,24,25,26,27}:  
## :...pdays > 182: yes (80.5/31.8)  
## pdays <= 182:  
## :...duration <= 223:  
## :...balance <= 40: no (151.2/2.6)  
## : balance > 40:  
## : :...job in {entrepreneur,housemaid,retired,self-employed,  
## : : unknown}: no (53.9)  
## : job in {admin.,blue-collar,management,services,student,  
## : : technician,unemployed}:  
## : :...campaign > 2:  
## : :...job in {admin.,blue-collar,management,services,  
## : : : technician,unemployed}: no (181.6/13.4)  
## : : job = student: yes (11.5/2)  
## : campaign <= 2:  
## : :...month in {jul,may}: no (204.7/50)  
## : month = aug:  
## : :...balance <= 49: yes (11.7)  
## : balance > 49:  
## : :...marital in {divorced,married}: yes (129/59)  
## : marital = single: no (60.6/9.5)  
## duration > 223:  
## :...age > 57: no (30.9/2.6)  
## age <= 57:  
## :...day in {2,3,18}:  
## :...contact = telephone: no (8.4/0.5)  
## : contact = cellular:  
## : :...campaign <= 2: yes (137.2/43.5)  
## : campaign > 2: no (51.5/16)  
## day in {6,7,10,11,12,13,14,22,24,25,26,27}:  
## :...campaign > 7: no (42.7/4.7)  
## campaign <= 7:  
## :...housing = yes:  
## :...age > 40: no (100.4/4.7)  
## : age <= 40:  
## : :...day in {6,7,26,27}: no (55.1)  
## : day in {10,11,12,13,14,22,24,25}:  
## : :...marital = divorced: yes (24.5/8.1)  
## : marital in {married,single}:  
## : :...duration <= 226: yes (12.8/1.5)  
## : duration > 226: no (204.2/62.4)  
## housing = no:  
## :...balance <= 5: no (47.8/4.4)  
## balance > 5:  
## :...balance <= 22: yes (31.7/4.4)  
## balance > 22:  
## :...day in {6,7,10,24,25}:  
## :...pdays > 82: yes (12.4)  
## : pdays <= 82:  
## : :...job in {entrepreneur,housemaid,  
## : : retired,self-employed,  
## : : student,unemployed,  
## : : unknown}: yes (61.8/8.6)  
## : job in {admin.,blue-collar,  
## : : management,services,  
## : : technician}: [S24]  
## day in {11,12,13,14,22,26,27}:  
## :...job in {entrepreneur,housemaid,  
## : self-employed,services,  
## : unknown}: no (39.3)  
## job = retired: yes (13.4/1.7)  
## job in {admin.,blue-collar,management,  
## : student,technician,unemployed}:  
## :...duration > 437: yes (19/5.2)  
## duration <= 437:  
## :...job in {blue-collar,  
## : student}: no (23.3)  
## job in {admin.,management,  
## : technician,unemployed}: [S25]  
##   
## SubTree [S24]  
##   
## contact = cellular: no (152/55.8)  
## contact = telephone: yes (12.6/3.1)  
##   
## SubTree [S25]  
##   
## contact = telephone: no (4.7)  
## contact = cellular:  
## :...age <= 29: yes (23.4/4.5)  
## age > 29: no (191.9/55.9)  
##   
## ----- Trial 4: -----  
##   
## Decision tree:  
##   
## duration <= 205:  
## :...poutcome = success:  
## : :...duration <= 62: no (30.1/3.5)  
## : : duration > 62:  
## : : :...balance > 11804: yes (25.9/3.6)  
## : : balance <= 11804:  
## : : :...job in {housemaid,self-employed,unknown}: yes (77.4/17.4)  
## : : job in {admin.,blue-collar,entrepreneur,management,retired,  
## : : : services,student,technician,unemployed}:  
## : : :...age <= 24: yes (29.5/5.4)  
## : : age > 24:  
## : : :...marital = single:  
## : : :...contact = telephone: no (4.4)  
## : : : contact = unknown: yes (3.5)  
## : : : contact = cellular:  
## : : : :...pdays > 184: no (89.1/10.5)  
## : : : pdays <= 184:  
## : : : :...day in {1,2,3,4,7,8,10,11,12,13,14,16,17,  
## : : : : 18,19,25,26,27,28,29,30,  
## : : : : 31}: no (151.5/53.6)  
## : : : day in {5,6,9,15,20,21,22,23,  
## : : : 24}: yes (41.5/0.4)  
## : : marital in {divorced,married}:  
## : : :...education = unknown: yes (40.9/8)  
## : : education in {primary,secondary,tertiary}:  
## : : :...job = student: no (0)  
## : : job in {admin.,services,  
## : : : unemployed}: yes (102.9/30.5)  
## : : job in {blue-collar,entrepreneur,management,  
## : : : retired,technician}:  
## : : :...pdays > 227: no (24.8)  
## : : pdays <= 227:  
## : : :...day in {1,2,5,7,14,16,18,21,23,24,25,  
## : : : 27,30}: no (118/22)  
## : : day in {3,4,6,8,9,10,11,12,13,15,17,19,  
## : : : 20,22,26,28,29,31}:  
## : : :...loan = yes: yes (11.4/1.4)  
## : : loan = no:  
## : : :...month in {apr,aug,dec,feb,jan,  
## : : : mar,nov,oct,  
## : : : sep}: yes (190/61.7)  
## : : month in {jul,jun,  
## : : may}: no (23/2.3)  
## : poutcome in {failure,other,unknown}:  
## : :...month in {apr,feb,mar,oct,sep}:  
## : :...duration <= 96:  
## : : :...day in {2,3,4,5,6,7,9,10,11,12,14,17,19,20,22,24,25,26,28,30,  
## : : : : 31}: no (574.4/64.1)  
## : : : day in {1,8,13,15,16,18,21,23,27,29}:  
## : : : :...month in {apr,mar,oct,sep}: no (180.7/38.4)  
## : : : month = feb: yes (62/23.6)  
## : : duration > 96:  
## : : :...contact = unknown: yes (27.1/6.1)  
## : : contact in {cellular,telephone}:  
## : : :...previous > 10: no (34.3/2.1)  
## : : previous <= 10:  
## : : :...day in {1,2,4,5,7,30}:  
## : : :...month in {apr,feb,sep}: no (486.4/85.3)  
## : : : month in {mar,oct}:  
## : : : :...job in {admin.,entrepreneur,housemaid,services,  
## : : : : student,unemployed,  
## : : : : unknown}: no (59.5/7)  
## : : : job in {blue-collar,management,retired,  
## : : : self-employed,  
## : : : technician}: yes (93.4/36.4)  
## : : day in {3,6,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,  
## : : : 23,24,25,26,27,28,29,31}:  
## : : :...campaign <= 1:  
## : : :...month = sep: no (71.7/20.3)  
## : : : month in {apr,feb,mar,oct}:  
## : : : :...marital = single:  
## : : : :...age > 45: no (18.3/2.1)  
## : : : : age <= 45:  
## : : : : :...duration <= 118: no (78.7/27.7)  
## : : : : duration > 118:  
## : : : : :...day in {3,6,8,9,10,12,13,14,15,  
## : : : : : 17,18,19,20,21,22,23,  
## : : : : : 24,25,26,27,28,29,  
## : : : : : 31}: yes (230.5/48.6)  
## : : : : day in {11,16}: no (11.7)  
## : : : marital in {divorced,married}:  
## : : : :...pdays > 309: no (26.8)  
## : : : pdays <= 309:  
## : : : :...balance <= 196: no (108.1/29.8)  
## : : : balance > 196:  
## : : : :...balance <= 402: yes (83.5/13.6)  
## : : : balance > 402:  
## : : : :...day = 18: yes (0)  
## : : : day in {3,8,  
## : : : : 14}: no (39.1)  
## : : : day in {6,9,10,11,12,13,15,  
## : : : : 16,17,19,20,21,22,  
## : : : : 23,24,25,26,27,28,  
## : : : : 29,31}: [S1]  
## : : campaign > 1:  
## : : :...marital = divorced: yes (113.8/47.4)  
## : : marital in {married,single}:  
## : : :...campaign > 5: no (51.7/0.4)  
## : : campaign <= 5:  
## : : :...contact = telephone: no (49.2/4)  
## : : contact = cellular:  
## : : :...education = primary: no (75.6/8.2)  
## : : education in {secondary,tertiary,  
## : : : unknown}: [S2]  
## : month in {aug,dec,jan,jul,jun,may,nov}:  
## : :...balance <= -1: no (663.8)  
## : balance > -1:  
## : :...duration <= 77: no (1916.2/44.8)  
## : duration > 77:  
## : :...contact in {telephone,unknown}:  
## : :...month in {jan,jul,jun,may}: no (1701.4/23.3)  
## : : month in {aug,dec,nov}:  
## : : :...contact = unknown: yes (73.6/19)  
## : : contact = telephone:  
## : : :...day in {1,2,3,4,5,6,7,8,10,11,12,15,19,20,21,  
## : : : 23,24,25,27,28,29,30,  
## : : : 31}: no (112.8)  
## : : day in {9,13,14,16,17,18,22,  
## : : 26}: yes (78.6/35.3)  
## : contact = cellular:  
## : :...month = jun:  
## : :...day in {6,7,10,11,13,18,19,20,21,22,23,24,25,26,27,  
## : : : 28,31}: no (51.9)  
## : : day in {1,2,3,4,5,8,9,12,14,15,16,17,29,30}:  
## : : :...previous > 3: no (30.7/5.6)  
## : : previous <= 3:  
## : : :...education = primary: no (8.9)  
## : : education in {secondary,tertiary,unknown}:  
## : : :...marital = divorced: yes (42.5/7)  
## : : marital in {married,single}:  
## : : :...poutcome = other: no (15.4/0.4)  
## : : poutcome in {failure,unknown}:  
## : : :...day in {1,2,3,9,17,  
## : : : 30}: no (194.1/74.6)  
## : : day in {4,5,8,12,14,15,16,  
## : : 29}: yes (167.8/40)  
## : month in {aug,dec,jan,jul,may,nov}:  
## : :...campaign > 3: no (694.3/35.9)  
## : campaign <= 3:  
## : :...day in {4,5,6,7,8,13,15,16,17,18,19,21,22,23,  
## : : 24,29,30}: no (1899.3/227.6)  
## : day in {1,2,3,9,10,11,12,14,20,25,26,27,28,31}:  
## : :...previous > 1:  
## : :...education in {primary,  
## : : : unknown}: no (23.2/2.1)  
## : : education in {secondary,tertiary}:  
## : : :...age > 53: yes (60.6/13.7)  
## : : age <= 53:  
## : : :...day in {1,3,20,  
## : : : 31}: no (25.9)  
## : : day in {2,9,10,11,12,14,25,26,  
## : : : 27,28}:  
## : : :...age <= 26: no (8.6)  
## : : age > 26:  
## : : :...age > 51: no (8.4)  
## : : age <= 51: [S3]  
## : previous <= 1:  
## : :...age <= 24: yes (71.2/34.1)  
## : age > 24:  
## : :...education = unknown: no (24.9)  
## : education in {primary,secondary,  
## : : tertiary}:  
## : :...balance <= 45: no (116.9/4)  
## : balance > 45:  
## : :...duration <= 109: no (143.6/8.4)  
## : duration > 109:  
## : :...campaign > 2: no (94.7/9.6)  
## : campaign <= 2: [S4]  
## duration > 205:  
## :...poutcome = success:  
## :...default = yes: no (3.5)  
## : default = no:  
## : :...day in {1,2,3,9,11,12,13,14,15,16,17,19,21,22,23,24,25,27,28,30}:  
## : :...age > 32:  
## : : :...marital = divorced: yes (95.2/40.7)  
## : : : marital in {married,single}:  
## : : : :...age <= 56:  
## : : : :...job in {admin.,blue-collar,entrepreneur,management,  
## : : : : : retired,services,student,technician,  
## : : : : : unemployed,unknown}: yes (373.2/71.1)  
## : : : : job in {housemaid,self-employed}: no (14.4/2.3)  
## : : : age > 56:  
## : : : :...marital = single: no (4.4/0.4)  
## : : : marital = married:  
## : : : :...campaign > 2: yes (28.9/1.8)  
## : : : campaign <= 2:  
## : : : :...campaign <= 1: yes (105.8/26.5)  
## : : : campaign > 1: no (85.2/32.2)  
## : : age <= 32:  
## : : :...duration > 647: yes (18.9)  
## : : duration <= 647:  
## : : :...previous > 5: no (41.7/7.8)  
## : : previous <= 5:  
## : : :...month in {dec,jan,jul,nov}: yes (36.1)  
## : : month in {apr,aug,feb,jun,mar,may,oct,sep}:  
## : : :...previous > 4: yes (11.1)  
## : : previous <= 4:  
## : : :...balance > 10360: no (8.6/0.4)  
## : : balance <= 10360:  
## : : :...contact in {telephone,  
## : : : unknown}: yes (6.2)  
## : : contact = cellular:  
## : : :...day in {1,9,22,23,  
## : : : 25}: yes (24.5)  
## : : day in {2,3,11,12,13,14,15,16,17,  
## : : 19,21,24,27,28,  
## : : 30}: no (128.7/53.9)  
## : day in {4,5,6,7,8,10,18,20,26,29,31}:  
## : :...campaign > 3: no (39.1/3.4)  
## : campaign <= 3:  
## : :...month = dec: no (34.9/1.8)  
## : month in {apr,aug,feb,jan,jul,jun,mar,may,nov,oct,sep}:  
## : :...age > 57: yes (94.9/24.6)  
## : age <= 57:  
## : :...job in {blue-collar,entrepreneur,housemaid,  
## : : unknown}: no (78.6/11.9)  
## : job in {admin.,management,retired,self-employed,  
## : : services,student,technician,unemployed}:  
## : :...education = primary: yes (8.1)  
## : education in {secondary,tertiary,unknown}:  
## : :...previous > 3: yes (63.1/11.2)  
## : previous <= 3:  
## : :...campaign > 2: yes (15.3/2.1)  
## : campaign <= 2:  
## : :...duration > 540: yes (46.6/12.9)  
## : duration <= 540:  
## : :...duration > 514: no (14.6)  
## : duration <= 514:  
## : :...duration <= 405: no (178.3/48.4)  
## : duration > 405: yes (19.5/3.5)  
## poutcome in {failure,other,unknown}:  
## :...duration > 614:  
## :...contact = cellular:  
## : :...day in {1,2,3,9,16,22,23,24}: no (772.2/330.1)  
## : : day in {4,10,11,20,25,26,27,28,31}: yes (940.9/409.7)  
## : : day = 5:  
## : : :...campaign <= 3: yes (141.3/61.2)  
## : : : campaign > 3: no (9)  
## : : day = 8:  
## : : :...job in {admin.,blue-collar,housemaid,  
## : : : : self-employed}: no (45.8/14.3)  
## : : : job in {entrepreneur,management,retired,services,student,  
## : : : technician,unemployed,unknown}: yes (109.4/23.6)  
## : : day = 12:  
## : : :...age <= 58: yes (131.8/39.5)  
## : : : age > 58: no (18.2/0.4)  
## : : day = 29:  
## : : :...balance <= 305: no (44.3/5.1)  
## : : : balance > 305: yes (103.8/31.7)  
## : : day = 6:  
## : : :...default = yes: no (5.1)  
## : : : default = no:  
## : : : :...education in {primary,unknown}: no (11.6/1.4)  
## : : : education in {secondary,tertiary}: yes (139.2/53.6)  
## : : day = 14:  
## : : :...education = unknown: no (7.5)  
## : : : education in {primary,secondary,tertiary}:  
## : : : :...pdays <= 291: yes (127.5/44.5)  
## : : : pdays > 291: no (29.7/8)  
## : : day = 15:  
## : : :...poutcome = other: yes (7.4)  
## : : : poutcome in {failure,unknown}:  
## : : : :...job in {admin.,blue-collar,housemaid,retired,  
## : : : : technician,unemployed}: no (121.2/48.5)  
## : : : job in {entrepreneur,management,self-employed,services,  
## : : : student,unknown}: yes (65.6/11.5)  
## : : day = 19:  
## : : :...job in {entrepreneur,housemaid,student,unemployed,  
## : : : : unknown}: no (18.3)  
## : : : job in {admin.,blue-collar,management,retired,  
## : : : : self-employed,services,technician}:  
## : : : :...poutcome = failure: no (25.6/4.9)  
## : : : poutcome in {other,unknown}: yes (126/53.1)  
## : : day = 30:  
## : : :...default = yes: yes (10.2)  
## : : : default = no:  
## : : : :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : : management,services,student,  
## : : : : technician}: yes (123.5/33.3)  
## : : : job in {retired,self-employed,unemployed,  
## : : : unknown}: no (34.7/6.5)  
## : : day = 7:  
## : : :...month in {feb,jan,jun,mar,nov}: yes (0)  
## : : : month in {apr,oct,sep}: no (26.7/2.5)  
## : : : month in {aug,dec,jul,may}:  
## : : : :...duration > 1410: no (22.9/2.2)  
## : : : duration <= 1410:  
## : : : :...job in {admin.,entrepreneur,housemaid,retired,  
## : : : : self-employed,services,technician,  
## : : : : unemployed,unknown}: yes (80.8/12)  
## : : : job in {blue-collar,management,  
## : : : student}: no (72.4/28.3)  
## : : day = 17:  
## : : :...education = unknown: yes (10.2)  
## : : : education in {primary,secondary,tertiary}:  
## : : : :...job in {student,unknown}: no (0)  
## : : : job in {entrepreneur,housemaid,retired,technician,  
## : : : : unemployed}: yes (83.7/22.9)  
## : : : job in {admin.,blue-collar,management,self-employed,  
## : : : : services}:  
## : : : :...age <= 29: yes (12.9/0.4)  
## : : : age > 29: no (185.2/58.8)  
## : : day = 13:  
## : : :...poutcome = other: no (13.4/0.8)  
## : : : poutcome in {failure,unknown}:  
## : : : :...pdays > 222: yes (13.2)  
## : : : pdays <= 222:  
## : : : :...poutcome = failure: no (11.5)  
## : : : poutcome = unknown:  
## : : : :...education = unknown: no (7.4)  
## : : : education in {primary,secondary,tertiary}:  
## : : : :...housing = no: yes (63.7/16.1)  
## : : : housing = yes: no (87.9/39.5)  
## : : day = 21:  
## : : :...duration > 1361: yes (16.4)  
## : : : duration <= 1361:  
## : : : :...balance > 8132: yes (13.3)  
## : : : balance <= 8132:  
## : : : :...pdays > 154: no (22.1)  
## : : : pdays <= 154:  
## : : : :...duration > 1145: no (11.3)  
## : : : duration <= 1145:  
## : : : :...pdays > 57: yes (10.6/1.9)  
## : : : pdays <= 57:  
## : : : :...balance <= 2451: no (144.4/65.8)  
## : : : balance > 2451: yes (33.6/7.4)  
## : : day = 18:  
## : : :...default = yes: no (4.4)  
## : : default = no:  
## : : :...balance <= 119: yes (55.7/17.5)  
## : : balance > 119:  
## : : :...duration > 1468: no (15.4)  
## : : duration <= 1468:  
## : : :...marital = divorced: yes (12.9)  
## : : marital in {married,single}:  
## : : :...job in {student,unknown}: no (0)  
## : : job = entrepreneur: yes (8.3)  
## : : job in {admin.,blue-collar,housemaid,  
## : : : management,retired,self-employed,  
## : : : services,technician,unemployed}:  
## : : :...month in {apr,dec,feb,jan,mar,  
## : : : oct}: no (0)  
## : : month in {jun,sep}: yes (5.1)  
## : : month in {aug,jul,may,nov}:  
## : : :...pdays <= 239: no (146/39.9)  
## : : pdays > 239: yes (14/4.9)  
## : contact in {telephone,unknown}:  
## : :...age > 78: yes (28.5/5.6)  
## : age <= 78:  
## : :...duration > 1532: yes (165.9/60.9)  
## : duration <= 1532:  
## : :...previous > 1: no (29.9/5)  
## : previous <= 1:  
## : :...month in {dec,oct}: yes (13.3)  
## : month in {apr,aug,feb,jan,jul,jun,mar,may,nov,sep}:  
## : :...duration > 1424: no (42.9/5.2)  
## : duration <= 1424:  
## : :...poutcome = failure: yes (7.6/3.6)  
## : poutcome = other: no (10.9/1.8)  
## : poutcome = unknown:  
## : :...duration <= 618: yes (38.9/8.9)  
## : duration > 618:  
## : :...duration <= 635: no (79.2/12.1)  
## : duration > 635:  
## : :...balance > 7635: no (48.6/6.7)  
## : balance <= 7635:  
## : :...duration > 1313: yes (66/22.1)  
## : duration <= 1313:  
## : :...duration > 1272: no (25.1/0.4)  
## : duration <= 1272: [S5]  
## duration <= 614:  
## :...contact = unknown:  
## :...duration <= 368:  
## : :...month in {apr,aug,feb,jan,mar,oct,sep}: yes (20.5)  
## : : month in {dec,jul,jun,may,nov}: no (1035.5/31.5)  
## : duration > 368:  
## : :...month in {apr,aug,feb,jul,mar}: yes (46.8/16.1)  
## : month in {dec,jan,may,nov,oct,sep}: no (859.1/178.1)  
## : month = jun:  
## : :...balance <= -302: yes (25.9/3.7)  
## : balance > -302:  
## : :...job = unemployed: yes (20.1/3.8)  
## : job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : management,retired,self-employed,services,  
## : : student,technician,unknown}:  
## : :...education in {primary,tertiary,  
## : : unknown}: no (229.7/52.3)  
## : education = secondary:  
## : :...duration <= 371: yes (16/2)  
## : duration > 371:  
## : :...campaign > 13: yes (16.1/3.8)  
## : campaign <= 13:  
## : :...balance <= 33: yes (35.9/13.5)  
## : balance > 33: no (202.3/45.8)  
## contact in {cellular,telephone}:  
## :...pdays > 381:  
## :...previous > 14: no (13.7/1.4)  
## : previous <= 14:  
## : :...month in {apr,aug,dec,feb,jan,jul,jun,may,  
## : : oct}: yes (163.7/34.7)  
## : month in {mar,nov,sep}: no (48.3/14)  
## pdays <= 381:  
## :...age > 60:  
## :...marital = single: no (25/3.8)  
## : marital in {divorced,married}:  
## : :...job in {entrepreneur,unemployed,  
## : : unknown}: no (33.5/5.3)  
## : job in {self-employed,services,  
## : : student}: yes (8)  
## : job in {admin.,blue-collar,housemaid,management,  
## : : retired,technician}:  
## : :...balance > 4809: no (143/46.2)  
## : balance <= 4809:  
## : :...age > 77: no (96.6/36.3)  
## : age <= 77:  
## : :...housing = yes: yes (39/7.9)  
## : housing = no:  
## : :...balance > 2303: yes (123.3/25.2)  
## : balance <= 2303:  
## : :...day = 19: yes (0)  
## : day in {1,4,6,11,13,17,18,21,  
## : : 23,25,26,27,30}:  
## : :...pdays <= 184: yes (167.7/24.2)  
## : : pdays > 184: no (9.2)  
## : day in {2,3,5,7,8,9,10,12,14,  
## : : 15,16,20,22,24,28,29,  
## : : 31}:  
## : :...age > 68: no (105.5/25.5)  
## : age <= 68:  
## : :...age <= 67: no (149.3/71.1)  
## : age > 67: yes (13.5)  
## age <= 60:  
## :...month in {dec,jun,mar,sep}:  
## :...duration > 548: no (45.6/10.2)  
## : duration <= 548:  
## : :...duration > 471: yes (103.4/23.6)  
## : duration <= 471:  
## : :...duration > 438: no (56.8/13.9)  
## : duration <= 438:  
## : :...job in {blue-collar,  
## : : unknown}: yes (67.6/13.8)  
## : job in {admin.,entrepreneur,housemaid,  
## : : management,retired,  
## : : self-employed,services,student,  
## : : technician,unemployed}:  
## : :...day = 20: no (0)  
## : day in {6,19,22,26,  
## : : 28}: yes (31.5)  
## : day in {1,2,3,4,5,7,8,9,10,11,12,  
## : : 13,14,15,16,17,18,21,23,24,  
## : : 25,27,29,30,31}: [S6]  
## month in {apr,aug,feb,jan,jul,may,nov,oct}:  
## :...housing = no:  
## :...loan = yes:  
## : :...campaign > 5: no (30.5)  
## : : campaign <= 5:  
## : : :...day in {3,4,10,12,13,14,23,24,29,  
## : : : 31}: no (105.4)  
## : : day in {1,2,5,6,7,8,9,11,15,16,17,18,  
## : : : 19,20,21,22,25,26,27,28,30}:  
## : : :...month in {apr,  
## : : : may}: yes (29.8/8.2)  
## : : month in {aug,feb,jan,jul,nov,oct}: [S7]  
## : loan = no:  
## : :...pdays > 278: no (125.7/27.6)  
## : pdays <= 278:  
## : :...month = jan:  
## : :...day in {1,2,3,4,5,6,7,9,10,16,17,  
## : : : 19,20,21,22,23,24,25,  
## : : : 31}: no (0)  
## : : day in {11,12,14,15,  
## : : : 27}: yes (67.4/15.7)  
## : : day in {8,13,18,26,28,29,30}:  
## : : :...default = no: no (222.1/29.4)  
## : : default = yes: yes (6.6/0.8)  
## : month in {apr,may}:  
## : :...education = primary: no (61.7/14.1)  
## : : education in {secondary,tertiary,  
## : : : unknown}:  
## : : :...day in {2,9,10,14,19,20,22,23,  
## : : : 25,28,29,  
## : : : 31}: yes (246.8/67.3)  
## : : day in {3,11,15,  
## : : : 18}: no (29.4)  
## : : day in {1,4,5,6,7,8,12,13,16,  
## : : : 17,21,24,26,27,30}:  
## : : :...balance <= 25: no (50.7/5.7)  
## : : balance > 25:  
## : : :...duration <= 320: [S8]  
## : : duration > 320: [S9]  
## : month in {aug,feb,jul,nov,oct}:  
## : :...day in {12,16,23,28}:  
## : :...month in {feb,  
## : : : oct}: yes (50.8/4.4)  
## : : month in {aug,jul,nov}:  
## : : :...day = 23: no (11.1)  
## : : day in {12,16,28}: [S10]  
## : day in {1,2,3,4,5,6,7,8,9,10,11,13,  
## : : 14,15,17,18,19,20,21,22,24,  
## : : 25,26,27,29,30,31}:  
## : :...balance <= -1: no (55.1/6.1)  
## : balance > -1:  
## : :...age <= 27: [S11]  
## : age > 27: [S12]  
## housing = yes:  
## :...campaign > 8: no (41.2)  
## campaign <= 8:  
## :...previous > 14: yes (28.3/10.8)  
## previous <= 14:  
## :...previous > 10: no (32.4/2.1)  
## previous <= 10:  
## :...month = jan: no (97.7/4.2)  
## month in {apr,jul}:  
## :...day in {5,19,  
## : : 26}: no (0)  
## : day in {2,6,7,12,13,23,29,30}: [S13]  
## : day in {1,3,4,8,9,10,11,14,15,  
## : : 16,17,18,20,21,22,24,  
## : : 25,27,28,31}: [S14]  
## month in {aug,feb,may,nov,oct}:  
## :...day in {1,2,5,6,9,11,19,24,29,  
## : 30}: no (649.4/132.6)  
## day in {10,16,22,25,27,  
## : 31}: yes (126.6/38.5)  
## day in {3,4,7,8,12,13,14,15,17,  
## : 18,20,21,23,26,28}:  
## :...campaign > 5: no (44.8/3)  
## campaign <= 5:  
## :...duration <= 282: no (413.5/81.5)  
## duration > 282: [S15]  
##   
## SubTree [S1]  
##   
## duration <= 98: yes (21.3)  
## duration > 98:  
## :...balance > 5000: no (54.2/12.2)  
## balance <= 5000:  
## :...education = unknown: no (5.9)  
## education in {primary,secondary,tertiary}:  
## :...balance > 2313: yes (91.4/12.5)  
## balance <= 2313:  
## :...month in {apr,oct}: no (101.3/37.7)  
## month in {feb,mar}: yes (51.4/13.6)  
##   
## SubTree [S2]  
##   
## job in {entrepreneur,self-employed,unemployed,unknown}: no (38.6)  
## job in {admin.,blue-collar,housemaid,management,retired,services,student,  
## : technician}:  
## :...duration <= 104: no (43.5/4)  
## duration > 104:  
## :...day in {12,15,16,18,21,22,31}: yes (126.9/36)  
## day in {3,6,8,9,10,11,13,14,17,19,20,23,24,25,26,27,28,29}:  
## :...pdays > 321: no (21.7)  
## pdays <= 321:  
## :...previous > 5: yes (23/6.9)  
## previous <= 5:  
## :...marital = single: no (163.5/67.4)  
## marital = married:  
## :...duration <= 110: yes (17.7/3.8)  
## duration > 110:  
## :...month in {apr,feb,oct,sep}: no (157.8/23.9)  
## month = mar: yes (28.6/10.8)  
##   
## SubTree [S3]  
##   
## poutcome = failure: no (117.2/54.9)  
## poutcome in {other,unknown}: yes (36.8/6.2)  
##   
## SubTree [S4]  
##   
## housing = yes: no (200.7/37.8)  
## housing = no:  
## :...poutcome = failure: yes (54.9/23.2)  
## poutcome = other: no (6)  
## poutcome = unknown:  
## :...duration <= 123: no (30.3)  
## duration > 123:  
## :...duration <= 125: yes (19.6/2)  
## duration > 125:  
## :...education = primary: no (21/1.9)  
## education in {secondary,tertiary}:  
## :...balance <= 200: no (24.2)  
## balance > 200:  
## :...balance <= 259: yes (13.1/0.4)  
## balance > 259:  
## :...age <= 34: no (65.1/12.1)  
## age > 34:  
## :...marital in {divorced,married}: no (119.8/52.5)  
## marital = single: yes (42.7/7.6)  
##   
## SubTree [S5]  
##   
## month in {apr,mar,nov}: yes (46.7/19)  
## month in {aug,feb,jan,jul,sep}: no (171.1/58.6)  
## month = jun:  
## :...day in {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,18,19,20,21,22,23,25,26,27,  
## : : 28,29,30,31}: yes (477.1/212.6)  
## : day in {17,24}: no (47.2/6.2)  
## month = may:  
## :...age > 58: yes (26.6/4.9)  
## age <= 58:  
## :...marital = divorced: yes (116.2/53.2)  
## marital = single:  
## :...balance <= 80: no (73/14)  
## : balance > 80:  
## : :...balance > 3662: no (19/0.4)  
## : balance <= 3662:  
## : :...balance > 2892: yes (20.9)  
## : balance <= 2892:  
## : :...day in {1,2,3,4,7,8,9,10,11,15,16,17,19,20,22,24,25,26,  
## : : 28,29,30,31}: yes (121.5/33)  
## : day in {5,6,12,13,14,18,21,23,27}: no (62.2/12.2)  
## marital = married:  
## :...job in {self-employed,student,unemployed,unknown}: no (19.5)  
## job in {admin.,blue-collar,entrepreneur,housemaid,management,  
## : retired,services,technician}:  
## :...duration <= 838:  
## :...contact = telephone: yes (4.6/0.4)  
## : contact = unknown:  
## : :...balance > 1598: no (39.4)  
## : balance <= 1598:  
## : :...job in {admin.,entrepreneur,retired,  
## : : technician}: yes (91.7/40.4)  
## : job in {blue-collar,housemaid,management,  
## : services}: no (169.2/39.2)  
## duration > 838:  
## :...contact = telephone: no (3.5)  
## contact = unknown:  
## :...job in {entrepreneur,retired}: no (9.3)  
## job in {admin.,blue-collar,housemaid,management,  
## : services,technician}:  
## :...loan = yes: no (35.7/13.2)  
## loan = no:  
## :...campaign <= 4: yes (139.6/54.5)  
## campaign > 4: no (8.2)  
##   
## SubTree [S6]  
##   
## marital = divorced: yes (36.8/14.4)  
## marital = married:  
## :...loan = yes: yes (36.4/14.1)  
## : loan = no:  
## : :...poutcome in {failure,other}: no (109.2/36.3)  
## : poutcome = unknown:  
## : :...education in {primary,tertiary,unknown}: no (166.6/66.3)  
## : education = secondary: yes (113.1/47.7)  
## marital = single:  
## :...age > 36: yes (56.6/13.7)  
## age <= 36:  
## :...balance > 2439: yes (50.4/12.1)  
## balance <= 2439:  
## :...balance > 2048: no (22.2)  
## balance <= 2048:  
## :...day in {1,4,13,14,17,25,29}: yes (60.9/10.2)  
## day in {2,3,5,7,8,9,10,11,12,15,16,18,21,23,24,27,30,  
## 31}: no (165.4/47.4)  
##   
## SubTree [S7]  
##   
## job in {housemaid,retired,self-employed,student,unemployed,  
## : unknown}: no (46.5)  
## job in {admin.,blue-collar,entrepreneur,management,services,technician}:  
## :...duration <= 530: no (292.7/74.3)  
## duration > 530: yes (89.3/39.8)  
##   
## SubTree [S8]  
##   
## campaign > 2: no (56.6/9.3)  
## campaign <= 2:  
## :...job = technician: yes (22.6/3.5)  
## job in {entrepreneur,housemaid,self-employed,services,  
## : unknown}: no (11.8)  
## job in {admin.,blue-collar,management,retired,student,unemployed}:  
## :...day in {5,6,7,8,12,13,24,30}: yes (109.4/48.2)  
## day in {1,4,16,17,21,26,27}: no (43.7/2.1)  
##   
## SubTree [S9]  
##   
## contact = telephone: yes (15.1/1.8)  
## contact = cellular:  
## :...balance > 3583: no (35.8/11.3)  
## balance <= 3583:  
## :...balance > 2005: yes (43.2/2.8)  
## balance <= 2005:  
## :...duration > 529: yes (12)  
## duration <= 529:  
## :...age > 43: no (25/3.5)  
## age <= 43:  
## :...day in {1,5,6,7,8,16,24,26,30}: yes (90.7/15.3)  
## day in {4,12,13,17,21,27}: no (63.5/18.6)  
##   
## SubTree [S10]  
##   
## poutcome = other: yes (7.6)  
## poutcome in {failure,unknown}:  
## :...contact = telephone: no (9/1.4)  
## contact = cellular:  
## :...education in {primary,tertiary,unknown}: no (134.8/55.3)  
## education = secondary: yes (138.7/34.1)  
##   
## SubTree [S11]  
##   
## job in {entrepreneur,retired,self-employed,unknown}: yes (25/0.8)  
## job in {admin.,blue-collar,housemaid,management,services,student,technician,  
## : unemployed}:  
## :...education = primary: yes (6.9)  
## education in {secondary,tertiary,unknown}:  
## :...month in {aug,nov}: yes (94.2/33)  
## month in {feb,jul,oct}:  
## :...campaign <= 4: no (146.7/44)  
## campaign > 4: yes (19/4.8)  
##   
## SubTree [S12]  
##   
## job in {blue-collar,entrepreneur,housemaid,self-employed,student,unknown}:  
## :...duration <= 408: no (363.6/65.5)  
## : duration > 408:  
## : :...duration > 608: yes (13.5)  
## : duration <= 608:  
## : :...education = unknown: no (17.6)  
## : education in {primary,secondary,tertiary}:  
## : :...pdays > 186: no (12)  
## : pdays <= 186:  
## : :...pdays > 52: yes (13.4/1.8)  
## : pdays <= 52:  
## : :...day in {2,6,10,11,14,17,18,20,22,26,29,  
## : : 30}: yes (155.4/73.8)  
## : day in {1,3,4,5,7,8,9,13,15,19,21,24,25,27,  
## : 31}: no (47)  
## job in {admin.,management,retired,services,technician,unemployed}:  
## :...pdays > 154: yes (115.6/46.9)  
## pdays <= 154:  
## :...pdays > 106: no (45/5.2)  
## pdays <= 106:  
## :...poutcome = failure: yes (77.7/33.6)  
## poutcome = other: no (33.4/8.6)  
## poutcome = unknown:  
## :...day in {4,10,14,15,25,26,29,31}: no (330/66.1)  
## day in {1,2,3,5,6,7,8,9,11,13,17,18,19,20,21,22,24,27,30}:  
## :...education = primary: no (83.7/19.4)  
## education in {secondary,tertiary,unknown}:  
## :...default = yes: no (7.7)  
## default = no:  
## :...duration <= 222: no (79.7/16)  
## duration > 222:  
## :...duration > 581: no (59.4/12.2)  
## duration <= 581:  
## :...duration > 548: yes (75.7/20.7)  
## duration <= 548:  
## :...job in {admin.,technician,unemployed}:  
## :...age <= 43:  
## : :...campaign <= 6: no (314.6/90.7)  
## : : campaign > 6: yes (21.3/7.3)  
## : age > 43:  
## : :...day in {1,8,9,11,19,  
## : : 27}: no (40.8)  
## : day in {2,3,5,6,7,13,17,18,20,  
## : : 21,22,24,30}:  
## : :...month = oct: no (9.3)  
## : month in {aug,feb,jul,nov}: [S16]  
## job in {management,retired,services}:  
## :...marital = divorced: yes (108.5/33.8)  
## marital in {married,single}:  
## :...day in {9,18,20,22,24,  
## : 30}: no (116.7/26.9)  
## day in {1,2,3,5,6,7,8,11,13,17,  
## : 19,21,27}: [S17]  
##   
## SubTree [S13]  
##   
## job in {housemaid,retired,student,unknown}: no (16.1)  
## job in {admin.,blue-collar,entrepreneur,management,self-employed,services,  
## : technician,unemployed}:  
## :...balance <= 258: yes (130.1/39.7)  
## balance > 258:  
## :...balance <= 488: no (28.2)  
## balance > 488:  
## :...day in {2,7,13,23}: no (76.7/15.6)  
## day in {6,12,29,30}: yes (105.4/40.6)  
##   
## SubTree [S14]  
##   
## contact = telephone: no (49.1)  
## contact = cellular:  
## :...pdays > 328: no (43.9)  
## pdays <= 328:  
## :...loan = yes: no (167.3/13.3)  
## loan = no:  
## :...marital = divorced: no (106.8/7.7)  
## marital in {married,single}:  
## :...duration <= 250: no (145.1/13.5)  
## duration > 250:  
## :...balance > 2463: no (85.8)  
## balance <= 2463:  
## :...day in {1,3,4,11,20,27,31}: no (71/2.1)  
## day in {8,9,10,14,15,16,17,18,21,22,24,25,28}:  
## :...duration > 598: no (35.9/2.1)  
## duration <= 598:  
## :...previous > 1: yes (64.8/26.9)  
## previous <= 1:  
## :...job in {admin.,entrepreneur,housemaid,  
## : unemployed,  
## : unknown}: no (83.9/7.8)  
## job in {retired,student}: yes (14/2)  
## job in {blue-collar,management,  
## : self-employed,services,technician}:  
## :...month = apr: no (128.5/57)  
## month = jul:  
## :...balance <= 87: no (49.8/4.2)  
## balance > 87:  
## :...balance <= 172: yes (29.4/5.6)  
## balance > 172: no (143.9/44.3)  
##   
## SubTree [S15]  
##   
## balance > 8079: no (40.8/4)  
## balance <= 8079:  
## :...balance > 6513: yes (29.6/5.5)  
## balance <= 6513:  
## :...poutcome = failure:  
## :...month in {aug,nov}: no (38.8)  
## : month in {feb,may,oct}:  
## : :...marital = divorced: no (20.7)  
## : marital in {married,single}:  
## : :...day in {3,12,14,15,18,28}: yes (118.9/53.6)  
## : day in {4,7,8,13,17,20,21,23,26}: no (88.8/13.7)  
## poutcome in {other,unknown}:  
## :...duration > 524:  
## :...default = yes: yes (8)  
## : default = no:  
## : :...duration <= 534: yes (50.6/5.3)  
## : duration > 534:  
## : :...education in {primary,secondary}: yes (143.3/55.8)  
## : education in {tertiary,unknown}: no (95/38.3)  
## duration <= 524:  
## :...default = yes: no (12.6)  
## default = no:  
## :...duration > 508: no (29.6/0.4)  
## duration <= 508:  
## :...education = primary: no (51.8/9.2)  
## education in {secondary,tertiary,unknown}:  
## :...job = unknown: no (0)  
## job in {entrepreneur,self-employed,services,  
## : student,unemployed}: yes (146.9/49.5)  
## job in {admin.,blue-collar,housemaid,management,  
## : retired,technician}:  
## :...duration <= 289: yes (27.1/5.4)  
## duration > 289:  
## :...campaign > 3: no (23.8)  
## campaign <= 3:  
## :...duration <= 306: no (26)  
## duration > 306:  
## :...duration <= 309: yes (28.5/6.1)  
## duration > 309:  
## :...duration <= 350: no (66.1/6)  
## duration > 350:  
## :...balance <= -521: yes (17.7/2.3)  
## balance > -521:  
## :...age <= 29: yes (75/23.4)  
## age > 29: [S18]  
##   
## SubTree [S16]  
##   
## marital = single: no (14.4/3)  
## marital in {divorced,married}:  
## :...campaign <= 2: yes (136.9/35.8)  
## campaign > 2: no (65.2/28)  
##   
## SubTree [S17]  
##   
## contact = telephone: yes (41.8/10.1)  
## contact = cellular:  
## :...month in {feb,jul,oct}: yes (132.6/40.9)  
## month in {aug,nov}:  
## :...balance > 7434: no (13.4)  
## balance <= 7434:  
## :...age <= 42: no (129.9/53.9)  
## age > 42: yes (111.1/40.8)  
##   
## SubTree [S18]  
##   
## contact = telephone: yes (8.9/2.3)  
## contact = cellular:  
## :...month in {aug,feb}: no (33.2/1.9)  
## month in {may,nov,oct}:  
## :...duration <= 369: no (15.8)  
## duration > 369:  
## :...balance <= 1603: no (148.4/46.7)  
## balance > 1603: yes (41.9/13)  
##   
## ----- Trial 5: -----  
##   
## Decision tree:  
##   
## duration <= 129:  
## :...month in {aug,dec,jan,jul,jun,may,nov}:  
## : :...day in {1,2,3,4,10,12,27}:  
## : : :...month = nov: yes (64.7/18.3)  
## : : : month in {aug,dec,jan,jul,jun,may}:  
## : : : :...contact in {telephone,unknown}: no (267.6/17)  
## : : : contact = cellular:  
## : : : :...duration <= 80: no (109.2/13.1)  
## : : : duration > 80:  
## : : : :...job in {blue-collar,entrepreneur,management,retired,  
## : : : : student,unemployed,unknown}: no (146.6/22.9)  
## : : : job in {admin.,housemaid,self-employed,services,  
## : : : : technician}:  
## : : : :...day in {1,2,3,4,27}: yes (127.9/47.7)  
## : : : day in {10,12}: no (49.8/3.3)  
## : : day in {5,6,7,8,9,11,13,14,15,16,17,18,19,20,21,22,23,24,25,26,28,29,  
## : : : 30,31}:  
## : : :...campaign > 3: no (947)  
## : : campaign <= 3:  
## : : :...balance <= 90: no (671.1)  
## : : balance > 90:  
## : : :...housing = yes: no (959.2/39.4)  
## : : housing = no:  
## : : :...age > 34:  
## : : :...day in {5,8,14,15,16,17,18,19,23,24,25,28,  
## : : : : 31}: no (292.6)  
## : : : day in {6,7,9,11,13,20,21,22,26,29,30}:  
## : : : :...previous <= 1: no (288.1/37.8)  
## : : : previous > 1: yes (38.3/16.4)  
## : : age <= 34:  
## : : :...balance > 705: no (131.1/8.4)  
## : : balance <= 705:  
## : : :...day in {6,7,11,17,18,19,22,23,24,28,29,  
## : : : 30}: no (45.6)  
## : : day in {5,8,9,13,14,15,16,20,21,25,26,31}:  
## : : :...poutcome = failure: no (9.5)  
## : : poutcome in {other,success,unknown}:  
## : : :...education in {primary,  
## : : : unknown}: no (8.4)  
## : : education in {secondary,tertiary}:  
## : : :...month in {aug,jul,jun,may,  
## : : : nov}: yes (144.3/52.1)  
## : : month in {dec,jan}: no (9.5)  
## : month in {apr,feb,mar,oct,sep}:  
## : :...duration <= 78: no (457.4/64.9)  
## : duration > 78:  
## : :...pdays > 185:  
## : :...day in {1,2,3,4,5,6,7,9,10,11,13,14,17,18,19,20,21,24,26,28,30,  
## : : : 31}: no (117.4)  
## : : day in {8,12,15,16,22,23,25,27,29}: yes (55.1/25.7)  
## : pdays <= 185:  
## : :...pdays > 182: yes (31.7/6)  
## : pdays <= 182:  
## : :...education = unknown: no (37.5/3.1)  
## : education in {primary,secondary,tertiary}:  
## : :...month = mar:  
## : :...day in {1,6,7,13,14,17,18,19,21,28,  
## : : : 31}: yes (0)  
## : : day in {4,15,16,20,24,26,27}: no (25.2)  
## : : day in {2,3,5,8,9,10,11,12,22,23,25,29,30}:  
## : : :...marital = divorced: yes (15.5)  
## : : marital in {married,single}:  
## : : :...education = primary: no (7.3)  
## : : education in {secondary,  
## : : tertiary}: yes (149.8/51.9)  
## : month in {apr,feb,oct,sep}:  
## : :...balance <= 195: no (210.3/34)  
## : balance > 195:  
## : :...job in {retired,self-employed,  
## : : unknown}: no (107.5/19.9)  
## : job in {admin.,blue-collar,entrepreneur,  
## : : housemaid,management,services,student,  
## : : technician,unemployed}:  
## : :...poutcome = success: yes (50.4/12.3)  
## : poutcome in {failure,other,unknown}:  
## : :...day in {4,5,6,7,8,9,10,12,14,15,16,25,  
## : : 30,31}: no (198.8/38.7)  
## : day in {1,2,3,11,13,17,18,19,20,21,22,  
## : : 23,24,26,27,28,29}:  
## : :...balance <= 410: no (48.5/10.2)  
## : balance > 410: [S1]  
## duration > 129:  
## :...poutcome = success:  
## :...housing = yes:  
## : :...age > 60: yes (29.6/4.5)  
## : : age <= 60:  
## : : :...month = mar: yes (13.3)  
## : : month in {aug,dec,jul,jun,sep}:  
## : : :...day in {1,2,6,7,8,10,12,13,14,15,21,25,26,  
## : : : : 30}: no (115/39.2)  
## : : : day in {3,4,5,9,11,16,17,18,19,20,22,23,24,27,28,29,  
## : : : 31}: yes (67.1)  
## : : month in {apr,feb,jan,may,nov,oct}:  
## : : :...age <= 28: yes (43.5/15.1)  
## : : age > 28:  
## : : :...education in {primary,tertiary,  
## : : : unknown}: no (198.7/59.1)  
## : : education = secondary:  
## : : :...contact in {telephone,unknown}: yes (10.9)  
## : : contact = cellular:  
## : : :...day in {1,24,31}: no (0)  
## : : day in {5,10,14,21,22,30}: yes (28.1)  
## : : day in {2,3,4,6,7,8,9,11,12,13,15,16,17,18,19,  
## : : : 20,23,25,26,27,28,29}:  
## : : :...job in {admin.,blue-collar,entrepreneur,  
## : : : housemaid,retired,services,student,  
## : : : technician,unemployed,  
## : : : unknown}: no (170.9/44.2)  
## : : job in {management,  
## : : self-employed}: yes (6.7/0.3)  
## : housing = no:  
## : :...previous > 10: no (37/12.9)  
## : previous <= 10:  
## : :...previous > 8: yes (26.2/1.7)  
## : previous <= 8:  
## : :...duration <= 212:  
## : :...pdays > 203: no (37.6/6.1)  
## : : pdays <= 203:  
## : : :...loan = yes: yes (15.5/1.2)  
## : : loan = no:  
## : : :...previous > 2:  
## : : :...day in {1,17,19,31}: no (0)  
## : : : day in {10,11,12,20,22,23,24,  
## : : : : 28}: yes (29.8)  
## : : : day in {2,3,4,5,6,7,8,9,13,14,15,16,18,21,  
## : : : : 25,26,27,29,30}:  
## : : : :...balance <= 1266: yes (69.4/30)  
## : : : balance > 1266: no (84.4/8.1)  
## : : previous <= 2:  
## : : :...contact in {telephone,  
## : : : unknown}: yes (7.5)  
## : : contact = cellular:  
## : : :...job in {entrepreneur,  
## : : : retired}: no (31.2/6.1)  
## : : job in {housemaid,self-employed,  
## : : : unemployed,  
## : : : unknown}: yes (15)  
## : : job in {admin.,blue-collar,management,  
## : : : services,student,technician}:  
## : : :...age > 53: yes (22.4)  
## : : age <= 53:  
## : : :...day in {1,2,5,10,12,13,14,16,  
## : : : 17,18,20,21,22,23,24,  
## : : : 25,26,29,  
## : : : 31}: yes (102.6/12.4)  
## : : day in {3,4,6,7,8,9,11,15,19,  
## : : 27,28,  
## : : 30}: no (101.2/27)  
## : duration > 212:  
## : :...marital = divorced: no (97.5/46.5)  
## : marital in {married,single}:  
## : :...pdays > 381: yes (35.7/1.7)  
## : pdays <= 381:  
## : :...campaign > 2: yes (116.6/22.1)  
## : campaign <= 2:  
## : :...job in {admin.,housemaid,  
## : : self-employed}: no (137/63)  
## : job in {blue-collar,entrepreneur,  
## : : management,retired,services,  
## : : student,technician,unemployed,  
## : : unknown}:  
## : :...month in {jun,mar}: no (93/44)  
## : month in {apr,aug,dec,feb,jan,jul,may,  
## : : nov,oct,sep}:  
## : :...loan = yes: yes (11.6)  
## : loan = no:  
## : :...day in {1,4,6,9,11,14,15,17,21,  
## : : 22,23,25,28,30,  
## : : 31}: yes (217.2/17.9)  
## : day in {2,3,5,7,8,10,12,13,16,  
## : : 18,19,20,24,26,27,29}:  
## : :...month = jan: yes (20)  
## : month in {apr,aug,dec,feb,  
## : : jul,may,nov,oct,  
## : : sep}: [S2]  
## poutcome in {failure,other,unknown}:  
## :...contact = unknown:  
## :...duration <= 393:  
## : :...month in {apr,aug,feb,mar,nov,oct,sep}: yes (101.3/42.3)  
## : : month in {dec,jan,jul,jun,may}: no (1751.4/53.7)  
## : duration > 393:  
## : :...duration > 503:  
## : :...day in {1,11,21,22,24,30}: yes (309.1/141.3)  
## : : day in {2,3,4,6,7,8,9,10,12,13,14,15,17,18,19,23,25,26,27,  
## : : : 28,29,31}: no (1873.3/668.9)  
## : : day = 16:  
## : : :...campaign > 13: no (12.9)  
## : : : campaign <= 13:  
## : : : :...age <= 49: yes (124.1/49.6)  
## : : : age > 49: no (59.3/7.9)  
## : : day = 20:  
## : : :...default = yes: no (7.2)  
## : : : default = no:  
## : : : :...loan = no: no (125.6/45)  
## : : : loan = yes: yes (32/6.5)  
## : : day = 5:  
## : : :...age > 53: yes (30.2/6.3)  
## : : age <= 53:  
## : : :...age <= 29: yes (13.7/3.2)  
## : : age > 29:  
## : : :...job in {admin.,blue-collar,entrepreneur,  
## : : : management,retired,self-employed,  
## : : : services,student,technician,  
## : : : unknown}: no (141/22.9)  
## : : job in {housemaid,unemployed}: yes (16.6/4.8)  
## : duration <= 503:  
## : :...day in {4,7,10,11,14,16,18,22,24,25,28,29,30,  
## : : 31}: no (109.3)  
## : day in {1,2,3,5,6,8,9,12,13,15,17,19,20,21,23,26,27}:  
## : :...housing = no: no (86.8/12.8)  
## : housing = yes:  
## : :...duration <= 395: yes (19.2/2.3)  
## : duration > 395:  
## : :...duration <= 405: no (23.6)  
## : duration > 405:  
## : :...day in {23,27}: no (31.4)  
## : day in {1,2,3,5,6,8,9,12,13,15,17,19,20,21,  
## : : 26}:  
## : :...balance <= -299: yes (23.6/3)  
## : balance > -299:  
## : :...day in {2,13}: no (25)  
## : day in {17,26}: yes (42.1/10.8)  
## : day in {1,3,5,6,8,9,12,15,19,20,21}:  
## : :...loan = yes: no (19.8)  
## : loan = no:  
## : :...month in {apr,dec,feb,jan,  
## : : mar,nov,oct,  
## : : sep}: no (0)  
## : month in {aug,  
## : : jul}: yes (4.7)  
## : month in {jun,may}:  
## : :...default = no: no (174.2/62.6)  
## : default = yes: yes (11.5/2.9)  
## contact in {cellular,telephone}:  
## :...duration > 644:  
## :...duration > 1792: no (146.1/42.7)  
## : duration <= 1792:  
## : :...age > 78: yes (29/3.3)  
## : age <= 78:  
## : :...day in {1,2,3,7,8,9,13,14,15,16,21,22,23,24,30}:  
## : :...duration > 1478: yes (61.2/1.7)  
## : : duration <= 1478:  
## : : :...default = yes: yes (42.6/5.2)  
## : : default = no:  
## : : :...campaign > 10: no (31.3/9.3)  
## : : campaign <= 10:  
## : : :...age <= 25: yes (97.2/19)  
## : : age > 25:  
## : : :...job in {entrepreneur,services,  
## : : : student,unemployed}: [S3]  
## : : job in {admin.,blue-collar,  
## : : : housemaid,management,  
## : : : retired,self-employed,  
## : : : technician,unknown}:  
## : : :...month in {dec,jan,  
## : : : oct}: no (60.7/16.5)  
## : : month = mar: yes (11.4)  
## : : month in {jul,sep}: [S4]  
## : : month in {apr,aug,feb,jun,may,  
## : : : nov}:  
## : : :...pdays > 112:  
## : : :...duration > 965: no (78.8/18.7)  
## : : : duration <= 965: [S5]  
## : : pdays <= 112: [S6]  
## : day in {4,5,6,10,11,12,17,18,19,20,25,26,27,28,29,31}:  
## : :...duration <= 921:  
## : :...month in {dec,oct,sep}: yes (35.8/3.7)  
## : : month in {apr,aug,feb,jan,jul,jun,mar,may,nov}:  
## : : :...contact = telephone: no (61.7/3.1)  
## : : contact = cellular:  
## : : :...education in {primary,secondary,  
## : : : tertiary}: no (1232.4/436.4)  
## : : education = unknown: yes (38.3/14.4)  
## : duration > 921:  
## : :...age > 60: no (33.5/4.5)  
## : age <= 60:  
## : :...job in {entrepreneur,housemaid,  
## : : student}: no (104.7/31.3)  
## : job in {admin.,blue-collar,management,  
## : : retired,self-employed,services,  
## : : technician,unemployed,unknown}:  
## : :...contact = telephone: yes (76.8/19.9)  
## : contact = cellular:  
## : :...campaign > 6: no (37.9/11.8)  
## : campaign <= 6:  
## : :...housing = yes:  
## : :...duration > 1478: yes (52.5/4.7)  
## : : duration <= 1478: [S7]  
## : housing = no: [S8]  
## duration <= 644:  
## :...month in {dec,jun,mar,oct,sep}:  
## :...campaign > 7: no (43.9/11.2)  
## : campaign <= 7:  
## : :...duration <= 161:  
## : :...previous > 5: no (28.9)  
## : : previous <= 5:  
## : : :...day in {1,2,5,6,7,8,12,13,14,15,17,18,20,22,25,  
## : : : 26,28,30}: no (282/70)  
## : : day in {3,4,9,10,11,16,19,21,23,24,27,29,31}:  
## : : :...poutcome = other: no (13.6/3.6)  
## : : poutcome in {failure,unknown}:  
## : : :...job in {admin.,blue-collar,  
## : : : entrepreneur,housemaid,retired,  
## : : : student}: no (84.7/41)  
## : : job in {management,self-employed,  
## : : services,technician,unemployed,  
## : : unknown}: yes (89.6/13)  
## : duration > 161:  
## : :...balance > 15035: no (33.9/7.3)  
## : balance <= 15035:  
## : :...loan = yes: no (124.5/53.3)  
## : loan = no:  
## : :...day in {2,5,8,9,10,11,17,18,20,22,24,27,28,  
## : : 29,30}:  
## : :...job in {entrepreneur,services,student,  
## : : : unemployed,unknown}:  
## : : :...campaign > 2: yes (54.6/20.1)  
## : : : campaign <= 2: [S9]  
## : : job in {admin.,blue-collar,housemaid,  
## : : : management,retired,  
## : : : self-employed,technician}:  
## : : :...campaign > 2: yes (139.3/29.9)  
## : : campaign <= 2:  
## : : :...balance <= 512: yes (212.9/50.1)  
## : : balance > 512:  
## : : :...balance <= 943: no (133/52.4)  
## : : balance > 943: [S10]  
## : day in {1,3,4,6,7,12,13,14,15,16,19,21,23,  
## : : 25,26,31}:  
## : :...contact = telephone: no (154.7/47.2)  
## : contact = cellular:  
## : :...month in {dec,sep}:  
## : :...day in {12,19,26,  
## : : : 31}: yes (0)  
## : : day in {13,14,23,  
## : : : 25}: no (55.8/12.4)  
## : : day in {1,3,4,6,7,15,16,21}:  
## : : :...pdays > 253: yes (22.9)  
## : : pdays <= 253: [S11]  
## : month in {jun,mar,oct}: [S12]  
## month in {apr,aug,feb,jan,jul,may,nov}:  
## :...age > 60:  
## :...loan = yes: no (4.1)  
## : loan = no:  
## : :...age > 84: yes (35.2/4.2)  
## : age <= 84:  
## : :...marital = single: no (20.9/3.1)  
## : marital in {divorced,married}:  
## : :...day in {1,3,4,6,7,8,13,14,15,16,17,19,20,  
## : : 21,23,25,26,27,30,31}:  
## : :...poutcome in {failure,  
## : : : other}: no (94.9/32.1)  
## : : poutcome = unknown:  
## : : :...duration > 321: yes (164.3/28.5)  
## : : duration <= 321:  
## : : :...housing = yes: yes (36.2/4.3)  
## : : housing = no:  
## : : :...campaign <= 1: no (140.9/58)  
## : : campaign > 1: yes (102.2/29.9)  
## : day in {2,5,9,10,11,12,18,22,24,28,29}:  
## : :...job in {admin.,housemaid,technician,  
## : : unknown}: no (29.5)  
## : job in {entrepreneur,services,student,  
## : : unemployed}: yes (15.1/1.4)  
## : job in {blue-collar,management,retired,  
## : : self-employed}:  
## : :...balance > 5368: no (31.4)  
## : balance <= 5368:  
## : :...duration <= 224: no (110/13.5)  
## : duration > 224:  
## : :...duration <= 241: yes (19.3)  
## : duration > 241: no (129.4/57)  
## age <= 60:  
## :...housing = yes:  
## :...duration > 363:  
## : :...pdays > 370: yes (27.9/1.9)  
## : : pdays <= 370:  
## : : :...month = jan: no (59.7/3.6)  
## : : month in {apr,aug,feb,jul}:  
## : : :...duration > 625: yes (92.2/42.7)  
## : : : duration <= 625:  
## : : : :...default = yes: no (30.3/14.2)  
## : : : default = no: [S13]  
## : : month in {may,nov}:  
## : : :...job in {housemaid,retired,student,  
## : : : unknown}: no (42.1/1.7)  
## : : job in {admin.,blue-collar,  
## : : : entrepreneur,management,  
## : : : self-employed,services,  
## : : : technician,unemployed}:  
## : : :...campaign > 4: no (43.3/4.7)  
## : : campaign <= 4:  
## : : :...day in {1,2,10,23,24,26,27,28,  
## : : : 29,30,  
## : : : 31}: no (0)  
## : : day in {3,16,22,  
## : : : 25}: yes (19.5)  
## : : day in {7,9,11,14}:  
## : : :...duration <= 455: no (74.1/3.1)  
## : : : duration > 455:  
## : : : :...default = yes: yes (3.3)  
## : : : default = no: [S14]  
## : : day in {4,5,6,8,12,13,15,17,18,  
## : : : 19,20,21}:  
## : : :...job in {admin.,  
## : : : entrepreneur,  
## : : : self-employed,  
## : : : technician}:  
## : : :...day in {5,15,18,20}: [S15]  
## : : : day in {4,6,8,12,13,17,  
## : : : : 19,21}:  
## : : : :...age > 39: no (74.1/34)  
## : : : age <= 39: [S16]  
## : : job in {blue-collar,  
## : : : management,  
## : : : services,  
## : : : unemployed}: [S17]  
## : duration <= 363:  
## : :...month in {aug,feb}:  
## : :...day in {1,9,19,20,21,22,24,25,29,  
## : : : 30}: no (76.4)  
## : : day in {15,17,23,31}: yes (35.5)  
## : : day in {2,3,4,5,6,7,8,10,11,12,13,14,16,18,  
## : : : 26,27,28}:  
## : : :...balance <= 896:  
## : : :...day in {2,4,6,7,8,10,12,  
## : : : : 26}: no (122.2)  
## : : : day in {3,5,11,13,14,16,18,27,28}:  
## : : : :...campaign <= 2: yes (118.4/52.1)  
## : : : campaign > 2: no (59.9/8.5)  
## : : balance > 896:  
## : : :...balance > 4782: no (25.2)  
## : : balance <= 4782:  
## : : :...age <= 27: yes (18.8)  
## : : age > 27:  
## : : :...duration <= 214: no (92.7/30.9)  
## : : duration > 214: yes (130.5/29.3)  
## : month in {apr,jan,jul,may,nov}:  
## : :...balance > 11555: yes (59.1/22)  
## : balance <= 11555:  
## : :...campaign > 5: no (113.9)  
## : campaign <= 5:  
## : :...day in {1,3,6,7,11,12,13,16,17,18,  
## : : 19,20,21,26,28,29,  
## : : 31}: no (1637.2/176.3)  
## : day = 27: yes (27.1/4.7)  
## : day in {2,4,5,8,9,10,14,15,22,23,  
## : : 24,25,30}: [S18]  
## housing = no:  
## :...loan = yes:  
## :...campaign > 5: no (49.1)  
## : campaign <= 5:  
## : :...month = apr: yes (18.7/6.7)  
## : month = jan: no (29.8)  
## : month in {aug,feb,jul,may,nov}:  
## : :...poutcome = failure: yes (56.8/26.5)  
## : poutcome in {other,unknown}:  
## : :...education in {primary,  
## : : unknown}: no (96.2/7.3)  
## : education in {secondary,tertiary}:  
## : :...day in {1,5,9,  
## : : 26}: yes (78.8/26.8)  
## : day in {2,3,4,6,7,8,10,11,12,  
## : 13,14,15,16,17,18,19,  
## : 20,21,22,23,24,25,27,  
## : 28,29,30,  
## : 31}: no (507.2/110.8)  
## loan = no:  
## :...balance <= 65:  
## :...duration <= 334: no (583.9/103.1)  
## : duration > 334:  
## : :...contact = telephone: no (20.9/3.3)  
## : contact = cellular:  
## : :...campaign > 6: no (28.9/4.7)  
## : campaign <= 6:  
## : :...day in {1,3,4,7,9,10,14,15,16,  
## : : 17,21,22,23,24,  
## : : 25}: no (139.2/25.3)  
## : day in {2,5,6,8,11,12,13,18,19,  
## : : 20,26,27,28,29,30,31}:  
## : :...month in {jan,may,  
## : : nov}: no (66.7/17.1)  
## : month in {apr,aug,feb,jul}: [S19]  
## balance > 65:  
## :...poutcome = other:  
## :...month = jul: yes (43.7/1.6)  
## : month in {apr,aug,feb,jan,may,nov}:  
## : :...day in {1,2,4,5,8,9,11,14,15,16,17,  
## : : 18,22,26,  
## : : 28}: no (98.9/14.8)  
## : day in {3,6,7,10,12,13,19,20,21,23,  
## : : 24,25,27,29,30,31}:  
## : :...default = yes: no (2.2)  
## : default = no: [S20]  
## poutcome in {failure,unknown}:  
## :...month = apr:  
## :...poutcome = failure: no (73.5/26.1)  
## : poutcome = unknown:  
## : :...marital in {divorced,married}: [S21]  
## : marital = single:  
## : :...duration > 343: yes (52.6/7.7)  
## : duration <= 343: [S22]  
## month in {aug,feb,jan,jul,may,nov}:  
## :...job in {blue-collar,housemaid,  
## : unknown}:  
## :...default = yes: yes (9.3/2.1)  
## : default = no:  
## : :...day in {1,15,17,19,20,23,  
## : : 27,29,30,  
## : : 31}: no (104.3)  
## : day in {2,3,4,5,6,7,8,9,10,  
## : : 11,12,13,14,16,18,  
## : : 21,22,24,25,26,28}:  
## : :...balance <= 2490: no (362.4/80)  
## : balance > 2490: yes (113.5/48.4)  
## job in {admin.,entrepreneur,  
## : management,retired,  
## : self-employed,services,  
## : student,technician,  
## : unemployed}:  
## :...contact = telephone:  
## :...day in {2,3,5,9,15,16,19,  
## : : 21,22,24,25,27,28,  
## : : 29,30,  
## : : 31}: no (122.6/1.6)  
## : day in {1,4,6,7,8,10,11,12,  
## : : 13,14,17,18,20,23,  
## : : 26}: [S23]  
## contact = cellular:  
## :...day in {3,4,7,9,10,12,13,  
## : 16,19,22,23,26,28}: [S24]  
## day in {1,2,5,6,8,11,14,15,  
## : 17,18,20,21,24,25,  
## : 27,29,30,31}:  
## :...previous > 3: no (77/11.7)  
## previous <= 3: [S25]  
##   
## SubTree [S1]  
##   
## poutcome = failure: no (25.1/8.1)  
## poutcome in {other,unknown}: yes (237.7/80.5)  
##   
## SubTree [S2]  
##   
## campaign <= 1: yes (165.2/65)  
## campaign > 1: no (98/43)  
##   
## SubTree [S3]  
##   
## poutcome in {failure,unknown}: yes (302/79.3)  
## poutcome = other: no (23.4/10.2)  
##   
## SubTree [S4]  
##   
## poutcome = other: no (9.3/0.3)  
## poutcome in {failure,unknown}:  
## :...duration <= 682: no (65.5/15.2)  
## duration > 682:  
## :...contact = telephone: no (43.8/14.7)  
## contact = cellular:  
## :...campaign > 2:  
## :...campaign > 7: yes (10.6)  
## : campaign <= 7:  
## : :...day in {1,2,3,7,8,9,13,14,15,16,21,22,23,  
## : : 30}: yes (141.4/46.7)  
## : day = 24: no (10.4)  
## campaign <= 2:  
## :...day in {2,3,13,14,15}: no (24.6)  
## day in {1,7,8,9,16,21,22,23,24,30}:  
## :...balance <= -90: yes (10.9)  
## balance > -90:  
## :...campaign <= 1: yes (113.1/44.7)  
## campaign > 1: no (79.5/27.4)  
##   
## SubTree [S5]  
##   
## month = feb: no (9.6)  
## month in {apr,aug,jun,may,nov}:  
## :...campaign <= 4: yes (148.6/45.9)  
## campaign > 4: no (8.9/1.6)  
##   
## SubTree [S6]  
##   
## poutcome = other: yes (13.8)  
## poutcome in {failure,unknown}:  
## :...balance > 3374: yes (107.4/22.2)  
## balance <= 3374:  
## :...job in {housemaid,self-employed}: no (9.8/0.3)  
## job in {admin.,blue-collar,management,retired,technician,unknown}:  
## :...day in {1,22,30}: yes (65.2/7.1)  
## day in {2,3,7,8,9,13,14,15,16,21,23,24}:  
## :...balance <= 404:  
## :...education = unknown: no (8.1)  
## : education in {primary,secondary,tertiary}:  
## : :...month in {apr,jun}: no (37.3/11.4)  
## : month in {aug,feb,may,nov}: yes (233.4/57.1)  
## balance > 404:  
## :...housing = no: no (99.9/38)  
## housing = yes:  
## :...job in {retired,unknown}: yes (6.8)  
## job in {admin.,blue-collar,management,technician}:  
## :...balance <= 451: no (11)  
## balance > 451: yes (178.6/81.3)  
##   
## SubTree [S7]  
##   
## marital = divorced: no (45.9/16.5)  
## marital in {married,single}:  
## :...duration <= 1361: yes (257.7/91.7)  
## duration > 1361: no (39.8/9.1)  
##   
## SubTree [S8]  
##   
## job in {self-employed,services}: yes (31.5)  
## job in {admin.,blue-collar,management,retired,technician,unemployed,unknown}:  
## :...day in {10,12,26,27}: yes (27)  
## day in {4,5,6,11,17,18,19,20,25,28,29,31}:  
## :...education in {primary,unknown}: yes (16.5/3.4)  
## education in {secondary,tertiary}:  
## :...duration > 1628: no (13.2)  
## duration <= 1628:  
## :...age > 57: no (21.5/1.4)  
## age <= 57:  
## :...age > 54: yes (12.1)  
## age <= 54:  
## :...age > 52: no (14)  
## age <= 52:  
## :...balance <= 63: yes (22.7/3.6)  
## balance > 63:  
## :...day in {4,5,6,17,19,28,29,31}: yes (112.8/52.4)  
## day in {11,18,20,25}: no (51.8/6.3)  
##   
## SubTree [S9]  
##   
## contact = telephone: no (20.5/2.6)  
## contact = cellular:  
## :...age <= 21: yes (19.3/4.3)  
## age > 21: no (147.5/53)  
##   
## SubTree [S10]  
##   
## previous <= 6: yes (376.3/110.3)  
## previous > 6: no (22.8/8.1)  
##   
## SubTree [S11]  
##   
## education = unknown: no (17.7/4.2)  
## education in {primary,secondary,tertiary}:  
## :...pdays <= 127: yes (167.9/49.3)  
## pdays > 127: no (28.6/9.2)  
##   
## SubTree [S12]  
##   
## education = unknown: yes (26.7/4.6)  
## education in {primary,secondary,tertiary}:  
## :...age <= 25: yes (46/9.3)  
## age > 25:  
## :...marital = married:  
## :...age <= 33: yes (65.5/28.8)  
## : age > 33: no (298.4/88.5)  
## marital in {divorced,single}:  
## :...balance <= 19: no (22.9/2.5)  
## balance > 19:  
## :...balance <= 838: yes (124/40)  
## balance > 838: no (141.8/57)  
##   
## SubTree [S13]  
##   
## job in {admin.,blue-collar,entrepreneur,housemaid,retired,self-employed,  
## : services,student,unemployed,unknown}: no (624.5/160.8)  
## job = technician:  
## :...previous <= 2: no (198.5/37)  
## : previous > 2: yes (20.2/7.1)  
## job = management:  
## :...day in {1,2,3,5,6,7,9,12,18,19,20,22,23,24,25,26,27,29,31}: no (83.8)  
## day in {4,8,10,11,13,14,15,16,17,21,28,30}:  
## :...balance > 2562: no (15.8)  
## balance <= 2562:  
## :...duration <= 599: yes (138.9/47.5)  
## duration > 599: no (10.4)  
##   
## SubTree [S14]  
##   
## marital in {divorced,married}: no (128.5/24.8)  
## marital = single: yes (65.7/26.9)  
##   
## SubTree [S15]  
##   
## default = no: no (151.1/51.7)  
## default = yes: yes (3.3)  
##   
## SubTree [S16]  
##   
## age <= 28: no (11.1/3.6)  
## age > 28: yes (140.2/26)  
##   
## SubTree [S17]  
##   
## contact = telephone: yes (24.7/8.1)  
## contact = cellular:  
## :...duration <= 381: no (26)  
## duration > 381:  
## :...duration > 617: no (47.1/5.3)  
## duration <= 617:  
## :...day in {4,5,6,13,18,19,20}:  
## :...age <= 24: no (23.2/4.6)  
## : age > 24: yes (259.4/112.5)  
## day in {8,12,15,17,21}:  
## :...campaign > 2: yes (21.8/7.3)  
## campaign <= 2:  
## :...pdays <= 360: no (175/32.4)  
## pdays > 360: yes (10.9/3.4)  
##   
## SubTree [S18]  
##   
## job in {self-employed,student,unknown}: no (51.1)  
## job in {admin.,blue-collar,entrepreneur,housemaid,management,retired,services,  
## : technician,unemployed}:  
## :...age > 38: no (379.3/55.5)  
## age <= 38:  
## :...loan = yes: no (81.3/12.5)  
## loan = no:  
## :...education = unknown: no (11.8)  
## education in {primary,tertiary}:  
## :...pdays <= 369: no (195.7/45.6)  
## : pdays > 369: yes (9.9/0.3)  
## education = secondary:  
## :...pdays > 346: no (31.3/2.5)  
## pdays <= 346:  
## :...month = nov: yes (29.1/3.1)  
## month = jan: no (9.8)  
## month in {apr,jul,may}:  
## :...day in {5,24}: no (21.6)  
## day in {2,4,8,9,10,14,15,22,23,25,30}:  
## :...balance > 1486: no (36.5/4.7)  
## balance <= 1486:  
## :...age <= 29: no (61.4/16.5)  
## age > 29:  
## :...poutcome in {failure,  
## : other}: yes (61.3/9.6)  
## poutcome = unknown:  
## :...marital = divorced: no (8.6)  
## marital in {married,single}:  
## :...duration <= 152: no (9.3)  
## duration > 152:  
## :...month in {apr,  
## : may}: yes (120.8/33)  
## month = jul: no (33.1/11)  
##   
## SubTree [S19]  
##   
## job in {admin.,entrepreneur,self-employed,student,unknown}: yes (40.1/2.1)  
## job in {blue-collar,housemaid,management,retired,services,technician,  
## : unemployed}:  
## :...marital in {divorced,single}: yes (111.7/33.6)  
## marital = married: no (71.9/32.5)  
##   
## SubTree [S20]  
##   
## contact = telephone: no (7.4/1.5)  
## contact = cellular:  
## :...education = unknown: no (3.2)  
## education in {primary,secondary,tertiary}:  
## :...job in {admin.,blue-collar,entrepreneur,management,retired,student,  
## : technician,unknown}: yes (157/37)  
## job in {housemaid,self-employed,services,unemployed}: no (26.3/7.7)  
##   
## SubTree [S21]  
##   
## education in {primary,tertiary,unknown}: yes (200.6/88)  
## education = secondary:  
## :...marital = divorced: yes (18.4/5.1)  
## marital = married: no (153.5/57.7)  
##   
## SubTree [S22]  
##   
## contact = telephone: no (6.3)  
## contact = cellular:  
## :...balance <= 887: no (94.2/37.6)  
## balance > 887: yes (108/28.6)  
##   
## SubTree [S23]  
##   
## duration <= 169: no (14.8)  
## duration > 169: yes (144.8/68.1)  
##   
## SubTree [S24]  
##   
## previous > 6: yes (33.5/6.4)  
## previous <= 6:  
## :...campaign > 9: yes (40.7/8.9)  
## campaign <= 9:  
## :...age > 46:  
## :...job in {entrepreneur,self-employed,student}: no (37.7)  
## : job in {admin.,management,retired,services,technician,unemployed}:  
## : :...campaign <= 1:  
## : :...duration <= 164: no (12)  
## : : duration > 164: yes (143.9/55.3)  
## : campaign > 1:  
## : :...day in {13,16}: yes (68/22.9)  
## : day in {3,4,7,9,10,12,19,22,23,26,28}:  
## : :...previous <= 2: no (199.2/29.7)  
## : previous > 2: yes (14.2/4.5)  
## age <= 46:  
## :...education in {primary,unknown}: yes (98.2/36)  
## education = secondary:  
## :...duration > 428: yes (124.9/36.6)  
## : duration <= 428:  
## : :...day in {10,19,22,23,28}: no (85.8/4.8)  
## : day in {3,4,7,9,12,13,16,26}:  
## : :...balance > 941: no (94.4/19)  
## : balance <= 941:  
## : :...age <= 22: yes (14.8)  
## : age > 22:  
## : :...balance <= 254: no (49.7/6.7)  
## : balance > 254: yes (119/42.3)  
## education = tertiary:  
## :...campaign > 2: no (150/61.7)  
## campaign <= 2:  
## :...marital = divorced: no (21.9/2.9)  
## marital in {married,single}:  
## :...age <= 35:  
## :...duration > 574: yes (19.2/1.2)  
## : duration <= 574:  
## : :...month in {aug,jan,jul,nov}: no (145.1/54)  
## : month in {feb,may}: yes (126.2/45.6)  
## age > 35:  
## :...previous > 3: no (12.2/3.6)  
## previous <= 3:  
## :...age <= 42: yes (179.6/34.9)  
## age > 42: no (21/8.5)  
##   
## SubTree [S25]  
##   
## duration <= 139: no (43.8)  
## duration > 139:  
## :...previous > 2: yes (36/14.6)  
## previous <= 2:  
## :...marital = divorced: no (206.8/52.3)  
## marital = single:  
## :...age > 35:  
## : :...day in {1,2,5,8,11,15,17,18,20,25,27,29,30,31}: no (101.3/0.3)  
## : : day in {6,14,21,24}: yes (53.1/19.8)  
## : age <= 35:  
## : :...balance > 11177: yes (31.3/4.5)  
## : balance <= 11177:  
## : :...day in {1,15,18,24}: no (26.9)  
## : day in {2,5,6,8,11,14,17,20,21,25,27,29,30,31}:  
## : :...month in {jul,may,nov}:  
## : :...age <= 23: yes (23.6/2.6)  
## : : age > 23:  
## : : :...age <= 26: no (30/7.2)  
## : : age > 26: yes (181.7/72)  
## : month in {aug,feb,jan}:  
## : :...age <= 24: no (37.3/2.5)  
## : age > 24:  
## : :...age <= 25: yes (16.9/0.3)  
## : age > 25:  
## : :...campaign > 3: yes (38.6/14.2)  
## : campaign <= 3:  
## : :...day in {2,5,6,14,17,21,25,  
## : : 29}: no (126.6/20.3)  
## : day in {8,11,20,27,30,  
## : 31}: yes (97.2/34.9)  
## marital = married:  
## :...balance <= 153: yes (101.8/41.7)  
## balance > 153:  
## :...balance <= 208: no (33.9)  
## balance > 208:  
## :...day in {24,29,30}: no (48.5)  
## day in {1,2,5,6,8,11,14,15,17,18,20,21,25,27,31}:  
## :...age <= 32: no (77.5/8)  
## age > 32:  
## :...balance > 8494: no (39.8/2.9)  
## balance <= 8494:  
## :...education = secondary:  
## :...month in {aug,feb,jan,jul,  
## : : nov}: no (245.3/59.4)  
## : month = may: yes (21.1/7)  
## education in {primary,tertiary,unknown}:  
## :...month = jan: yes (15)  
## month in {aug,feb,jul,may,nov}:  
## :...duration > 507: yes (76.7/27.9)  
## duration <= 507:  
## :...job in {admin.,services,student,  
## : unemployed}: no (23.8/1.2)  
## job in {entrepreneur,management,  
## : retired,self-employed,  
## : technician}: [S26]  
##   
## SubTree [S26]  
##   
## education = primary: yes (37/10.2)  
## education in {tertiary,unknown}: no (261.3/100.7)  
##   
## ----- Trial 6: -----  
##   
## Decision tree:  
##   
## duration <= 124:  
## :...month in {aug,jan,jul,jun,may,nov}:  
## : :...poutcome = unknown: no (2788.3/98.6)  
## : : poutcome in {failure,other,success}:  
## : : :...day in {5,8,11,15,17,18,19,21,22,23,24,29,30,31}: no (279.2)  
## : : day in {1,2,3,4,6,7,9,10,12,13,14,16,20,25,26,27,28}:  
## : : :...contact = telephone: no (32.1)  
## : : contact in {cellular,unknown}:  
## : : :...month in {jan,may}:  
## : : :...pdays <= 27: yes (11.4/2.4)  
## : : : pdays > 27: no (136.5/5.6)  
## : : month in {aug,jul,jun,nov}:  
## : : :...pdays > 268: yes (75.5/26.3)  
## : : pdays <= 268:  
## : : :...campaign > 3: no (18.8)  
## : : campaign <= 3:  
## : : :...job in {housemaid,self-employed,  
## : : : unknown}: yes (24.2/2.3)  
## : : job in {admin.,blue-collar,entrepreneur,  
## : : : management,retired,services,student,  
## : : : technician,unemployed}:  
## : : :...duration <= 113: no (148.6/34.5)  
## : : duration > 113: yes (32.4/10.8)  
## : month in {apr,dec,feb,mar,oct,sep}:  
## : :...duration <= 48: no (125)  
## : duration > 48:  
## : :...pdays > 200: no (178.7/21.5)  
## : pdays <= 200:  
## : :...poutcome = other: no (53.9/6.3)  
## : poutcome in {failure,success,unknown}:  
## : :...day in {2,3,4,6,14,16,19,23,28,30,31}: no (339.1/56.6)  
## : day in {1,5,7,8,9,10,11,12,13,15,17,18,20,21,22,24,25,26,  
## : : 27,29}:  
## : :...campaign > 2: no (184/51.7)  
## : campaign <= 2:  
## : :...marital = divorced: yes (101.7/41.6)  
## : marital in {married,single}:  
## : :...duration <= 86: no (160.9/35.1)  
## : duration > 86:  
## : :...contact = telephone: no (18.7/3.4)  
## : contact in {cellular,unknown}:  
## : :...month = dec: no (0)  
## : month in {apr,oct}:  
## : :...duration <= 96: no (36.5)  
## : : duration > 96:  
## : : :...housing = no: yes (125.5/48.5)  
## : : housing = yes: no (63.8/9.9)  
## : month in {feb,mar,sep}:  
## : :...pdays > 155: no (17.8/2.7)  
## : pdays <= 155:  
## : :...pdays > 103: yes (20.6/1.2)  
## : pdays <= 103:  
## : :...loan = yes: yes (19.4/2.8)  
## : loan = no:  
## : :...housing = no: no (123.6/52)  
## : housing = yes: yes (70.3/21.4)  
## duration > 124:  
## :...poutcome = success:  
## :...campaign > 3:  
## : :...duration <= 458: no (125.7/49)  
## : : duration > 458: yes (24.7/2.5)  
## : campaign <= 3:  
## : :...month in {feb,jul,jun,mar,sep}:  
## : :...job in {entrepreneur,housemaid,services,  
## : : : student}: no (93.4/44)  
## : : job in {admin.,blue-collar,management,retired,self-employed,  
## : : : technician,unemployed,unknown}:  
## : : :...pdays <= 184: yes (524.6/115.2)  
## : : pdays > 184:  
## : : :...day in {1,2,3,5,6,8,9,14,15,16,17,22,23,  
## : : : 26}: no (138.2/64.3)  
## : : day in {4,7,10,11,12,13,18,19,20,21,24,25,27,28,29,30,  
## : : 31}: yes (46)  
## : month in {apr,aug,dec,jan,may,nov,oct}:  
## : :...job in {entrepreneur,unknown}: no (46.5/21.2)  
## : job in {housemaid,self-employed,services,student,  
## : : unemployed}: yes (269.4/99.7)  
## : job = admin.:  
## : :...day in {4,7,8,10,12,16,17,18,19,25,29}: no (91/29.2)  
## : : day in {1,2,3,5,6,9,11,13,14,15,20,21,22,23,24,26,27,28,30,  
## : : 31}: yes (107.2/14.3)  
## : job = blue-collar:  
## : :...duration <= 158: no (15.8)  
## : : duration > 158:  
## : : :...day in {1,2,3,4,9,12,16,17,21,22,23,24,25,26,27,29,  
## : : : 31}: yes (55.4)  
## : : day in {5,6,7,8,10,11,13,14,15,18,19,20,28,  
## : : 30}: no (100.5/44.4)  
## : job = retired:  
## : :...education = unknown: no (7.7)  
## : : education in {primary,secondary,tertiary}:  
## : : :...day in {1,2,3,5,7,8,9,11,13,17,18,20,21,23,24,26,29,30,  
## : : : 31}: yes (53.2)  
## : : day in {4,6,10,12,14,15,16,19,22,25,27,  
## : : 28}: no (116.4/48.4)  
## : job = management:  
## : :...marital = divorced: no (41.6/13.4)  
## : : marital in {married,single}:  
## : : :...loan = yes: yes (13.1)  
## : : loan = no:  
## : : :...balance > 5397: no (25.5/4.5)  
## : : balance <= 5397:  
## : : :...age <= 28: no (16.7/3.3)  
## : : age > 28: yes (235.5/66.4)  
## : job = technician:  
## : :...marital = divorced: yes (8.2)  
## : marital in {married,single}:  
## : :...duration <= 166: no (37.7/4)  
## : duration > 166:  
## : :...previous > 4: yes (38.4/1.5)  
## : previous <= 4:  
## : :...contact in {telephone,unknown}: yes (6.7)  
## : contact = cellular:  
## : :...housing = no: yes (104.9/44.2)  
## : housing = yes: no (63.1/17)  
## poutcome in {failure,other,unknown}:  
## :...duration > 472:  
## :...age > 79: yes (53/13)  
## : age <= 79:  
## : :...duration > 644:  
## : :...marital in {divorced,married}:  
## : : :...poutcome = failure:  
## : : : :...default = yes: yes (7.1)  
## : : : : default = no:  
## : : : : :...day in {26,31}: yes (0)  
## : : : : day in {5,11,12,17,19,21,22,23,24,28,  
## : : : : : 29}: no (122.7/28.5)  
## : : : : day in {1,2,3,4,6,7,8,9,10,13,14,15,16,18,20,  
## : : : : : 25,27,30}:  
## : : : : :...contact = unknown: yes (0)  
## : : : : contact = telephone: no (28.5/11.4)  
## : : : : contact = cellular:  
## : : : : :...job in {admin.,blue-collar,housemaid,  
## : : : : : management,retired,services,  
## : : : : : student,technician,unemployed,  
## : : : : : unknown}: yes (194.3/36.1)  
## : : : : job in {entrepreneur,  
## : : : : self-employed}: no (20.1/4.2)  
## : : : poutcome in {other,unknown}:  
## : : : :...day in {1,4,7,11,15,24,25,27,28,  
## : : : : 31}: no (968.2/420.9)  
## : : : day in {2,3,9,10,22,23,26,29,  
## : : : : 30}: yes (919.9/434.8)  
## : : : day = 5:  
## : : : :...contact = cellular: yes (92.2/29.9)  
## : : : : contact in {telephone,unknown}: no (123.6/40.4)  
## : : : day = 6:  
## : : : :...campaign <= 5: yes (159.9/70.2)  
## : : : : campaign > 5: no (9.7)  
## : : : day = 8:  
## : : : :...duration <= 1055: no (133/44.6)  
## : : : : duration > 1055: yes (19)  
## : : : day = 12:  
## : : : :...age <= 58: yes (133.1/59.4)  
## : : : : age > 58: no (15.8)  
## : : : day = 14:  
## : : : :...age <= 43: no (100.6/30.9)  
## : : : : age > 43: yes (74/19)  
## : : : day = 16:  
## : : : :...age <= 52: yes (170.9/79)  
## : : : : age > 52: no (26.6)  
## : : : day = 13:  
## : : : :...poutcome = other: no (15.7)  
## : : : : poutcome = unknown:  
## : : : : :...duration <= 835: no (79.5/24.3)  
## : : : : duration > 835: yes (80.9/21.8)  
## : : : day = 19:  
## : : : :...contact = telephone: yes (4.8)  
## : : : : contact in {cellular,unknown}:  
## : : : : :...duration <= 912: no (88.3/19)  
## : : : : duration > 912: yes (92.2/41.6)  
## : : : day = 18:  
## : : : :...campaign > 6: no (11.6)  
## : : : : campaign <= 6:  
## : : : : :...job in {entrepreneur,self-employed,student,  
## : : : : : unemployed,  
## : : : : : unknown}: yes (16.3)  
## : : : : job in {admin.,blue-collar,housemaid,  
## : : : : : management,retired,services,  
## : : : : : technician}:  
## : : : : :...age <= 35: yes (41.6/8.2)  
## : : : : age > 35: no (134.9/55.4)  
## : : : day = 20:  
## : : : :...campaign > 5: no (21.5/4.6)  
## : : : : campaign <= 5:  
## : : : : :...poutcome = other: no (10.5/2.4)  
## : : : : poutcome = unknown:  
## : : : : :...month in {apr,dec,feb,jan,jul,jun,mar,  
## : : : : : may,oct,sep}: yes (151.6/47.6)  
## : : : : month in {aug,nov}: no (124.6/46.9)  
## : : : day = 21:  
## : : : :...default = yes: no (6.6)  
## : : : : default = no:  
## : : : : :...poutcome = other: no (11.8/2.1)  
## : : : : poutcome = unknown:  
## : : : : :...marital = divorced: yes (30.9/8.2)  
## : : : : marital = married:  
## : : : : :...campaign <= 1: no (75.6/20.8)  
## : : : : campaign > 1: yes (130.2/48.2)  
## : : : day = 17:  
## : : : :...default = yes: yes (6.8)  
## : : : default = no:  
## : : : :...balance > 5909: no (16.2)  
## : : : balance <= 5909:  
## : : : :...balance > 4912: yes (16.6/1.3)  
## : : : balance <= 4912:  
## : : : :...age > 55: no (27.6/4.4)  
## : : : age <= 55:  
## : : : :...balance <= -268: yes (11.3)  
## : : : balance > -268: [S1]  
## : : marital = single:  
## : : :...day = 25: yes (30.9)  
## : : day in {1,2,7,8,9,12,15,18,19,23,24,26,27,28,29,30}:  
## : : :...pdays > 213: no (81.5/32)  
## : : : pdays <= 213:  
## : : : :...duration <= 689: no (133.3/61.7)  
## : : : duration > 689:  
## : : : :...default = yes: yes (8.1)  
## : : : default = no:  
## : : : :...duration > 1492: yes (63.9/8.4)  
## : : : duration <= 1492:  
## : : : :...education in {primary,  
## : : : : unknown}: yes (105.1/37.5)  
## : : : education = tertiary:  
## : : : :...job in {retired,  
## : : : : : unknown}: yes (0)  
## : : : : job in {services,student,  
## : : : : : unemployed}: no (19.2/3.7)  
## : : : : job in {admin.,blue-collar,  
## : : : : : entrepreneur,housemaid,  
## : : : : : management,  
## : : : : : self-employed,  
## : : : : : technician}:  
## : : : : :...duration <= 1376: yes (225.3/55.4)  
## : : : : duration > 1376: no (15.9/3.4)  
## : : : education = secondary: [S2]  
## : : day in {3,4,5,6,10,11,13,14,16,17,20,21,22,31}:  
## : : :...age > 54: no (28.5/2.3)  
## : : age <= 54:  
## : : :...default = yes: yes (26.2/7.8)  
## : : default = no:  
## : : :...balance <= 144:  
## : : :...contact in {telephone,  
## : : : : unknown}: no (66.2/23.8)  
## : : : contact = cellular:  
## : : : :...age <= 28: yes (20.2)  
## : : : age > 28:  
## : : : :...age <= 31: no (40.3/14.7)  
## : : : age > 31: yes (110.6/27.4)  
## : : balance > 144:  
## : : :...previous > 1: yes (26/9.7)  
## : : previous <= 1:  
## : : :...pdays > 147: no (41.8/6)  
## : : pdays <= 147: [S3]  
## : duration <= 644:  
## : :...default = yes: yes (101.3/47)  
## : default = no:  
## : :...month in {dec,mar}: yes (53.3/15.3)  
## : month = jan: no (96.9/21)  
## : month in {aug,jun,oct}:  
## : :...pdays > 183: yes (32.1/6.4)  
## : : pdays <= 183:  
## : : :...age <= 26: no (72.4/16.8)  
## : : age > 26:  
## : : :...poutcome = other: yes (24.6/5.1)  
## : : poutcome in {failure,unknown}:  
## : : :...housing = no:  
## : : :...day in {1,7,10,14,15,16,19,23,24,  
## : : : : 27,29}: no (154/28.3)  
## : : : day in {2,3,4,5,6,8,9,11,12,13,17,  
## : : : : 18,20,21,22,25,26,28,30,31}: [S4]  
## : : housing = yes:  
## : : :...balance <= 161: no (56.4/14.8)  
## : : balance > 161:  
## : : :...month = oct: yes (10.8)  
## : : month in {aug,jun}:  
## : : :...day in {1,15,21,23,24,28,  
## : : : 30,  
## : : : 31}: yes (0)  
## : : day in {3,8,13,18,22,27,  
## : : : 29}: no (25.4)  
## : : day in {2,4,5,6,7,9,10,11,  
## : : : 12,14,16,17,19,20,  
## : : : 25,26}: [S5]  
## : month in {apr,feb,jul,may,nov,sep}:  
## : :...housing = no:  
## : :...day in {3,6,10,14,17,18,19,20,24,25}:  
## : : :...previous > 1: no (29.8)  
## : : : previous <= 1:  
## : : : :...age <= 29: yes (37.7/12.1)  
## : : : age > 29:  
## : : : :...education = unknown: yes (4.9/0.5)  
## : : : education in {primary,secondary,  
## : : : : tertiary}:  
## : : : :...age > 58: yes (44/18.7)  
## : : : age <= 58:  
## : : : :...campaign <= 6: no (236.6/37.7)  
## : : : campaign > 6: yes (13.7/3.8)  
## : : day in {1,2,4,5,7,8,9,11,12,13,15,16,21,22,23,  
## : : : 26,27,28,29,30,31}:  
## : : :...duration <= 476: yes (33.7/4.7)  
## : : duration > 476:  
## : : :...poutcome = other: no (23.6/5.1)  
## : : poutcome in {failure,unknown}:  
## : : :...balance > 5437: yes (67.4/16.5)  
## : : balance <= 5437:  
## : : :...campaign <= 1:  
## : : :...pdays > 160: yes (14.5)  
## : : : pdays <= 160:  
## : : : :...age > 56: no (23.8/1.2)  
## : : : age <= 56: [S6]  
## : : campaign > 1:  
## : : :...campaign > 3: yes (78.1/31.3)  
## : : campaign <= 3: [S7]  
## : housing = yes:  
## : :...job in {housemaid,unemployed}: no (35.9)  
## : job in {admin.,blue-collar,entrepreneur,  
## : : management,retired,self-employed,  
## : : services,student,technician,unknown}:  
## : :...balance > 2480: no (278.7/75.5)  
## : balance <= 2480:  
## : :...age > 38:  
## : :...day in {2,6,10,11,22,23,24,26,27,  
## : : : 28,30,31}: no (121.7)  
## : : day in {1,3,4,5,7,8,9,12,13,14,15,  
## : : : 16,17,18,19,20,21,25,29}:  
## : : :...balance > 1245: yes (109.2/40.5)  
## : : balance <= 1245: [S8]  
## : age <= 38:  
## : :...balance > 1854: no (39.7/4.1)  
## : balance <= 1854:  
## : :...month in {apr,feb,  
## : : nov}: no (221.8/89.6)  
## : month = sep: yes (2)  
## : month = jul: [S9]  
## : month = may: [S10]  
## duration <= 472:  
## :...contact = unknown:  
## :...month in {apr,mar,oct}: yes (15.7)  
## : month in {aug,feb,nov,sep}: no (105.4/36.7)  
## : month in {dec,jan,jul,jun,may}:  
## : :...duration <= 368: no (1342.4)  
## : duration > 368:  
## : :...day in {1,3,4,7,10,11,14,15,16,17,19,22,23,24,25,28,29,  
## : : 30,31}: no (154.9)  
## : day in {2,5,6,8,9,12,13,18,20,21,26,27}:  
## : :...age > 52: no (18.9)  
## : age <= 52:  
## : :...marital = divorced: yes (61.2/21.2)  
## : marital in {married,single}:  
## : :...campaign <= 3: no (188.7/44.8)  
## : campaign > 3: yes (48.5/21)  
## contact in {cellular,telephone}:  
## :...month in {jun,mar,oct,sep}:  
## :...job in {entrepreneur,services}: yes (193.1/77.6)  
## : job in {housemaid,self-employed,unemployed,  
## : : unknown}: no (204/84.3)  
## : job = blue-collar:  
## : :...duration <= 145: no (15.7)  
## : : duration > 145: yes (149.1/57.1)  
## : job = admin.:  
## : :...day in {2,5,6,7,10,11,13,16,19,20,23,25,26,28,29,  
## : : : 30}: no (188.3/53.1)  
## : : day in {1,3,4,8,9,12,14,15,17,18,21,22,24,27,31}:  
## : : :...age <= 28: no (25/8.7)  
## : : age > 28: yes (140.6/29.9)  
## : job = student:  
## : :...age > 33: yes (11)  
## : : age <= 33:  
## : : :...education = primary: yes (6.3)  
## : : education in {secondary,tertiary,unknown}:  
## : : :...previous <= 0: no (138.9/48.4)  
## : : previous > 0: yes (55.2/14.5)  
## : job = technician:  
## : :...education in {primary,unknown}: yes (13.3)  
## : : education in {secondary,tertiary}:  
## : : :...duration > 408: yes (27.8/2.7)  
## : : duration <= 408:  
## : : :...marital = divorced: yes (44.1/11.5)  
## : : marital in {married,single}:  
## : : :...duration <= 146: yes (33.3/7)  
## : : duration > 146:  
## : : :...loan = yes: no (15.4/2.5)  
## : : loan = no:  
## : : :...balance <= 678: yes (139.4/66.3)  
## : : balance > 678:  
## : : :...age <= 29: yes (23.1/8.8)  
## : : age > 29: no (137.6/28.4)  
## : job = retired:  
## : :...poutcome = failure: no (58.2/20.7)  
## : : poutcome in {other,unknown}:  
## : : :...age > 81: no (25.5/7.2)  
## : : age <= 81:  
## : : :...month = mar: yes (44.2/5.9)  
## : : month in {jun,oct,sep}:  
## : : :...marital in {divorced,  
## : : : single}: yes (44/10.4)  
## : : marital = married:  
## : : :...previous > 3: yes (14.8/2.4)  
## : : previous <= 3:  
## : : :...poutcome = other: no (8.6)  
## : : poutcome = unknown:  
## : : :...age > 80: yes (9.1)  
## : : age <= 80:  
## : : :...age <= 73: yes (130.5/54.3)  
## : : age > 73: no (37.9/11.1)  
## : job = management:  
## : :...day in {7,12,13,14,17,20,24}: no (85.4/7.2)  
## : day in {1,2,3,4,5,6,8,9,10,11,15,16,18,19,21,22,23,25,  
## : : 26,27,28,29,30,31}:  
## : :...campaign > 4: yes (28/2.7)  
## : campaign <= 4:  
## : :...education in {primary,  
## : : secondary}: yes (35.3/5.7)  
## : education in {tertiary,unknown}:  
## : :...contact = telephone: yes (37.2/8.6)  
## : contact = cellular:  
## : :...duration <= 153: no (88/25.5)  
## : duration > 153:  
## : :...duration > 421: no (24.2/4.5)  
## : duration <= 421:  
## : :...age <= 32: no (145.4/65.9)  
## : age > 32: [S11]  
## month in {apr,aug,dec,feb,jan,jul,may,nov}:  
## :...age > 60:  
## :...loan = yes: no (3.4)  
## : loan = no:  
## : :...housing = yes: yes (51/15.6)  
## : housing = no:  
## : :...duration <= 209:  
## : :...day in {1,2,3,4,6,8,10,18,19,21,25,29,30,  
## : : : 31}: no (66.4)  
## : : day in {5,7,9,11,12,13,14,15,16,17,20,22,  
## : : : 23,24,26,27,28}:  
## : : :...campaign > 3: no (26.8/1.4)  
## : : campaign <= 3:  
## : : :...education = unknown: no (18.8/3)  
## : : education in {primary,secondary,  
## : : : tertiary}:  
## : : :...duration <= 148: yes (65.8/15.4)  
## : : duration > 148: no (149.2/66.4)  
## : duration > 209:  
## : :...marital = single: no (8.1)  
## : marital in {divorced,married}:  
## : :...day in {1,19,21,23,25,29,  
## : : 30}: yes (49.9)  
## : day in {2,3,4,5,6,7,8,9,10,11,12,13,14,  
## : : 15,16,17,18,20,22,24,26,27,28,  
## : : 31}:  
## : :...balance > 3332: no (88.5/25.1)  
## : balance <= 3332:  
## : :...previous > 4: yes (22.3/1)  
## : previous <= 4:  
## : :...pdays <= 181: yes (328.5/126.6)  
## : pdays > 181: no (22.4/4.6)  
## age <= 60:  
## :...pdays > 374:  
## :...month in {apr,aug,dec,feb,jan,jul,  
## : : may}: yes (153.3/60.4)  
## : month = nov: no (14.3)  
## pdays <= 374:  
## :...default = yes: no (122.4/16.5)  
## default = no:  
## :...contact = telephone:  
## :...duration <= 159: no (112.5)  
## : duration > 159:  
## : :...campaign > 1:  
## : :...pdays <= 359: no (402/44)  
## : : pdays > 359: yes (21.8/7.8)  
## : campaign <= 1:  
## : :...month in {dec,jan,  
## : : may}: no (31.3)  
## : month in {apr,aug,feb,jul,nov}:  
## : :...day in {1,4,5,7,11,12,13,14,23,  
## : : 26,29}: yes (81.6/17.5)  
## : day in {2,3,6,8,9,10,15,16,17,  
## : 18,19,20,21,22,24,25,  
## : 27,28,30,  
## : 31}: no (86.3/12.4)  
## contact = cellular:  
## :...education = primary: no (883.9/161.4)  
## education in {secondary,tertiary,unknown}:  
## :...housing = yes:  
## :...day in {1,5,6,7,17,19,20,28,29}: [S12]  
## : day in {2,3,4,8,9,10,11,12,13,14,  
## : : 15,16,18,21,22,23,24,25,26,  
## : : 27,30,31}:  
## : :...campaign > 5: no (96.1/11.6)  
## : campaign <= 5:  
## : :...month in {apr,dec,feb,jan}:  
## : :...day = 31: no (0)  
## : : day in {11,18,21,22,23,  
## : : : 25,26,  
## : : : 27}: yes (101.8/14.7)  
## : : day in {2,3,4,8,9,10,  
## : : : 12,13,14,15,16,  
## : : : 24,30}: [S13]  
## : month in {aug,jul,may,nov}:  
## : :...day in {2,3,4,16,23,25,  
## : : 27}: [S14]  
## : day in {8,9,10,11,12,  
## : : 13,14,15,18,21,  
## : : 22,24,26,30,31}: [S15]  
## housing = no:  
## :...balance <= -122: no (69)  
## balance > -122:  
## :...previous > 6: yes (119.9/45.9)  
## previous <= 6:  
## :...month in {apr,dec,feb,jan,  
## : may}:  
## :...age > 59: no (25.3/2.4)  
## : age <= 59:  
## : :...age <= 22: yes (50.5/15)  
## : age > 22: [S16]  
## month in {aug,jul,nov}:  
## :...pdays > 83:  
## :...day in {1,2,3,5,10,  
## : : 13,14,16,  
## : : 17,19,20,  
## : : 21,22,26,  
## : : 30}: [S17]  
## : day in {4,6,7,8,9,  
## : : 11,12,15,  
## : : 18,23,24,  
## : : 25,27,28,  
## : : 29,31}: [S18]  
## pdays <= 83: [S19]  
##   
## SubTree [S1]  
##   
## job in {admin.,blue-collar,entrepreneur,management,self-employed,services,  
## : technician}: no (151.3/70.4)  
## job in {housemaid,retired,student,unemployed,unknown}: yes (18.8/1.5)  
##   
## SubTree [S2]  
##   
## contact in {telephone,unknown}: yes (140.6/63.2)  
## contact = cellular:  
## :...campaign > 4: no (31.3/10.5)  
## campaign <= 4:  
## :...duration <= 741: no (42.4/15)  
## duration > 741:  
## :...balance <= 5089: yes (182.3/22.8)  
## balance > 5089: no (9.2/1.3)  
##   
## SubTree [S3]  
##   
## education in {primary,unknown}: no (110.5/39.3)  
## education = secondary:  
## :...balance > 3726: no (45.9/8.7)  
## : balance <= 3726:  
## : :...balance > 854: yes (102.9/32.6)  
## : balance <= 854:  
## : :...day in {3,6,17,22}: yes (68/22.6)  
## : day in {4,5,10,11,13,14,16,20,21,31}: no (122.2/28.2)  
## education = tertiary:  
## :...duration > 1243: yes (34.2/8.2)  
## duration <= 1243:  
## :...balance <= 274: yes (18.8/4.6)  
## balance > 274:  
## :...campaign > 4: yes (12.4/3.7)  
## campaign <= 4:  
## :...poutcome in {failure,other}: yes (13.1/2.7)  
## poutcome = unknown: no (170.3/42)  
##   
## SubTree [S4]  
##   
## contact = telephone: yes (25.9/6.3)  
## contact in {cellular,unknown}:  
## :...education in {primary,unknown}: no (102.2/38.6)  
## education in {secondary,tertiary}:  
## :...job in {entrepreneur,housemaid,unknown}: no (11)  
## job = unemployed: yes (19.2/1.5)  
## job in {admin.,blue-collar,management,retired,self-employed,services,  
## : student,technician}:  
## :...balance <= 65: yes (87.2/21.6)  
## balance > 65: no (328.4/160.2)  
##   
## SubTree [S5]  
##   
## contact = telephone: no (4.2)  
## contact in {cellular,unknown}:  
## :...age > 55: yes (18)  
## age <= 55:  
## :...campaign <= 1: no (26.4/9.2)  
## campaign > 1: yes (139.9/35.3)  
##   
## SubTree [S6]  
##   
## marital in {divorced,married}: yes (123.8/30.6)  
## marital = single: no (112.4/53.2)  
##   
## SubTree [S7]  
##   
## contact = unknown: no (10.3)  
## contact in {cellular,telephone}:  
## :...job in {admin.,self-employed,student,technician,unemployed,  
## : unknown}: yes (134.6/58)  
## job in {blue-collar,entrepreneur,housemaid,management,retired,  
## services}: no (121.3/26.1)  
##   
## SubTree [S8]  
##   
## education = tertiary: no (60.3/6.9)  
## education in {primary,secondary,unknown}:  
## :...day in {3,4,5,21}: no (54.6/6.3)  
## day in {1,7,8,9,12,13,14,15,16,17,18,19,20,25,29}:  
## :...month in {apr,feb,nov,sep}: no (57.2/7.1)  
## month in {jul,may}:  
## :...marital = single: no (29.2/3.7)  
## marital in {divorced,married}:  
## :...poutcome = failure: no (24.1/2.7)  
## poutcome in {other,unknown}: yes (198.9/84.5)  
##   
## SubTree [S9]  
##   
## education = primary: yes (26.5/1.8)  
## education in {secondary,tertiary,unknown}: no (141/41.6)  
##   
## SubTree [S10]  
##   
## contact = telephone: yes (7)  
## contact in {cellular,unknown}:  
## :...campaign > 4: no (32.9/6)  
## campaign <= 4:  
## :...education = primary: no (68.5/19.4)  
## education in {secondary,tertiary,unknown}:  
## :...day in {1,2,3,4,10,17,22,24,31}: yes (0)  
## day in {7,12,14,19,20,21,27}: no (174.9/49.2)  
## day in {5,6,8,9,11,13,15,16,18,23,25,26,28,29,30}:  
## :...job in {admin.,entrepreneur,retired,self-employed,technician,  
## : unknown}: yes (120.8/22.3)  
## job = student: no (4.7)  
## job in {blue-collar,management,services}:  
## :...balance > 1237: yes (20.9/4.2)  
## balance <= 1237:  
## :...balance <= 491: yes (169.5/66.5)  
## balance > 491: no (26.2)  
##   
## SubTree [S11]  
##   
## education = unknown: yes (11.6)  
## education = tertiary:  
## :...day in {4,6,9,10,11,18,19,23,28,30,31}: yes (67.3/2.6)  
## day in {16,25}: no (13.2)  
## day in {1,2,3,5,8,15,21,22,26,27,29}:  
## :...previous > 3: no (11.2)  
## previous <= 3:  
## :...month = mar: yes (10.5)  
## month in {jun,oct,sep}:  
## :...balance <= 429: no (23.3/6.1)  
## balance > 429: yes (144.2/49.5)  
##   
## SubTree [S12]  
##   
## job in {admin.,blue-collar,entrepreneur,housemaid,management,self-employed,  
## : services,student,technician,unemployed,unknown}: no (1120.9/179.9)  
## job = retired: yes (26.5/7.9)  
##   
## SubTree [S13]  
##   
## job in {services,student,unknown}: no (63.4)  
## job in {admin.,blue-collar,entrepreneur,housemaid,management,retired,  
## : self-employed,technician,unemployed}:  
## :...pdays > 298: no (72.1/11.7)  
## pdays <= 298:  
## :...month in {dec,jan}: no (33.9/6.2)  
## month = feb:  
## :...age <= 26: yes (10.5/0.5)  
## : age > 26:  
## : :...day in {2,3,4,8,9,10,12,13,14,24,30}: no (185.5/50.3)  
## : day in {15,16}: yes (12.7/1.3)  
## month = apr:  
## :...campaign > 2: yes (66.6/20.7)  
## campaign <= 2:  
## :...age > 53: yes (17.9/3.7)  
## age <= 53:  
## :...day in {2,3,4,8,10,12,16}: no (99.5/16)  
## day in {9,13,14,15,24,30}:  
## :...balance <= -85: no (9.6)  
## balance > -85: yes (157.5/71.1)  
##   
## SubTree [S14]  
##   
## education = tertiary: no (61.9/8.2)  
## education in {secondary,unknown}:  
## :...job = unknown: yes (0)  
## job in {entrepreneur,housemaid,retired,student,unemployed}: no (12.4)  
## job in {admin.,blue-collar,management,self-employed,services,technician}:  
## :...balance > 1149: yes (62.4/12.6)  
## balance <= 1149:  
## :...month in {aug,nov}: no (25.2)  
## month in {jul,may}: yes (125.8/46.8)  
##   
## SubTree [S15]  
##   
## duration <= 306: no (910.9/133.7)  
## duration > 306:  
## :...duration <= 317: yes (76.9/27)  
## duration > 317:  
## :...age > 30:  
## :...month in {aug,jul,nov}: no (139.6)  
## : month = may:  
## : :...job in {admin.,housemaid,self-employed}: yes (71.6/28.9)  
## : job in {blue-collar,entrepreneur,management,retired,services,  
## : student,technician,unemployed,unknown}: no (172.3/31.3)  
## age <= 30:  
## :...duration <= 346: no (24.2)  
## duration > 346:  
## :...marital = divorced: yes (7)  
## marital in {married,single}:  
## :...poutcome = other: yes (4.4)  
## poutcome in {failure,unknown}:  
## :...job in {entrepreneur,housemaid,management,retired,  
## : student,unemployed,unknown}: no (17.2)  
## job in {admin.,blue-collar,self-employed,services,  
## : technician}:  
## :...day in {10,11,14,21,22}: no (21.6)  
## day in {8,9,12,13,15,18,24,26,30,  
## 31}: yes (141.3/58.5)  
##   
## SubTree [S16]  
##   
## day = 31: no (0)  
## day in {7,10,11,12,14,16,17,19,20,23,24,25}:  
## :...poutcome = failure: no (90.4/27.4)  
## : poutcome in {other,unknown}:  
## : :...balance > 5406: no (40.4/12.3)  
## : balance <= 5406:  
## : :...balance > 1520: yes (115.7/18.5)  
## : balance <= 1520:  
## : :...poutcome = other: no (22.7/5.9)  
## : poutcome = unknown:  
## : :...balance <= 43: yes (54.6/9.1)  
## : balance > 43:  
## : :...balance <= 180: no (40.8/7.6)  
## : balance > 180:  
## : :...balance <= 1268: yes (206.3/58.3)  
## : balance > 1268: no (11.4/1)  
## day in {1,2,3,4,5,6,8,9,13,15,18,21,22,26,27,28,29,30}:  
## :...job in {entrepreneur,services,unemployed}:  
## :...age <= 57: no (223.4/41.3)  
## : age > 57: yes (15.6/4.7)  
## job in {admin.,blue-collar,housemaid,management,retired,self-employed,  
## : student,technician,unknown}:  
## :...education = tertiary: no (771.2/365.9)  
## education in {secondary,unknown}:  
## :...month in {apr,dec}:  
## :...education = secondary: no (152.9/67.4)  
## : education = unknown: yes (42/12.4)  
## month in {feb,jan,may}:  
## :...day in {1,5,6,15,21,30}: no (83.2/2.7)  
## day in {2,3,4,8,9,13,18,22,26,27,28,29}:  
## :...campaign > 4: yes (32.9/13.1)  
## campaign <= 4:  
## :...campaign > 1: no (190.3/45.5)  
## campaign <= 1:  
## :...balance > 4394: yes (24.2/4.3)  
## balance <= 4394:  
## :...job in {blue-collar,housemaid,retired,  
## : self-employed,student}: no (62/6.2)  
## job in {admin.,management,technician,unknown}:  
## :...duration <= 190: yes (68.2/24.2)  
## duration > 190: no (118.9/42.9)  
##   
## SubTree [S17]  
##   
## balance <= 10500: no (224/49.8)  
## balance > 10500: yes (19.9/7.5)  
##   
## SubTree [S18]  
##   
## job in {retired,self-employed,unknown}: no (9.8)  
## job in {admin.,blue-collar,entrepreneur,housemaid,management,services,student,  
## : technician,unemployed}:  
## :...duration > 321: yes (40.4/0.3)  
## duration <= 321:  
## :...duration <= 300: yes (155/43.2)  
## duration > 300: no (14.5)  
##   
## SubTree [S19]  
##   
## day in {1,2,3}: yes (96.8/26.6)  
## day in {4,23}: no (86.7)  
## day in {6,8,9,11,15,18,20,21,22,25,26,27,28,29}:  
## :...duration <= 294: no (738.8/75)  
## : duration > 294:  
## : :...age <= 27: yes (53.4/22.8)  
## : age > 27:  
## : :...job in {entrepreneur,housemaid,self-employed,student,technician,  
## : : unemployed,unknown}: no (186.8/25.9)  
## : job in {admin.,blue-collar,management,retired,services}:  
## : :...balance <= 96: yes (96.2/36.5)  
## : balance > 96:  
## : :...loan = yes: no (10.1)  
## : loan = no:  
## : :...balance <= 264: no (30.1)  
## : balance > 264:  
## : :...duration > 410: no (49.9/3.9)  
## : duration <= 410:  
## : :...age <= 42: no (64.5/10.4)  
## : age > 42: yes (97/33.8)  
## day in {5,7,10,12,13,14,16,17,19,24,30,31}:  
## :...poutcome in {failure,other}: no (10.7)  
## poutcome = unknown:  
## :...loan = yes: no (97/16.5)  
## loan = no:  
## :...age <= 29: yes (128.3/51.1)  
## age > 29:  
## :...age <= 30: no (26.8)  
## age > 30:  
## :...duration <= 149: no (81.7/8.4)  
## duration > 149:  
## :...balance <= 111: no (106.6/18.4)  
## balance > 111:  
## :...age > 44:  
## :...day in {16,17,24,30}: yes (88.1/35)  
## : day in {5,7,10,12,13,14,19,31}:  
## : :...balance > 1258: no (102.5/4.1)  
## : balance <= 1258:  
## : :...balance <= 1196: no (142.1/33.5)  
## : balance > 1196: yes (9.5/0.3)  
## age <= 44:  
## :...day in {16,24,30}: no (17.6)  
## day in {5,7,10,12,13,14,17,19,31}:  
## :...balance <= 340: no (52.2/11.8)  
## balance > 340:  
## :...job in {services,  
## : unemployed}: yes (34/3.5)  
## job in {housemaid,retired,  
## : self-employed,student,  
## : unknown}: no (14.8)  
## job in {admin.,blue-collar,  
## : entrepreneur,management,  
## : technician}:  
## :...education = secondary: no (82/35.5)  
## education = unknown: yes (2.4)  
## education = tertiary:  
## :...day in {5,7,10,13,14,19,  
## : 31}: yes (145.9/43.2)  
## day in {12,17}: no (28.5/6.8)  
##   
## ----- Trial 7: -----  
##   
## Decision tree:  
##   
## duration <= 130:  
## :...month in {aug,jan,jul,jun,may,nov}:  
## : :...poutcome in {failure,other}: no (594.7/70.3)  
## : : poutcome = success:  
## : : :...day in {1,4,7,8,9,11,12,13,14,15,17,18,19,22,23,25,26,28,29,30,  
## : : : : 31}: no (112.9/15.2)  
## : : : day in {2,3,5,6,10,16,20,21,24,27}: yes (80.8/24.6)  
## : : poutcome = unknown:  
## : : :...age > 29: no (2128.4/9.5)  
## : : age <= 29:  
## : : :...day in {1,2,3,6,7,8,9,11,13,16,17,18,19,20,21,22,23,24,26,27,  
## : : : 28,29,30,31}: no (209.9)  
## : : day in {4,5,10,12,14,15,25}:  
## : : :...duration <= 123: no (116.3/21.6)  
## : : duration > 123: yes (35.3/8.2)  
## : month in {apr,dec,feb,mar,oct,sep}:  
## : :...duration <= 74: no (265.7/14.6)  
## : duration > 74:  
## : :...poutcome = success:  
## : :...day in {1,4,5,6,8,9,11,13,14,15,17,19,22,23,24,25,27,28,29,30,  
## : : : 31}: yes (117.5/38.2)  
## : : day in {2,3,7,10,12,16,18,20,21,26}: no (40.4)  
## : poutcome in {failure,other,unknown}:  
## : :...month = mar:  
## : :...contact = telephone: no (7.3)  
## : : contact = unknown: yes (5.6)  
## : : contact = cellular:  
## : : :...day in {1,4,6,7,13,14,15,16,17,18,19,20,21,22,23,24,26,  
## : : : 28,29,30,31}: no (24.7)  
## : : day in {2,3,5,8,9,10,11,12,25,27}:  
## : : :...balance <= 590: yes (89.6/25.3)  
## : : balance > 590: no (101.1/36.6)  
## : month in {apr,dec,feb,oct,sep}:  
## : :...balance <= 78: no (145.9/15.2)  
## : balance > 78:  
## : :...day in {4,6,10,30,31}: no (58.6)  
## : day in {1,2,3,5,7,8,9,11,12,13,14,15,16,17,18,19,20,21,  
## : : 22,23,24,25,26,27,28,29}:  
## : :...housing = yes:  
## : :...marital = single: no (142/55.4)  
## : : marital in {divorced,married}:  
## : : :...contact in {telephone,  
## : : : unknown}: yes (13.9/1.7)  
## : : contact = cellular:  
## : : :...previous <= 8: no (177.8/23.2)  
## : : previous > 8: yes (9/2.2)  
## : housing = no:  
## : :...education = unknown: no (13.6)  
## : education in {primary,secondary,tertiary}:  
## : :...poutcome in {failure,  
## : : other}: no (91.4/25.9)  
## : poutcome = unknown:  
## : :...duration <= 103: no (167.7/56.6)  
## : duration > 103:  
## : :...campaign > 2: no (49.1/16.2)  
## : campaign <= 2:  
## : :...balance <= 2823: yes (157.1/58.5)  
## : balance > 2823: no (63.8/22.3)  
## duration > 130:  
## :...poutcome = success:  
## :...duration <= 161:  
## : :...job = unemployed: no (0)  
## : : job in {self-employed,unknown}: yes (14.5)  
## : : job in {admin.,blue-collar,entrepreneur,housemaid,management,  
## : : : retired,services,student,technician}:  
## : : :...previous > 7: yes (17.6/3.6)  
## : : previous <= 7:  
## : : :...duration > 159: no (13)  
## : : duration <= 159:  
## : : :...pdays > 280: yes (13.6/1)  
## : : pdays <= 280:  
## : : :...month in {dec,jul,sep}: yes (11.8)  
## : : month in {apr,aug,feb,jan,jun,mar,may,nov,oct}:  
## : : :...balance <= 9444: no (204.3/72.7)  
## : : balance > 9444: yes (11.4/2)  
## : duration > 161:  
## : :...balance > 9725: no (59.4/24.3)  
## : balance <= 9725:  
## : :...day in {1,4,5,6,7,8,17,18,20,26,29}:  
## : :...previous > 9: no (33.7/6.6)  
## : : previous <= 9:  
## : : :...age > 54:  
## : : :...job in {admin.,blue-collar,entrepreneur,management,  
## : : : : retired,self-employed,student,technician,  
## : : : : unemployed}: yes (146.2/34.7)  
## : : : job in {housemaid,services,unknown}: no (15)  
## : : age <= 54:  
## : : :...job = retired: yes (0)  
## : : job in {entrepreneur,self-employed,  
## : : : unknown}: no (26.5/1.8)  
## : : job in {admin.,blue-collar,housemaid,management,  
## : : : services,student,technician,unemployed}:  
## : : :...month = aug: yes (32.4/2.1)  
## : : month in {jun,mar,oct,sep}:  
## : : :...contact in {cellular,  
## : : : : unknown}: yes (172.8/59.8)  
## : : : contact = telephone: no (3.8)  
## : : month in {apr,dec,feb,jan,jul,may,nov}:  
## : : :...contact = unknown: no (0)  
## : : contact = telephone: yes (10.4)  
## : : contact = cellular:  
## : : :...job in {housemaid,  
## : : : student}: yes (14.2)  
## : : job in {admin.,blue-collar,management,  
## : : : services,technician,unemployed}:  
## : : :...day in {5,20,29}: no (61.5/5.7)  
## : : day in {1,4,6,7,8,17,18,26}:  
## : : :...balance <= 2: no (28.3/4.1)  
## : : balance > 2:  
## : : :...previous > 4: yes (30/7.3)  
## : : previous <= 4:  
## : : :...balance > 1980: no (49.1/12.9)  
## : : balance <= 1980: [S1]  
## : day in {2,3,9,10,11,12,13,14,15,16,19,21,22,23,24,25,27,28,30,  
## : : 31}:  
## : :...month in {dec,feb,jul,jun,mar}: yes (382.6/70.7)  
## : month in {apr,aug,jan,may,nov,oct,sep}:  
## : :...previous > 7: yes (50.2/6.2)  
## : previous <= 7:  
## : :...pdays > 178:  
## : :...pdays <= 181: yes (47.5)  
## : : pdays > 181:  
## : : :...education = unknown: yes (23.1)  
## : : education in {primary,secondary,tertiary}:  
## : : :...day in {9,21,22,24,25,  
## : : : 31}: yes (61)  
## : : day in {2,3,10,11,12,13,14,15,16,19,23,  
## : : : 27,28,30}:  
## : : :...month = oct: no (29.4/7.3)  
## : : month in {apr,aug,jan,may,nov,sep}:  
## : : :...campaign > 3: yes (13.9)  
## : : campaign <= 3:  
## : : :...balance <= 12: no (21.1/3.2)  
## : : balance > 12: yes (230/71.3)  
## : pdays <= 178:  
## : :...age > 69: yes (28.5/2)  
## : age <= 69:  
## : :...duration > 492: yes (77.6/14.2)  
## : duration <= 492:  
## : :...job in {blue-collar,self-employed,  
## : : unknown}: yes (65.9/11.4)  
## : job in {admin.,entrepreneur,housemaid,  
## : : management,retired,services,  
## : : student,technician,unemployed}:  
## : :...pdays <= 78: no (24.5/2.1)  
## : pdays > 78:  
## : :...campaign > 4: no (16.1/2.7)  
## : campaign <= 4:  
## : :...balance > 5043: yes (18.6/1.2)  
## : balance <= 5043: [S2]  
## poutcome in {failure,other,unknown}:  
## :...duration > 503:  
## :...day in {4,8,11,13,15,18,24,25,27,28,31}:  
## : :...month = sep: yes (41.4/2.3)  
## : : month in {apr,aug,dec,feb,jan,jul,jun,mar,may,nov,oct}:  
## : : :...balance > 13450: no (33.9/6.8)  
## : : balance <= 13450:  
## : : :...balance > 9883: yes (26.6)  
## : : balance <= 9883:  
## : : :...duration <= 609:  
## : : :...month = dec: no (0)  
## : : : month in {aug,jun,mar,oct}:  
## : : : :...job in {entrepreneur,housemaid,  
## : : : : : self-employed,student,  
## : : : : : unknown}: no (19.8)  
## : : : : job in {admin.,blue-collar,management,  
## : : : : : retired,services,technician,  
## : : : : : unemployed}:  
## : : : : :...default = yes: no (6.2/1.3)  
## : : : : default = no:  
## : : : : :...campaign > 9: no (24.9/8.3)  
## : : : : campaign <= 9:  
## : : : : :...previous <= 5: yes (199.2/54.2)  
## : : : : previous > 5: no (9.8/2.3)  
## : : : month in {apr,feb,jan,jul,may,nov}:  
## : : : :...balance > 3953: no (33.7)  
## : : : balance <= 3953:  
## : : : :...campaign > 4: no (53.1/9.8)  
## : : : campaign <= 4:  
## : : : :...education = unknown: no (29.8/4.8)  
## : : : education = secondary:  
## : : : :...age > 53: yes (60.1/20.4)  
## : : : : age <= 53: [S3]  
## : : : education in {primary,tertiary}:  
## : : : :...age > 52: no (15.6)  
## : : : age <= 52: [S4]  
## : : duration > 609:  
## : : :...job in {entrepreneur,retired,self-employed,  
## : : : student}:  
## : : :...duration <= 685: yes (118/10.9)  
## : : : duration > 685:  
## : : : :...previous > 1: no (19.5/5.3)  
## : : : previous <= 1:  
## : : : :...duration <= 697: no (13.7/1.7)  
## : : : duration > 697:  
## : : : :...day in {4,8,15,18,24,27,  
## : : : : 31}: yes (148.7/27)  
## : : : day in {11,13,25,  
## : : : 28}: no (106.4/51)  
## : : job in {admin.,blue-collar,housemaid,  
## : : : management,services,technician,  
## : : : unemployed,unknown}:  
## : : :...pdays > 365: yes (30.7/3.9)  
## : : pdays <= 365:  
## : : :...pdays > 355: no (25.3/3.9)  
## : : pdays <= 355:  
## : : :...balance <= -201: yes (97.8/21)  
## : : balance > -201:  
## : : :...marital = divorced:  
## : : :...month in {aug,dec,jan,nov,  
## : : : : oct}: yes (39.3/1.3)  
## : : : month in {feb,  
## : : : : mar}: no (8.8)  
## : : : month in {apr,jul,jun,may}: [S5]  
## : : marital in {married,single}: [S6]  
## : day in {1,2,3,5,6,7,9,10,12,14,16,17,19,20,21,22,23,26,29,30}:  
## : :...campaign > 18: no (32/3.5)  
## : campaign <= 18:  
## : :...contact = unknown:  
## : :...duration > 1009:  
## : : :...marital = married:  
## : : : :...age <= 30: yes (30.1/8.4)  
## : : : : age > 30: no (280.9/98)  
## : : : marital in {divorced,single}:  
## : : : :...age <= 27: no (12.2)  
## : : : age > 27:  
## : : : :...age <= 29: yes (22)  
## : : : age > 29:  
## : : : :...duration <= 1934: yes (166/50.2)  
## : : : duration > 1934: no (10.7)  
## : : duration <= 1009:  
## : : :...duration > 973: no (36.3/2)  
## : : duration <= 973:  
## : : :...campaign > 9: yes (38.9/15)  
## : : campaign <= 9:  
## : : :...day in {7,10,12,17,30}: no (263.6/46.6)  
## : : day in {1,2,3,5,6,9,14,16,19,20,21,22,23,  
## : : : 26,29}:  
## : : :...balance <= 81: no (374.4/98.8)  
## : : balance > 81:  
## : : :...campaign > 3: no (145.8/39.2)  
## : : campaign <= 3:  
## : : :...duration > 788:  
## : : :...day in {1,2,9,14,16,19,20,  
## : : : : 21,22,  
## : : : : 29}: yes (140.8/35.4)  
## : : : day in {3,5,6,23,  
## : : : 26}: no (81.5/22.2)  
## : : duration <= 788:  
## : : :...duration <= 513: yes (27.5/6.4)  
## : : duration > 513:  
## : : :...balance > 2781: no (79.3/10)  
## : : balance <= 2781: [S7]  
## : contact in {cellular,telephone}:  
## : :...age <= 32:  
## : :...default = yes: no (15.6/2.3)  
## : : default = no:  
## : : :...contact = telephone: no (43.3/10.6)  
## : : contact = cellular:  
## : : :...duration > 1297: yes (88.6/20.2)  
## : : duration <= 1297:  
## : : :...pdays > 318: no (75.8/21)  
## : : pdays <= 318:  
## : : :...age > 31:  
## : : :...month in {dec,jan,jun,mar,may,  
## : : : : oct,  
## : : : : sep}: yes (41.2)  
## : : : month in {apr,aug,feb,jul,nov}:  
## : : : :...balance > 6754: no (10.8)  
## : : : balance <= 6754:  
## : : : :...balance > 2836: yes (24.1/0.2)  
## : : : balance <= 2836: [S8]  
## : : age <= 31: [S9]  
## : age > 32:  
## : :...job in {admin.,entrepreneur,housemaid,retired,  
## : : self-employed,technician}:  
## : :...month = dec: yes (9.7)  
## : : month = sep: no (43.9/8.7)  
## : : month in {apr,feb,jan,jul}:  
## : : :...duration <= 674:  
## : : : :...day in {2,9,14,16,17,20,21,22,29,  
## : : : : : 30}: no (193.7/29)  
## : : : : day in {1,3,5,6,7,10,12,19,23,  
## : : : : 26}: yes (85.5/29.8)  
## : : : duration > 674:  
## : : : :...balance <= -91: yes (39.7/7.9)  
## : : : balance > -91:  
## : : : :...campaign > 4: yes (39.6/9.6)  
## : : : campaign <= 4:  
## : : : :...duration > 1272: yes (57.2/12.3)  
## : : : duration <= 1272: [S10]  
## : : month in {aug,jun,mar,may,nov,oct}:  
## : : :...day in {2,3,23}: yes (20.3)  
## : : day in {6,10,16,19,22,26,30}:  
## : : :...contact = telephone: no (16.4/1.3)  
## : : : contact = cellular:  
## : : : :...previous > 1: yes (40.8/12.7)  
## : : : previous <= 1: [S11]  
## : : day in {1,5,7,9,12,14,17,20,21,29}:  
## : : :...previous > 2: no (45.9/19.2)  
## : : previous <= 2:  
## : : :...month = jun: no (25.1/10.3)  
## : : month in {mar,may,  
## : : : oct}: yes (136.7/47)  
## : : month = aug:  
## : : :...balance <= 11: no (12.6)  
## : : : balance > 11: [S12]  
## : : month = nov:  
## : : :...default = yes: yes (5.7)  
## : : default = no: [S13]  
## : job in {blue-collar,management,services,student,  
## : : unemployed,unknown}:  
## : :...age > 55:  
## : :...day in {2,12}: yes (15/0.2)  
## : : day in {1,3,5,6,7,9,10,14,16,17,19,20,21,  
## : : 22,23,26,29,30}: no (234.2/49.9)  
## : age <= 55:  
## : :...pdays > 266: yes (147.2/59.7)  
## : pdays <= 266:  
## : :...campaign > 2: no (570.4/199.8)  
## : campaign <= 2:  
## : :...job = student: no (9.8)  
## : job in {blue-collar,management,  
## : : services,unemployed,  
## : : unknown}:  
## : :...default = yes: yes (23.4/5.9)  
## : default = no:  
## : :...duration > 793:  
## : :...pdays > 127: no (38.1/9.2)  
## : : pdays <= 127: [S14]  
## : duration <= 793: [S15]  
## duration <= 503:  
## :...contact = unknown:  
## :...month in {apr,aug,mar,oct}: yes (29.1)  
## : month in {feb,jan,nov,sep}: no (99.2/48)  
## : month in {dec,jul,jun,may}:  
## : :...duration <= 368: no (1070)  
## : duration > 368:  
## : :...campaign <= 1: no (218.6/15.9)  
## : campaign > 1:  
## : :...day in {4,7,10,11,14,15,16,21,22,24,25,28,29,30,  
## : : 31}: no (105.3)  
## : day in {1,2,3,5,6,8,9,12,13,17,18,19,20,23,26,27}:  
## : :...campaign > 10: no (20.8)  
## : campaign <= 10:  
## : :...job in {housemaid,self-employed,student,  
## : : unemployed,unknown}: no (28.9)  
## : job in {admin.,blue-collar,entrepreneur,  
## : : management,retired,services,  
## : : technician}:  
## : :...education = unknown: no (9.3)  
## : education in {primary,secondary,  
## : : tertiary}:  
## : :...age <= 30: yes (83.3/33)  
## : age > 30:  
## : :...loan = yes: no (38.9)  
## : loan = no:  
## : :...day in {3,8,13,20,23,  
## : : 27}: no (39.8)  
## : day in {1,2,5,6,9,12,17,18,  
## : : 19,26}:  
## : :...balance <= 624: yes (112.2/44.2)  
## : balance > 624: no (40.8/5)  
## contact in {cellular,telephone}:  
## :...pdays > 578: yes (54.3/14.8)  
## pdays <= 578:  
## :...month in {aug,jan,jul,may,nov}:  
## :...age > 59:  
## : :...campaign > 5: no (31.1)  
## : : campaign <= 5:  
## : : :...day in {1,2,4,5,9,10,11,22,23,24,28,  
## : : : 31}: no (212.4/52.5)  
## : : day in {3,6,7,8,12,13,14,15,16,17,18,19,20,21,  
## : : : 25,26,27,29,30}:  
## : : :...duration <= 211: no (140/61.8)  
## : : duration > 211:  
## : : :...job in {student,  
## : : : unemployed}: yes (0)  
## : : job in {admin.,  
## : : : services}: no (8.2)  
## : : job in {blue-collar,entrepreneur,  
## : : : housemaid,management,retired,  
## : : : self-employed,technician,  
## : : : unknown}:  
## : : :...campaign > 2: yes (78.5/14.6)  
## : : campaign <= 2:  
## : : :...day in {3,16,20,25,26,27,  
## : : : 29}: yes (45.2/1.2)  
## : : day in {6,7,8,12,13,14,15,17,  
## : : : 18,19,21,30}:  
## : : :...housing = yes: no (10.1/2.2)  
## : : housing = no:  
## : : :...pdays > 168: yes (12.2)  
## : : pdays <= 168: [S16]  
## : age <= 59:  
## : :...loan = yes:  
## : :...day in {3,5,6,8,11,12,13,14,16,17,18,19,20,21,  
## : : : 22,23,24,26,28,29,30}: no (699/74.3)  
## : : day in {1,2,4,7,9,10,15,25,27,31}:  
## : : :...month in {aug,jan,jul,may}: no (281.8/62)  
## : : month = nov: yes (15.5/1)  
## : loan = no:  
## : :...day = 3: yes (63.8/14.4)  
## : day in {1,21,23,29,30}:  
## : :...month = may: yes (5.4/1)  
## : : month in {aug,jan,jul,nov}:  
## : : :...balance <= -137: yes (33.6/15.3)  
## : : balance > -137:  
## : : :...pdays <= 44: no (557.1/47.6)  
## : : pdays > 44:  
## : : :...day in {1,21,29,  
## : : : 30}: no (140.3/29.7)  
## : : day = 23: yes (9.3)  
## : day in {2,4,5,6,7,8,9,10,11,12,13,14,15,16,17,  
## : : 18,19,20,22,24,25,26,27,28,31}:  
## : :...duration > 322:  
## : :...job in {blue-collar,  
## : : : unknown}: no (360.2/76.2)  
## : : job in {admin.,entrepreneur,housemaid,  
## : : : management,retired,  
## : : : self-employed,services,student,  
## : : : technician,unemployed}:  
## : : :...education in {primary,unknown}:  
## : : :...day in {2,26,  
## : : : : 27}: yes (0)  
## : : : day in {11,15,16,20,24,25,  
## : : : : 31}: no (26.6)  
## : : : day in {4,5,6,7,8,9,10,12,13,  
## : : : : 14,17,18,19,22,28}:  
## : : : :...pdays > 182: no (12.9/1.6)  
## : : : pdays <= 182: [S17]  
## : : education in {secondary,tertiary}:  
## : : :...balance <= 0:  
## : : :...balance <= -754: yes (14/3.1)  
## : : : balance > -754: no (190.9/32.5)  
## : : balance > 0: [S18]  
## : duration <= 322:  
## : :...previous > 2:  
## : :...contact = telephone: no (32.7)  
## : : contact = cellular:  
## : : :...day in {7,8,9,17,18,  
## : : : 24}: no (60)  
## : : day in {2,4,5,6,10,11,12,13,14,  
## : : : 15,16,19,20,22,25,26,  
## : : : 27,28,31}:  
## : : :...pdays > 277: no (76.7/11.9)  
## : : pdays <= 277:  
## : : :...duration > 297: no (26.2/3.8)  
## : : duration <= 297: [S19]  
## : previous <= 2:  
## : :...age <= 26:  
## : :...day in {2,4,6,7,9,11,14,15,18,  
## : : : 22,24,25,27,28,  
## : : : 31}: no (142.4/19)  
## : : day in {5,8,10,12,13,16,17,19,  
## : : 20,26}: yes (127.9/44.1)  
## : age > 26:  
## : :...duration <= 159:  
## : :...day in {2,4,5,6,7,8,9,10,  
## : : : 13,15,16,17,19,22,  
## : : : 24,25,26,  
## : : : 31}: no (283.2)  
## : : day in {11,12,14,18,20,27,  
## : : : 28}:  
## : : :...campaign > 2: no (45.8)  
## : : campaign <= 2: [S20]  
## : duration > 159: [S21]  
## month in {apr,dec,feb,jun,mar,oct,sep}:  
## :...housing = yes:  
## :...day in {10,11,18,21,22,23,24,25,27,29}:  
## : :...poutcome in {failure,unknown}: yes (251.2/66)  
## : : poutcome = other: no (53.2/12.3)  
## : day in {1,2,3,4,5,6,7,8,9,12,13,14,15,16,17,19,20,  
## : : 26,28,30,31}:  
## : :...pdays > 349: yes (48.5/18.1)  
## : pdays <= 349:  
## : :...pdays > 323: no (79.6)  
## : pdays <= 323:  
## : :...previous > 9: no (35.3/1.7)  
## : previous <= 9:  
## : :...duration <= 288: [S22]  
## : duration > 288:  
## : :...month = sep: yes (16.1)  
## : month in {apr,dec,feb,jun,mar,  
## : : oct}: [S23]  
## housing = no:  
## :...month = feb:  
## :...day in {7,14,20,21,28,29,30,  
## : : 31}: no (0)  
## : day in {8,10,11,12,13,16,17,18,19,23,24,26,27}:  
## : :...marital = divorced: yes (46.9/2)  
## : : marital in {married,single}:  
## : : :...education = primary: no (26.7/9.7)  
## : : education in {secondary,tertiary,  
## : : unknown}: yes (223.2/60.4)  
## : day in {1,2,3,4,5,6,9,15,22,25}:  
## : :...duration <= 171: no (142.7/11.6)  
## : duration > 171:  
## : :...job in {blue-collar,entrepreneur,  
## : : services,  
## : : unemployed}: no (185.6/23)  
## : job in {admin.,housemaid,management,  
## : : retired,self-employed,student,  
## : : technician,unknown}:  
## : :...contact = telephone: no (46.4/5.4)  
## : contact = cellular:  
## : :...campaign > 5: yes (25.8/5.5)  
## : campaign <= 5:  
## : :...day in {1,5,6,  
## : : 15}: no (67.6/11.3)  
## : day in {2,3,4,9,22,25}:  
## : :...balance <= 334: yes (152.5/63.5)  
## : balance > 334: no (170.1/60.2)  
## month in {apr,dec,jun,mar,oct,sep}:  
## :...pdays > 454: no (33.3/7.3)  
## pdays <= 454:  
## :...contact = telephone:  
## :...loan = yes: yes (9.2/1.2)  
## : loan = no:  
## : :...balance <= 30: no (44.8/3.6)  
## : balance > 30:  
## : :...duration <= 156: no (44.2/6.6)  
## : duration > 156:  
## : :...month in {mar,  
## : : sep}: no (98/31.7)  
## : month in {apr,dec,jun,oct}: [S24]  
## contact = cellular:  
## :...pdays > 374: yes (38.3/5.8)  
## pdays <= 374:  
## :...pdays > 318: no (37.8/8.2)  
## pdays <= 318:  
## :...duration > 456: yes (137.2/36.2)  
## duration <= 456:  
## :...campaign > 5: no (48/12.7)  
## campaign <= 5: [S25]  
##   
## SubTree [S1]  
##   
## pdays <= 63: no (8.8)  
## pdays > 63: yes (142.2/58.4)  
##   
## SubTree [S2]  
##   
## job in {housemaid,retired,student,unemployed}: no (71.8/15.5)  
## job in {admin.,entrepreneur,management,services,technician}:  
## :...pdays > 170: no (11.3)  
## pdays <= 170:  
## :...day in {2,3,11,13,14,22,23,24,25,31}: yes (41.5)  
## day in {9,10,12,15,16,19,21,27,28,30}: no (144.3/67.1)  
##   
## SubTree [S3]  
##   
## job in {admin.,management,self-employed}: yes (40.4/13.1)  
## job in {blue-collar,entrepreneur,housemaid,retired,services,student,technician,  
## unemployed,unknown}: no (176/31.5)  
##   
## SubTree [S4]  
##   
## poutcome = failure: no (22.7/4.9)  
## poutcome in {other,unknown}:  
## :...campaign > 3: yes (23.3/2)  
## campaign <= 3:  
## :...age <= 28: no (21.6/3)  
## age > 28:  
## :...previous > 5: yes (9.4)  
## previous <= 5:  
## :...previous > 1: no (10)  
## previous <= 1:  
## :...loan = no: yes (132.3/42.9)  
## loan = yes: no (26.7/7)  
##   
## SubTree [S5]  
##   
## job in {admin.,blue-collar,management,services}: yes (167.3/52.7)  
## job in {housemaid,technician,unemployed,unknown}: no (31.4/6.8)  
##   
## SubTree [S6]  
##   
## contact = telephone: yes (66.5/31.7)  
## contact = unknown:  
## :...default = yes: yes (5.7)  
## : default = no:  
## : :...month in {apr,aug,dec,feb,jan,jul,mar,nov,oct}: no (5.7)  
## : month in {jun,may}:  
## : :...job in {services,unknown}: no (38.5/3.4)  
## : job in {admin.,blue-collar,housemaid,management,technician,  
## : : unemployed}:  
## : :...housing = no: yes (79/26.8)  
## : housing = yes: no (259.3/120.9)  
## contact = cellular:  
## :...campaign > 3:  
## :...balance <= -33: no (18.5/2)  
## : balance > -33:  
## : :...default = yes: no (2)  
## : default = no:  
## : :...day in {4,25}: yes (44.8/2)  
## : day in {8,11,13,15,18,24,27,28,31}:  
## : :...balance <= 58: yes (54.7/6.4)  
## : balance > 58:  
## : :...age > 52: yes (44.7/6.1)  
## : age <= 52:  
## : :...month in {apr,aug,dec,feb,jan,jun,mar,may,  
## : : oct}: yes (135/46.7)  
## : month in {jul,nov}: no (68.5/16.6)  
## campaign <= 3:  
## :...age <= 31:  
## :...day in {4,8,31}: yes (59.6/3.6)  
## : day in {11,13,15,18,24,25,27,28}:  
## : :...balance > 690: yes (89.4/23.9)  
## : balance <= 690:  
## : :...balance <= 394: yes (115.4/48.8)  
## : balance > 394: no (35.5/2)  
## age > 31:  
## :...job = unknown: yes (9.4)  
## job in {admin.,blue-collar,housemaid,management,services,  
## : technician,unemployed}:  
## :...day in {4,24,25,28,31}: no (196.6/64)  
## day = 15: yes (45.7/9.7)  
## day in {8,11,13,18,27}:  
## :...default = yes: no (3.5)  
## default = no:  
## :...education = primary: no (53.5/15.3)  
## education in {secondary,tertiary,unknown}:  
## :...loan = yes: yes (34.3/8.3)  
## loan = no:  
## :...balance > 2007: yes (86.5/24.2)  
## balance <= 2007:  
## :...age <= 32: no (12.1)  
## age > 32:  
## :...duration <= 902: no (120.1/35)  
## duration > 902: yes (78.2/20.5)  
##   
## SubTree [S7]  
##   
## month in {apr,aug,dec,feb,jan,jul,mar,nov,oct,sep}: yes (26.3/2.1)  
## month = jun:  
## :...job in {student,unemployed}: yes (0)  
## : job in {admin.,retired,unknown}: no (19.6)  
## : job in {blue-collar,entrepreneur,housemaid,management,self-employed,  
## : : services,technician}:  
## : :...campaign <= 1: no (47/16.2)  
## : campaign > 1: yes (140.7/47.9)  
## month = may:  
## :...job in {entrepreneur,housemaid,management,retired,student,unemployed,  
## : unknown}: no (59)  
## job in {admin.,blue-collar,self-employed,services,technician}:  
## :...loan = yes: no (6.1)  
## loan = no:  
## :...age <= 31: yes (69.4/24.7)  
## age > 31:  
## :...marital = divorced: yes (31.9/12.7)  
## marital in {married,single}: no (208.2/67.3)  
##   
## SubTree [S8]  
##   
## previous <= 1: yes (148/59.9)  
## previous > 1: no (9.4)  
##   
## SubTree [S9]  
##   
## education = unknown: no (22.4/3.4)  
## education in {primary,secondary,tertiary}:  
## :...day in {3,5,6,7,14,20,22,29}:  
## :...duration <= 524: no (23.1)  
## : duration > 524:  
## : :...balance > 1153: no (106/21.7)  
## : balance <= 1153:  
## : :...month = mar: no (0)  
## : month in {apr,aug,dec,jun,may}: yes (122.5/46)  
## : month in {feb,jan,jul,nov,oct,sep}:  
## : :...balance <= 543: no (107.3/14.5)  
## : balance > 543: yes (43/13.7)  
## day in {1,2,9,10,12,16,17,19,21,23,26,30}:  
## :...duration <= 541: yes (62.7/2.8)  
## duration > 541:  
## :...month in {dec,mar,oct,sep}: yes (18.7)  
## month in {apr,aug,feb,jan,jul,jun,may,nov}:  
## :...job in {admin.,housemaid,retired,student,unemployed,  
## : unknown}: yes (115.6/27.9)  
## job in {blue-collar,entrepreneur,management,self-employed,  
## : services,technician}:  
## :...duration <= 571: no (18.7/2.1)  
## duration > 571:  
## :...age > 30: no (41.9/13.3)  
## age <= 30:  
## :...marital = divorced: yes (3.8)  
## marital = married: no (89.4/41.5)  
## marital = single:  
## :...campaign <= 5: yes (140.4/46.7)  
## campaign > 5: no (7.5)  
##   
## SubTree [S10]  
##   
## education = unknown: yes (7.9)  
## education in {primary,secondary,tertiary}:  
## :...age > 57: yes (40.6/9.3)  
## age <= 57:  
## :...day in {1,3,9,20,22,26,29}: no (46.5)  
## day in {2,5,6,7,10,12,14,16,17,19,21,23,30}:  
## :...duration <= 743: yes (39.7/9.7)  
## duration > 743:  
## :...month = feb: no (20.3)  
## month in {apr,jan,jul}:  
## :...previous <= 1: no (158/50.9)  
## previous > 1: yes (11.5/2.2)  
##   
## SubTree [S11]  
##   
## education in {primary,unknown}: no (38.1/2)  
## education in {secondary,tertiary}:  
## :...poutcome = other: no (0)  
## poutcome = failure: yes (2.3)  
## poutcome = unknown:  
## :...duration <= 639: no (61.8/12.6)  
## duration > 639: yes (87.4/35.6)  
##   
## SubTree [S12]  
##   
## education = primary: yes (19.1)  
## education in {secondary,tertiary,unknown}:  
## :...job = housemaid: no (5.1)  
## job in {admin.,entrepreneur,retired,self-employed,technician}:  
## :...duration <= 953: yes (147.7/27.3)  
## duration > 953: no (40.2/15.5)  
##   
## SubTree [S13]  
##   
## job = entrepreneur: yes (29.8/1.7)  
## job in {admin.,housemaid,retired,self-employed,technician}:  
## :...pdays > 172: no (10.9)  
## pdays <= 172:  
## :...pdays > 4: yes (13.3)  
## pdays <= 4:  
## :...duration > 1468: yes (13.5)  
## duration <= 1468:  
## :...duration > 1206: no (12.4)  
## duration <= 1206:  
## :...loan = no: no (146.2/69.2)  
## loan = yes: yes (17.3/1.3)  
##   
## SubTree [S14]  
##   
## balance > 3049: yes (54.1/6.9)  
## balance <= 3049:  
## :...duration > 1580: no (32.2/6.1)  
## duration <= 1580:  
## :...age <= 33: yes (24.4/2)  
## age > 33:  
## :...marital = divorced: no (44.7/16.5)  
## marital in {married,single}:  
## :...day in {3,5,6,19,23,26,30}: yes (34.4)  
## day in {1,2,7,9,10,12,14,16,17,20,21,22,29}:  
## :...poutcome in {failure,other}: yes (5.8)  
## poutcome = unknown:  
## :...campaign <= 1: yes (97.4/32.9)  
## campaign > 1: no (75.5/22.2)  
##   
## SubTree [S15]  
##   
## month in {aug,jun,sep}: yes (89.6/30.1)  
## month in {dec,jan,mar}: no (31.3)  
## month in {apr,feb,jul,may,nov,oct}:  
## :...balance > 4332: no (31.3)  
## balance <= 4332:  
## :...duration > 782: no (33/2.4)  
## duration <= 782:  
## :...day in {2,3,5,6,7,10,14,22,23}: no (201.1/47.2)  
## day in {1,9,12,16,17,19,20,21,26,29,30}:  
## :...month in {feb,may}: yes (14.5)  
## month in {apr,jul,nov,oct}:  
## :...education = unknown: yes (5.9)  
## education in {primary,secondary,tertiary}:  
## :...age > 48: yes (63.1/15.1)  
## age <= 48:  
## :...age > 46: no (24.3)  
## age <= 46:  
## :...age > 45: yes (14.1/1.1)  
## age <= 45:  
## :...loan = yes: no (39.1/4.4)  
## loan = no:  
## :...housing = no: yes (49.1/14.4)  
## housing = yes: no (120.2/43.3)  
##   
## SubTree [S16]  
##   
## day in {6,7,8,12,13,17,18}: yes (137.3/55)  
## day in {14,15,19,21,30}: no (31.9/3.2)  
##   
## SubTree [S17]  
##   
## campaign <= 5: yes (159.9/50.4)  
## campaign > 5: no (11.9/2.2)  
##   
## SubTree [S18]  
##   
## contact = telephone: no (83/23.3)  
## contact = cellular:  
## :...housing = yes:  
## :...job in {entrepreneur,retired,student,unemployed}: no (33.7)  
## : job in {admin.,housemaid,management,self-employed,services,technician}:  
## : :...duration <= 441:  
## : :...marital = divorced: no (30.9)  
## : : marital in {married,single}:  
## : : :...previous <= 3: no (288.2/71.9)  
## : : previous > 3: yes (23/4.3)  
## : duration > 441:  
## : :...balance > 4683: no (15)  
## : balance <= 4683:  
## : :...day in {4,6,7,8,10,12,13,14,16,18,19,20,22,24,  
## : : 28}: yes (170.5/66.9)  
## : day in {2,5,9,11,15,17,25,26,27,31}: no (23.2)  
## housing = no:  
## :...month in {jan,may}:  
## :...day in {7,12,18,28}: no (47.1/18.4)  
## : day in {2,9,10,11,16,17,19,24,31}: yes (8.2/0.2)  
## : day in {4,5,6,8,13,14,15,20,22,25,26,27}:  
## : :...job in {admin.,entrepreneur,housemaid,management,retired,  
## : : technician,unemployed}: yes (139.6/24.1)  
## : job in {self-employed,services,student}: no (24.9/4.1)  
## month in {aug,jul,nov}:  
## :...marital = divorced: yes (114.3/48.4)  
## marital in {married,single}:  
## :...age > 47: no (150.8/31.1)  
## age <= 47:  
## :...age > 39:  
## :...day in {2,5,6,7,9,10,11,12,13,14,16,17,20,22,25,  
## : : 26}: yes (124.4/27.9)  
## : day in {4,8,15,18,19,24,27,28,31}: no (48.8/2.2)  
## age <= 39:  
## :...age > 36: no (40.2)  
## age <= 36:  
## :...day in {4,9,10,14,17,20,22,24,26}: no (88.3/10.9)  
## day in {2,5,6,7,8,11,12,13,15,16,18,19,25,27,28,31}:  
## :...education = secondary: yes (103.3/39.5)  
## education = tertiary:  
## :...balance <= 18: yes (11.4/1)  
## balance > 18: no (165.8/64.1)  
##   
## SubTree [S19]  
##   
## marital = divorced: yes (22.7/1.5)  
## marital in {married,single}:  
## :...age > 52: no (30.2/7.3)  
## age <= 52:  
## :...age <= 26: no (16.2/2.8)  
## age > 26:  
## :...month in {aug,jan,jul,nov}: yes (176.8/40.8)  
## month = may: no (58.2/26.7)  
##   
## SubTree [S20]  
##   
## duration <= 132: yes (17.3/4.6)  
## duration > 132:  
## :...job in {admin.,blue-collar,entrepreneur,management,retired,self-employed,  
## : services,student,technician,unknown}: no (168.2/27.8)  
## job in {housemaid,unemployed}: yes (17.7/4.7)  
##   
## SubTree [S21]  
##   
## job in {entrepreneur,retired,self-employed,services,unemployed,  
## : unknown}: no (513.4/60.6)  
## job in {admin.,blue-collar,housemaid,management,student,technician}:  
## :...balance <= -1: no (68)  
## balance > -1:  
## :...pdays > 381: yes (30.3/11.6)  
## pdays <= 381:  
## :...pdays > 353: no (44.1)  
## pdays <= 353:  
## :...pdays > 266: yes (69.9/32.7)  
## pdays <= 266:  
## :...pdays > 101: no (137.7/30.4)  
## pdays <= 101:  
## :...poutcome = failure: yes (73.1/25.9)  
## poutcome in {other,unknown}:  
## :...duration <= 177: no (199.6/25.3)  
## duration > 177:  
## :...month in {aug,jul}:  
## :...day in {4,9,10,15,16,17,25,26,  
## : : 27}: no (160.9)  
## : day in {2,5,6,7,8,11,12,13,14,18,19,20,22,  
## : : 24,28,31}:  
## : :...age > 55: no (34.2)  
## : age <= 55:  
## : :...campaign > 1: no (451.5/97.6)  
## : campaign <= 1:  
## : :...day in {2,5,7,11,12,13,14,18,  
## : : 19,20}: yes (161.3/62.7)  
## : day in {6,8,22,24,28,  
## : 31}: no (34.8)  
## month in {jan,may,nov}:  
## :...day in {2,5,6,7,12,15,17,18,19,20,24,26,28,  
## : 31}: no (355.5/57.1)  
## day in {4,8,9,10,11,13,14,16,22,25,27}:  
## :...marital = divorced: no (12.8)  
## marital in {married,single}:  
## :...month = nov: yes (50.9/7.4)  
## month in {jan,may}:  
## :...campaign > 3: yes (49.7/9.6)  
## campaign <= 3: [S26]  
##   
## SubTree [S22]  
##   
## education = unknown: no (19.7)  
## education in {primary,secondary,tertiary}:  
## :...job in {entrepreneur,housemaid,student,unemployed,unknown}: no (50)  
## job in {admin.,blue-collar,management,retired,self-employed,services,  
## : technician}:  
## :...duration > 282: no (32)  
## duration <= 282:  
## :...pdays > 306: no (25.8)  
## pdays <= 306:  
## :...pdays > 279: yes (26.8/4.8)  
## pdays <= 279:  
## :...day in {2,5,6,7,9,17,19,20,30}: no (367.2/46.7)  
## day in {1,3,4,8,12,13,14,15,16,26,28,31}:  
## :...poutcome = other: no (26.1/1.7)  
## poutcome in {failure,unknown}:  
## :...duration <= 159: yes (99.6/35.1)  
## duration > 159: no (280.7/84.5)  
##   
## SubTree [S23]  
##   
## contact = telephone: yes (21.5/6)  
## contact = cellular:  
## :...day in {5,6,12,19,26,28,31}: no (33.6)  
## day in {1,2,3,4,7,8,9,13,14,15,16,17,20,30}:  
## :...poutcome = other: yes (42.2/14.7)  
## poutcome in {failure,unknown}:  
## :...duration <= 310: no (29.2)  
## duration > 310:  
## :...education = unknown: yes (15.6/3)  
## education in {primary,secondary,tertiary}:  
## :...marital = divorced: no (25.2/3.9)  
## marital in {married,single}:  
## :...duration <= 383:  
## :...day in {1,4,7,8,15,16,20}: no (66.8/12.3)  
## : day in {2,3,9,13,14,17,30}: yes (142.3/50.4)  
## duration > 383:  
## :...duration <= 483: no (122/23.7)  
## duration > 483: yes (32/13.1)  
##   
## SubTree [S24]  
##   
## duration > 393: yes (26.6)  
## duration <= 393:  
## :...balance <= 112: yes (12.1)  
## balance > 112:  
## :...day in {1,3,4,5,8,9,12,14,15,16,18,19,20,22,23,27,28}: yes (147.7/59)  
## day in {2,6,7,10,11,13,17,21,24,25,26,29,30,31}: no (49.9/0.8)  
##   
## SubTree [S25]  
##   
## poutcome = failure:  
## :...day in {3,5,9,13,14,17,18,21,22,23,27,30,31}: yes (165.8/48.8)  
## : day in {1,2,4,6,7,8,10,11,12,15,16,19,20,24,25,26,28,29}:  
## : :...education = primary: yes (22.5/7.7)  
## : education in {secondary,tertiary,unknown}: no (157/28.2)  
## poutcome in {other,unknown}:  
## :...day in {3,7,12,13,17,18,19,26}:  
## :...job = unknown: yes (13)  
## : job in {admin.,blue-collar,entrepreneur,housemaid,management,retired,  
## : : self-employed,services,student,technician,unemployed}:  
## : :...age > 63: no (43.1/6)  
## : age <= 63:  
## : :...balance <= 855:  
## : :...balance <= 83: yes (46.6/20.2)  
## : : balance > 83: no (136.7/27.1)  
## : balance > 855:  
## : :...education in {primary,unknown}: no (5.9)  
## : education in {secondary,tertiary}:  
## : :...campaign <= 2: yes (152.3/62.6)  
## : campaign > 2: no (20.5/3.3)  
## day in {1,2,4,5,6,8,9,10,11,14,15,16,20,21,22,23,24,25,27,28,29,30,31}:  
## :...age <= 28:  
## :...previous > 1: yes (26.7)  
## : previous <= 1:  
## : :...marital in {divorced,married}: yes (34.8/3.4)  
## : marital = single:  
## : :...campaign > 3: yes (28.5/2.7)  
## : campaign <= 3:  
## : :...education = unknown: no (40.8/14.4)  
## : education in {primary,secondary,tertiary}:  
## : :...duration <= 181: no (59.3/25.4)  
## : duration > 181: yes (195.3/51.3)  
## age > 28:  
## :...duration <= 137: yes (39.1/5.1)  
## duration > 137:  
## :...age <= 32:  
## :...education = primary: no (12.9)  
## : education in {secondary,tertiary,unknown}:  
## : :...duration > 376: no (28.8/3.6)  
## : duration <= 376:  
## : :...job in {entrepreneur,housemaid,retired,  
## : : self-employed,student,  
## : : unknown}: yes (35.7/3.3)  
## : job in {admin.,blue-collar,management,services,  
## : : technician,unemployed}:  
## : :...day in {25,28}: no (0)  
## : day in {6,14,24,29,31}: yes (27.9)  
## : day in {1,2,4,5,8,9,10,11,15,16,20,21,22,23,27,  
## : : 30}:  
## : :...poutcome = other: yes (33.9/11.2)  
## : poutcome = unknown:  
## : :...month = dec: yes (6.2)  
## : month in {apr,jun,mar,oct,sep}:  
## : :...duration <= 180: yes (54.8/22.5)  
## : duration > 180: no (133/28.9)  
## age > 32:  
## :...age <= 33: yes (56.3/11)  
## age > 33:  
## :...loan = yes: yes (14.4/1.3)  
## loan = no:  
## :...campaign > 2: yes (139.1/41.5)  
## campaign <= 2:  
## :...month = dec: no (17.5/3)  
## month in {apr,mar,sep}:  
## :...age > 51:  
## : :...balance > 7613: yes (21.9)  
## : : balance <= 7613:  
## : : :...balance <= 4979: yes (250.3/72.2)  
## : : balance > 4979: no (14.4/2)  
## : age <= 51:  
## : :...marital = divorced: no (50.3/14.5)  
## : marital in {married,single}:  
## : :...age > 47: no (44.7/11.6)  
## : age <= 47:  
## : :...day in {1,8,9,20,23,  
## : : 27}: no (56.5/11.7)  
## : day in {2,4,5,6,10,11,14,15,16,  
## : 21,22,24,25,28,29,30,  
## : 31}: yes (166.5/27.1)  
## month in {jun,oct}:  
## :...balance <= 67: no (38.1/3.7)  
## balance > 67:  
## :...previous > 3: no (22.6/5.7)  
## previous <= 3:  
## :...balance <= 634: yes (91.4/24.2)  
## balance > 634:  
## :...age > 66: no (16.7/1.2)  
## age <= 66:  
## :...age > 63: yes (11)  
## age <= 63:  
## :...duration > 315: no (32.7/2.8)  
## duration <= 315: [S27]  
##   
## SubTree [S26]  
##   
## job in {admin.,blue-collar,housemaid,technician}: no (126.9/35.3)  
## job in {management,student}: yes (56/16.5)  
##   
## SubTree [S27]  
##   
## job in {admin.,management,retired,self-employed,services,technician,unemployed,  
## : unknown}: no (149.8/71.1)  
## job in {blue-collar,entrepreneur,housemaid,student}: yes (21)  
##   
## ----- Trial 8: -----  
##   
## Decision tree:  
##   
## poutcome = success:  
## :...default = yes: no (4.1)  
## : default = no:  
## : :...duration <= 132:  
## : :...contact = telephone: no (15.3)  
## : : contact in {cellular,unknown}:  
## : : :...pdays <= 67: yes (25.1/6.1)  
## : : pdays > 67:  
## : : :...pdays <= 84: no (33.6)  
## : : pdays > 84:  
## : : :...pdays <= 94: yes (69.8/22.9)  
## : : pdays > 94: no (272.6/82.7)  
## : duration > 132:  
## : :...day in {2,4,5,6,7,8,14,17,18,26,29,31}:  
## : :...age <= 25: yes (38/6.3)  
## : : age > 25:  
## : : :...pdays > 358: yes (73.3/17.7)  
## : : pdays <= 358:  
## : : :...month in {feb,nov}: no (125.9/27.8)  
## : : month in {apr,aug,dec,jan,jul,jun,mar,may,oct,sep}:  
## : : :...balance > 9725: no (26.4/3.2)  
## : : balance <= 9725:  
## : : :...balance > 6486: yes (25.5/4.1)  
## : : balance <= 6486:  
## : : :...housing = yes:  
## : : :...contact = unknown: no (0)  
## : : : contact = telephone: yes (3.8)  
## : : : contact = cellular:  
## : : : :...month in {aug,mar}: yes (18.4/1.5)  
## : : : month in {apr,dec,jan,jul,jun,may,  
## : : : : oct,sep}:  
## : : : :...duration <= 1005: no (205.3/58.4)  
## : : : duration > 1005: yes (18.7/2.7)  
## : : housing = no:  
## : : :...education = primary: yes (29.8/6.2)  
## : : education in {secondary,tertiary,  
## : : : unknown}:  
## : : :...campaign > 1:  
## : : :...balance > 5127: no (14.7)  
## : : : balance <= 5127:  
## : : : :...age <= 36: yes (78.8/3.6)  
## : : : age > 36: no (110.5/48.3)  
## : : campaign <= 1:  
## : : :...loan = yes: yes (4.7)  
## : : loan = no:  
## : : :...duration > 448: yes (45/11.5)  
## : : duration <= 448: [S1]  
## : day in {1,3,9,10,11,12,13,15,16,19,20,21,22,23,24,25,27,28,30}:  
## : :...duration > 1008: no (27.6/7.8)  
## : duration <= 1008:  
## : :...duration > 632: yes (74.9/6.4)  
## : duration <= 632:  
## : :...pdays > 262:  
## : :...pdays <= 273: no (16.3)  
## : : pdays > 273:  
## : : :...day in {1,3,10,19,21,23,24,27,28,  
## : : : 30}: yes (38.5/2)  
## : : day in {9,11,12,13,15,16,20,22,  
## : : 25}: no (124.6/49)  
## : pdays <= 262:  
## : :...pdays <= 44: no (32.1/10.4)  
## : pdays > 44:  
## : :...month in {feb,sep}: yes (196.8/24.1)  
## : month in {apr,aug,dec,jan,jul,jun,mar,may,nov,  
## : : oct}:  
## : :...contact in {telephone,  
## : : unknown}: yes (92.7/41.9)  
## : contact = cellular:  
## : :...month = mar: yes (25.1)  
## : month in {apr,aug,dec,jan,jul,jun,may,  
## : : nov,oct}:  
## : :...housing = yes:  
## : :...age <= 39: no (116.7/45.2)  
## : : age > 39: yes (129.5/25.6)  
## : housing = no:  
## : :...job in {housemaid,  
## : : unknown}: yes (29.3)  
## : job in {admin.,blue-collar,  
## : : entrepreneur,  
## : : management,retired,  
## : : self-employed,services,  
## : : student,technician,  
## : : unemployed}:  
## : :...day in {22,23,  
## : : 24}: yes (40.6)  
## : day in {1,3,9,10,11,12,13,  
## : : 15,16,19,20,21,25,  
## : : 27,28,30}:  
## : :...duration <= 145: no (32.3/9.2)  
## : duration > 145: [S2]  
## poutcome in {failure,other,unknown}:  
## :...duration > 613:  
## :...previous > 10: yes (25.6/3.6)  
## : previous <= 10:  
## : :...duration > 853:  
## : :...day in {1,4,6,8,9,10,11,13,22,24,25,26,28,30,  
## : : : 31}: yes (1381.3/559)  
## : : day in {2,3,23,27,29}: no (481.5/214)  
## : : day = 5:  
## : : :...marital in {divorced,married}: yes (137.2/52.5)  
## : : : marital = single: no (41.1/7.4)  
## : : day = 7:  
## : : :...loan = no: yes (151.5/57.9)  
## : : : loan = yes: no (20.6/1.7)  
## : : day = 12:  
## : : :...contact in {cellular,unknown}: yes (137.6/50)  
## : : : contact = telephone: no (12.9)  
## : : day = 14:  
## : : :...default = no: yes (151.8/55.3)  
## : : : default = yes: no (5.5)  
## : : day = 15:  
## : : :...poutcome = other: yes (7.9)  
## : : : poutcome in {failure,unknown}:  
## : : : :...duration <= 922: yes (44.5/7)  
## : : : duration > 922: no (113.9/41)  
## : : day = 21:  
## : : :...duration > 1464: yes (26.9)  
## : : : duration <= 1464:  
## : : : :...duration <= 1085: yes (125.8/52.3)  
## : : : duration > 1085: no (65.7/11.4)  
## : : day = 16:  
## : : :...campaign > 8: yes (9.1)  
## : : : campaign <= 8:  
## : : : :...campaign > 5: no (11.5)  
## : : : campaign <= 5:  
## : : : :...loan = no: no (149.2/68)  
## : : : loan = yes: yes (15)  
## : : day = 18:  
## : : :...balance <= -171: no (14.9)  
## : : : balance > -171:  
## : : : :...age > 60: yes (9.9)  
## : : : age <= 60:  
## : : : :...campaign <= 1: yes (50.4/13.4)  
## : : : campaign > 1: no (122.3/46.6)  
## : : day = 19:  
## : : :...campaign > 5: yes (15)  
## : : : campaign <= 5:  
## : : : :...default = yes: yes (5.5)  
## : : : default = no:  
## : : : :...balance <= 824: no (85.8/15.8)  
## : : : balance > 824: yes (69.9/28.6)  
## : : day = 17:  
## : : :...age > 56: no (11.6)  
## : : : age <= 56:  
## : : : :...balance > 5787: no (10.9)  
## : : : balance <= 5787:  
## : : : :...pdays > 258: no (22.9/3.2)  
## : : : pdays <= 258:  
## : : : :...job in {retired,unknown}: yes (0)  
## : : : job in {entrepreneur,  
## : : : : unemployed}: no (9)  
## : : : job in {admin.,blue-collar,housemaid,  
## : : : : management,self-employed,services,  
## : : : : student,technician}:  
## : : : :...duration <= 874: no (8.1)  
## : : : duration > 874: yes (151.1/37.8)  
## : : day = 20:  
## : : :...default = yes: no (2.6)  
## : : default = no:  
## : : :...job in {admin.,entrepreneur,retired,services,  
## : : : technician,unknown}: yes (113/22.7)  
## : : job in {blue-collar,housemaid,management,self-employed,  
## : : : student,unemployed}:  
## : : :...marital = divorced: yes (5)  
## : : marital in {married,single}:  
## : : :...pdays > 60: yes (14/1.6)  
## : : pdays <= 60:  
## : : :...balance <= 125: yes (26.9/5.5)  
## : : balance > 125: no (130.4/48.8)  
## : duration <= 853:  
## : :...age > 58:  
## : :...duration > 765: no (74.9/18.6)  
## : : duration <= 765:  
## : : :...duration <= 649: no (56.2/21.8)  
## : : duration > 649: yes (142.3/20.9)  
## : age <= 58:  
## : :...job = housemaid: no (75.4/12.2)  
## : job in {admin.,blue-collar,entrepreneur,management,retired,  
## : : self-employed,services,student,technician,  
## : : unemployed,unknown}:  
## : :...age <= 25:  
## : :...day in {1,6,10,13,14,15,17,19,25,29,  
## : : : 31}: yes (0)  
## : : day in {5,12,16,20,26,27}: no (26.6)  
## : : day in {2,3,4,7,8,9,11,18,21,22,23,24,28,30}:  
## : : :...balance <= 319: no (62.6/27.3)  
## : : balance > 319: yes (87.7/6.7)  
## : age > 25:  
## : :...contact = cellular:  
## : :...marital = divorced:  
## : : :...day in {1,2,4,5,7,11,12,16,17,22,24,25,26,  
## : : : : 28,29,30,31}: no (159.3/16.2)  
## : : : day in {3,6,8,9,10,13,14,15,18,19,20,21,23,  
## : : : 27}: yes (161.3/55.5)  
## : : marital in {married,single}:  
## : : :...month in {dec,feb,sep}: no (185.4/81.5)  
## : : month in {jan,jun,mar,  
## : : : oct}: yes (157.7/68)  
## : : month = apr:  
## : : :...duration > 753: no (94.2/11.1)  
## : : : duration <= 753:  
## : : : :...duration <= 635: no (29.4/3.2)  
## : : : duration > 635: yes (151.4/64.6)  
## : : month = aug:  
## : : :...duration <= 650: yes (90.5/26)  
## : : : duration > 650:  
## : : : :...day in {1,2,9,10,15,16,23,24,30,  
## : : : : 31}: no (0)  
## : : : day in {3,7,8,11,12,  
## : : : : 17}: yes (64.4/9.8)  
## : : : day in {4,5,6,13,14,18,19,20,21,22,  
## : : : : 25,26,27,28,29}:  
## : : : :...duration > 734: yes (98.9/42.9)  
## : : : duration <= 734: [S3]  
## : : month = jul:  
## : : :...poutcome in {failure,  
## : : : : other}: yes (3)  
## : : : poutcome = unknown:  
## : : : :...day in {2,3,7,8,16,17,25,  
## : : : : 28}: yes (192.8/64.1)  
## : : : day in {1,4,5,6,12,13,14,19,20,26,  
## : : : : 27}: no (29.2)  
## : : : day in {9,10,11,15,18,21,22,23,24,  
## : : : : 29,30,31}:  
## : : : :...age <= 27: no (34.4/0.2)  
## : : : age > 27:  
## : : : :...duration <= 624: no (15.8)  
## : : : duration > 624:  
## : : : :...loan = no: no (221/86)  
## : : : loan = yes: yes (71.3/28)  
## : : month = nov:  
## : : :...pdays > 155: no (26.4)  
## : : : pdays <= 155:  
## : : : :...day in {1,2,3,4,5,6,7,8,9,10,11,12,  
## : : : : 13,14,15,16,22,23,24,25,26,  
## : : : : 27,28,29,30,  
## : : : : 31}: yes (0)  
## : : : day = 19: no (68.2/16.2)  
## : : : day in {17,18,20,21}:  
## : : : :...previous > 0: yes (28)  
## : : : previous <= 0:  
## : : : :...age > 51: yes (18.8)  
## : : : age <= 51: [S4]  
## : : month = may:  
## : : :...default = yes: no (5.8)  
## : : default = no:  
## : : :...housing = no: yes (43.7/2.6)  
## : : housing = yes:  
## : : :...balance > 3508: yes (35.9/3.2)  
## : : balance <= 3508:  
## : : :...loan = yes: no (65.9/19.8)  
## : : loan = no:  
## : : :...balance <= -207: yes (14.3)  
## : : balance > -207: [S5]  
## : contact in {telephone,unknown}:  
## : :...poutcome = other: yes (11.1/0.2)  
## : poutcome in {failure,unknown}:  
## : :...month in {apr,dec,jan,mar,nov,  
## : : sep}: no (26/1)  
## : month in {aug,feb,jul,jun,may,oct}:  
## : :...job in {services,student,  
## : : unknown}: no (106.5/15.4)  
## : job in {admin.,blue-collar,  
## : : entrepreneur,management,  
## : : retired,self-employed,  
## : : technician,unemployed}:  
## : :...balance <= -209: no (39.7/4.5)  
## : balance > -209:  
## : :...marital in {divorced,single}:  
## : :...campaign > 11: no (24.8/4)  
## : : campaign <= 11: [S6]  
## : marital = married:  
## : :...age <= 29: no (35.7)  
## : age > 29:  
## : :...default = yes: yes (13.2/3)  
## : default = no: [S7]  
## duration <= 613:  
## :...duration <= 94: no (1922.2/56.1)  
## duration > 94:  
## :...month in {dec,mar,oct,sep}:  
## :...balance > 13265: no (57.6/8.3)  
## : balance <= 13265:  
## : :...previous > 6: no (99.8/24)  
## : previous <= 6:  
## : :...contact = unknown: yes (33.4/7.2)  
## : contact in {cellular,telephone}:  
## : :...duration <= 282:  
## : :...pdays > 450: no (46.8/8.9)  
## : : pdays <= 450:  
## : : :...day in {2,4,5,6,9,10,11,17,18,22,23,24,29,  
## : : : 31}:  
## : : :...campaign > 4: no (26.5/7.7)  
## : : : campaign <= 4:  
## : : : :...duration > 174:  
## : : : :...month = dec: no (38.6/13.2)  
## : : : : month in {mar,oct,  
## : : : : sep}: yes (282.9/68)  
## : : : duration <= 174:  
## : : : :...balance > 8629: yes (19.9/0.2)  
## : : : balance <= 8629: [S8]  
## : : day in {1,3,7,8,12,13,14,15,16,19,20,21,25,  
## : : : 26,27,28,30}:  
## : : :...marital = divorced: yes (93.2/32.8)  
## : : marital in {married,single}:  
## : : :...education = primary: no (77.4/7.9)  
## : : education in {secondary,tertiary,  
## : : : unknown}:  
## : : :...duration <= 98: yes (32.1/7.9)  
## : : duration > 98: [S9]  
## : duration > 282:  
## : :...day in {3,5,10,12,16,20,21,  
## : : 24}: yes (143.1/18.8)  
## : day in {1,2,4,6,7,8,9,11,13,14,15,17,18,19,22,  
## : : 23,25,26,27,28,29,30,31}:  
## : :...education = unknown: no (48.5/15.4)  
## : education in {primary,secondary,tertiary}:  
## : :...campaign > 2: yes (134.6/36.3)  
## : campaign <= 2:  
## : :...month = dec: yes (63.6/17.5)  
## : month in {mar,oct,sep}:  
## : :...age > 63: yes (78.6/24.9)  
## : age <= 63:  
## : :...age > 49: no (91.6/18.5)  
## : age <= 49:  
## : :...day in {11,23,26,27,  
## : : 28}: yes (50.4)  
## : day in {13,14,19,  
## : : 31}: no (31.2)  
## : day in {1,2,4,6,7,8,9,  
## : : 15,17,18,22,25,  
## : : 29,30}: [S10]  
## month in {apr,aug,feb,jan,jul,jun,may,nov}:  
## :...age > 60:  
## :...loan = yes: no (6.4)  
## : loan = no:  
## : :...age > 84: yes (34.6/4.7)  
## : age <= 84:  
## : :...campaign > 5: no (26/3.6)  
## : campaign <= 5:  
## : :...duration <= 111: no (31.9/3.1)  
## : duration > 111:  
## : :...job in {admin.,blue-collar,entrepreneur,  
## : : self-employed}: yes (73.9/20.2)  
## : job in {services,student,  
## : : unemployed}: no (6.3)  
## : job in {housemaid,management,retired,  
## : : technician,unknown}:  
## : :...pdays > 181: no (64.2/15.4)  
## : pdays <= 181:  
## : :...campaign > 4: no (38.9/10.4)  
## : campaign <= 4:  
## : :...age <= 64:  
## : :...day in {1,2,3,4,5,6,7,9,10,  
## : : : 11,12,14,16,17,18,  
## : : : 19,20,21,25,26,27,  
## : : : 29,  
## : : : 31}: yes (181.8/47.2)  
## : : day in {8,13,15,22,23,24,  
## : : 28,  
## : : 30}: no (70.1/10.5)  
## : age > 64: [S11]  
## age <= 60:  
## :...pdays > 370:  
## :...duration <= 249: no (146.5/38.5)  
## : duration > 249: yes (146.4/33.9)  
## pdays <= 370:  
## :...housing = yes:  
## :...duration <= 457:  
## : :...campaign > 8: no (78.5)  
## : : campaign <= 8:  
## : : :...month in {apr,jul,may}:  
## : : :...day in {1,3,5,6,7,8,9,10,11,12,13,14,  
## : : : : 15,16,17,18,19,20,23,26,28,29,  
## : : : : 31}: no (3213.5/228.7)  
## : : : day in {2,4,21,22,24,25,27,30}:  
## : : : :...balance <= -15: no (88.2)  
## : : : balance > -15:  
## : : : :...age <= 26: no (35.2)  
## : : : age > 26: [S12]  
## : : month in {aug,feb,jan,jun,nov}:  
## : : :...education = unknown: no (47.3)  
## : : education in {primary,secondary,  
## : : : tertiary}:  
## : : :...pdays > 319: yes (26.6/6.8)  
## : : pdays <= 319: [S13]  
## : duration > 457:  
## : :...loan = yes: no (281.1/55.9)  
## : loan = no:  
## : :...campaign > 2:  
## : :...day in {3,10,15,16,18,20,24,27,29,  
## : : : 31}: no (146.3/12.5)  
## : : day in {1,2,4,5,6,7,8,9,11,12,13,14,17,  
## : : : 19,21,22,23,25,26,28,30}:  
## : : :...poutcome = other: no (27.4/2.9)  
## : : poutcome in {failure,unknown}: [S14]  
## : campaign <= 2:  
## : :...balance > 6748: no (32.2)  
## : balance <= 6748:  
## : :...day in {1,2,3,5,7,8,9,11,15,17,22,  
## : : 23,25,26,27,29,  
## : : 31}: no (575.9/93)  
## : day in {4,6,10,12,13,14,16,18,19,  
## : : 20,21,24,28,30}:  
## : :...balance > 4547: yes (30.9/5.8)  
## : balance <= 4547: [S15]  
## housing = no:  
## :...month in {apr,jun,may}:  
## :...contact in {telephone,unknown}:  
## : :...pdays <= 173: no (753.7/102.4)  
## : : pdays > 173: yes (26.5/6.7)  
## : contact = cellular:  
## : :...pdays > 335: no (66.6/11.7)  
## : pdays <= 335:  
## : :...duration <= 156:  
## : :...education = primary: no (30.3)  
## : : education in {secondary,tertiary,  
## : : : unknown}:  
## : : :...poutcome = other: no (11.1)  
## : : poutcome in {failure,unknown}:  
## : : :...day in {1,2,3,4,6,7,9,10,  
## : : : 11,12,13,15,17,18,  
## : : : 24,25,26,27,28,29,  
## : : : 30,  
## : : : 31}: no (252.2/45.3)  
## : : day in {5,8,14,16,19,20,21,  
## : : 22,  
## : : 23}: yes (179.9/74.9)  
## : duration > 156:  
## : :...age > 55: [S16]  
## : age <= 55: [S17]  
## month in {aug,feb,jan,jul,nov}:  
## :...duration <= 384:  
## :...default = yes: no (46.4)  
## : default = no:  
## : :...pdays <= 41:  
## : :...age <= 26:  
## : : :...day in {1,7,10,13,17,19,20,  
## : : : : 26}: yes (54.5/4.9)  
## : : : day in {4,22}: no (0.6)  
## : : : day in {2,3,5,6,8,9,11,12,14,  
## : : : : 15,16,18,21,23,24,25,  
## : : : : 27,28,29,30,31}: [S18]  
## : : age > 26:  
## : : :...loan = yes: no (298.2/4.9)  
## : : loan = no:  
## : : :...day in {4,8,13,17,19,20,21,  
## : : : 22,23,28,29,  
## : : : 30}: no (1237.7/98.6)  
## : : day in {1,2,3,5,6,7,9,10,  
## : : : 11,12,14,15,16,18,  
## : : : 24,25,26,27,31}:  
## : : :...balance > 3369: [S19]  
## : : balance <= 3369: [S20]  
## : pdays > 41:  
## : :...day in {1,5,14,17,22,24,  
## : : 30}: no (129.2/5.7)  
## : day in {2,3,4,6,7,8,9,10,11,12,13,  
## : : 15,16,18,19,20,21,23,25,26,  
## : : 27,28,29,31}: [S21]  
## duration > 384:  
## :...age <= 23: yes (40.3/5.3)  
## age > 23:  
## :...previous > 5: yes (39.8/14)  
## previous <= 5:  
## :...poutcome = other: yes (52.8/22)  
## poutcome in {failure,unknown}:  
## :...pdays > 193: no (32.8)  
## pdays <= 193:  
## :...previous > 2: no (32.9/4.1)  
## previous <= 2:  
## :...pdays > 87: yes (36.7/12.2)  
## pdays <= 87:  
## :...balance > 1781: [S22]  
## balance <= 1781: [S23]  
##   
## SubTree [S1]  
##   
## month in {apr,aug,dec,jan,jul,jun,mar,may}: no (153.7/43.3)  
## month in {oct,sep}: yes (16.1)  
##   
## SubTree [S2]  
##   
## campaign > 2: yes (99.7/17.2)  
## campaign <= 2:  
## :...balance <= 142: yes (57/6.9)  
## balance > 142:  
## :...pdays <= 96: yes (212.6/58.5)  
## pdays > 96:  
## :...day in {1,9,19}: no (29.1/2.5)  
## day in {3,10,11,12,13,15,16,20,21,25,27,28,30}: yes (224.9/91.1)  
##   
## SubTree [S3]  
##   
## job in {admin.,entrepreneur,self-employed,services}: yes (28.1/7.8)  
## job in {blue-collar,management,retired,student,technician,unemployed,  
## unknown}: no (142.8/21.3)  
##   
## SubTree [S4]  
##   
## campaign <= 1: yes (106.3/31.6)  
## campaign > 1: no (69.7/19.6)  
##   
## SubTree [S5]  
##   
## day in {1,2,3,4,6,9,10,16,17,19,20,21,23,24,25,26,28,29,30,31}: yes (25.3)  
## day in {5,7,8,11,12,13,14,15,18,22,27}:  
## :...balance > 2228: no (17.5/2.5)  
## balance <= 2228:  
## :...age <= 27: yes (13.9)  
## age > 27:  
## :...job in {admin.,blue-collar,technician}: no (119/38.6)  
## job in {entrepreneur,management,retired,self-employed,services,  
## student,unemployed,unknown}: yes (72.4/17.7)  
##   
## SubTree [S6]  
##   
## contact = telephone: yes (14.8/2.9)  
## contact = unknown:  
## :...balance > 4211: no (26.8/5.7)  
## balance <= 4211:  
## :...age <= 28: yes (67.5/15.6)  
## age > 28:  
## :...month in {aug,feb,oct}: yes (0)  
## month = jul: no (11.8)  
## month in {jun,may}:  
## :...duration <= 727: no (141.1/51)  
## duration > 727:  
## :...age <= 54: yes (158.8/50.8)  
## age > 54: no (8.5)  
##   
## SubTree [S7]  
##   
## day in {1,3,4,5,6,7,9,10,17,20,23,24,25,29,30,31}: no (271.3/52.2)  
## day in {2,8,11,12,13,14,15,16,18,19,21,22,26,27,28}:  
## :...education = unknown: yes (20.7/2.1)  
## education in {primary,secondary,tertiary}:  
## :...age <= 32: yes (28.3/4.4)  
## age > 32:  
## :...age <= 35: no (23.1/3.1)  
## age > 35:  
## :...age <= 46: yes (167.7/62.7)  
## age > 46: no (104.9/40.6)  
##   
## SubTree [S8]  
##   
## job in {admin.,housemaid,student,technician,unknown}: no (135.4/40.8)  
## job in {blue-collar,entrepreneur,management,retired,self-employed,services,  
## : unemployed}:  
## :...day in {2,5,9,10,11,18,22,23,24,29,31}: yes (171.9/55.5)  
## day in {4,6,17}: no (13.5)  
##   
## SubTree [S9]  
##   
## job in {entrepreneur,housemaid,services,student}: yes (134.4/56.2)  
## job in {admin.,blue-collar,management,retired,self-employed,technician,  
## : unemployed,unknown}:  
## :...day in {7,13,15,19,20,25,26,27}: no (216.2/30.8)  
## day in {1,3,8,12,14,16,21,28,30}:  
## :...housing = yes: no (88.4/19.9)  
## housing = no:  
## :...duration > 261: no (22.2)  
## duration <= 261:  
## :...loan = yes: yes (6.3/0.8)  
## loan = no:  
## :...duration <= 119: no (25.5/5.7)  
## duration > 119:  
## :...age <= 26: no (10.9/1.1)  
## age > 26: yes (143/56.3)  
##   
## SubTree [S10]  
##   
## marital = divorced: yes (6.8)  
## marital in {married,single}:  
## :...duration <= 296: no (14.3)  
## duration > 296:  
## :...balance > 4336: yes (10.7)  
## balance <= 4336:  
## :...balance > 3083: no (22.7)  
## balance <= 3083:  
## :...contact = telephone: yes (13)  
## contact = cellular:  
## :...job in {admin.,blue-collar,housemaid,retired,self-employed,  
## : unknown}: yes (23.9)  
## job in {entrepreneur,management,services,student,  
## technician,unemployed}: no (133.4/58.5)  
##   
## SubTree [S11]  
##   
## marital = single: no (15.7)  
## marital in {divorced,married}:  
## :...duration > 519: yes (36.6/7.9)  
## duration <= 519:  
## :...balance > 8876: no (28.5/3.4)  
## balance <= 8876:  
## :...poutcome in {failure,unknown}: no (489/208.9)  
## poutcome = other: yes (21.9/5.5)  
##   
## SubTree [S12]  
##   
## contact in {telephone,unknown}: no (126.2/8.8)  
## contact = cellular:  
## :...month = jul: no (149.4/20)  
## month in {apr,may}:  
## :...day = 2: no (16.3)  
## day in {21,22,24,27}: yes (70.9/18.6)  
## day in {4,25,30}:  
## :...duration <= 332: no (160.2/48.2)  
## duration > 332: yes (38.5/4.5)  
##   
## SubTree [S13]  
##   
## job in {entrepreneur,self-employed,unknown}: no (95.9)  
## job in {admin.,blue-collar,housemaid,management,retired,services,student,  
## : technician,unemployed}:  
## :...day in {2,6,9,19,20,21,22,24,30}: no (528.3/31.5)  
## day in {7,8,15,16,26,31}: yes (141.3/57.6)  
## day in {1,3,4,5,10,11,12,13,14,17,18,23,25,27,28,29}:  
## :...duration <= 117: no (75.6)  
## duration > 117:  
## :...duration > 431: no (31.2)  
## duration <= 431:  
## :...month = aug:  
## :...pdays <= 95: no (168.5/14.1)  
## : pdays > 95: yes (64.1/13.4)  
## month in {feb,jan,jun,nov}:  
## :...day in {1,3,4,5,10,11,12,17,18,23,25,28,  
## : 29}: no (681.5/161.5)  
## day in {13,14,27}: yes (45.3/3.8)  
##   
## SubTree [S14]  
##   
## education = unknown: yes (16.6)  
## education in {primary,secondary,tertiary}:  
## :...contact = telephone: no (9.7)  
## contact in {cellular,unknown}:  
## :...duration <= 518:  
## :...day in {1,4,5,6,7,9,17,28}: yes (84.4/31.8)  
## : day in {2,8,11,12,13,14,19,21,22,23,25,26,30}: no (78.8/2)  
## duration > 518:  
## :...day = 1: yes (0)  
## day in {6,7}: no (23)  
## day in {2,4,5,8,9,11,12,13,14,17,19,21,22,23,25,26,28,30}:  
## :...age <= 33: yes (113.9/25.8)  
## age > 33:  
## :...pdays <= 318: yes (148.6/71)  
## pdays > 318: no (10.9)  
##   
## SubTree [S15]  
##   
## contact in {telephone,unknown}: no (240.4/67.6)  
## contact = cellular:  
## :...campaign > 1:  
## :...previous <= 6: no (179.4/46.1)  
## : previous > 6: yes (9.7/1.7)  
## campaign <= 1:  
## :...job = unknown: yes (0)  
## job in {housemaid,retired,technician,unemployed}: no (37.8/5)  
## job in {admin.,blue-collar,entrepreneur,management,self-employed,  
## : services,student}:  
## :...day in {12,13,20,28,30}: yes (67.2/5.6)  
## day in {4,6,10,14,16,18,19,21,24}:  
## :...month in {apr,jan,jun,nov}: no (72/20.1)  
## month in {aug,feb,jul,may}:  
## :...age > 51: yes (16)  
## age <= 51:  
## :...duration <= 485: no (10.8)  
## duration > 485: yes (161.8/65.7)  
##   
## SubTree [S16]  
##   
## job in {entrepreneur,student}: no (0)  
## job in {blue-collar,unknown}: yes (12.8/0.2)  
## job in {admin.,housemaid,management,retired,self-employed,services,technician,  
## : unemployed}:  
## :...day in {6,7,10,11,13,16,18,19,23,24,31}: no (0)  
## day in {5,17}: yes (14.9)  
## day in {1,2,3,4,8,9,12,14,15,20,21,22,25,26,27,28,29,30}:  
## :...pdays <= 229: no (153.8/30.3)  
## pdays > 229: yes (14/4.2)  
##   
## SubTree [S17]  
##   
## education = primary: no (108.6/35.3)  
## education in {secondary,tertiary,unknown}:  
## :...age > 51:  
## :...day in {1,2,4,5,7,9,10,11,12,13,14,17,18,19,20,21,24,25,28,29,30,  
## : : 31}: yes (90.5/4.8)  
## : day in {3,6,8,15,16,22,23,26,27}: no (68.6/28.3)  
## age <= 51:  
## :...previous > 4: yes (85/23.6)  
## previous <= 4:  
## :...poutcome = failure: no (176.6/65.3)  
## poutcome in {other,unknown}:  
## :...campaign > 3: yes (86/26.4)  
## campaign <= 3:  
## :...day in {1,2,6,10,19,22,24,29,31}: yes (235.6/58.8)  
## day in {3,4,5,7,8,9,11,12,13,14,15,16,17,18,20,21,23,25,26,  
## : 27,28,30}:  
## :...campaign > 1:  
## :...job in {blue-collar,retired,student,  
## : : unemployed}: no (84.9/13.9)  
## : job in {admin.,entrepreneur,housemaid,management,  
## : : self-employed,services,technician,unknown}:  
## : :...education = unknown: yes (10.2)  
## : education in {secondary,tertiary}:  
## : :...duration <= 197: yes (54.9/17.6)  
## : duration > 197:  
## : :...duration <= 265: no (66.2/8.2)  
## : duration > 265:  
## : :...day in {3,4,7,8,20,28,  
## : : 30}: yes (86.6/20.8)  
## : day in {5,9,11,12,13,14,15,16,17,  
## : 18,21,23,25,26,  
## : 27}: no (112/27.5)  
## campaign <= 1:  
## :...loan = yes: no (14.9/2.2)  
## loan = no:  
## :...job in {entrepreneur,housemaid,retired,  
## : unknown}: no (25.3/2)  
## job in {admin.,blue-collar,management,  
## : self-employed,services,student,  
## : technician,unemployed}:  
## :...balance <= 141: yes (63/14)  
## balance > 141:  
## :...duration <= 165: yes (37.6/7.1)  
## duration > 165:  
## :...day in {3,11,13,16,18,  
## : 23}: no (59.8/5.6)  
## day in {4,5,7,8,9,12,14,15,17,20,  
## : 21,25,26,27,28,30}:  
## :...balance > 3630: no (84.2/28.4)  
## balance <= 3630:  
## :...balance > 864: yes (184.7/47)  
## balance <= 864: [S24]  
##   
## SubTree [S18]  
##   
## marital in {divorced,married}: no (19.6)  
## marital = single:  
## :...campaign <= 4: no (258/66.7)  
## campaign > 4: yes (15.4/0.4)  
##   
## SubTree [S19]  
##   
## month in {aug,jul}: no (139.6/31.8)  
## month in {feb,jan,nov}: yes (117/30.4)  
##   
## SubTree [S20]  
##   
## duration <= 340: no (1213.4/209.7)  
## duration > 340:  
## :...duration > 372: no (24)  
## duration <= 372:  
## :...age <= 31: no (20.7/1.1)  
## age > 31: yes (152.4/62.8)  
##   
## SubTree [S21]  
##   
## education = primary: no (24.7)  
## education in {secondary,tertiary,unknown}:  
## :...job in {blue-collar,housemaid,retired,services,technician}:  
## :...day in {2,3,6,7,9,12,13,15,16,18,19,20,21,25,26,27,28,29,  
## : : 31}: no (186.7/29.7)  
## : day in {4,8,10,11,23}: yes (47/15.5)  
## job in {admin.,entrepreneur,management,self-employed,student,unemployed,  
## : unknown}:  
## :...balance <= 47: no (43.8/9.5)  
## balance > 47:  
## :...day in {3,7,9,10,12,15,19,23,27,31}: yes (177.9/43.4)  
## day in {2,4,6,8,11,13,16,18,20,21,25,26,28,29}:  
## :...balance <= 78: yes (21.7/0.2)  
## balance > 78:  
## :...loan = yes: no (17.7)  
## loan = no:  
## :...balance > 3603: no (26.8)  
## balance <= 3603:  
## :...balance > 2786: yes (35.7/4.5)  
## balance <= 2786:  
## :...job in {entrepreneur,  
## : unemployed}: yes (15.4/0.8)  
## job in {admin.,management,self-employed,  
## : student,unknown}:  
## :...contact = unknown: no (0)  
## contact = telephone: yes (10.9/3.4)  
## contact = cellular:  
## :...duration <= 253: no (145.9/33.9)  
## duration > 253: yes (55.2/21.1)  
##   
## SubTree [S22]  
##   
## day in {3,4,5,7,8,10,18,22,23,24,26,29,30,31}: no (154.4/20.8)  
## day in {1,2,6,9,11,12,13,14,15,16,17,19,20,21,25,27,28}:  
## :...month = feb: yes (20.2/0.4)  
## month in {aug,jan,jul,nov}:  
## :...contact = unknown: yes (0)  
## contact = telephone: no (4.9)  
## contact = cellular:  
## :...duration <= 592: yes (264.1/88.1)  
## duration > 592: no (27.6/9.6)  
##   
## SubTree [S23]  
##   
## duration > 603: no (38.4)  
## duration <= 603:  
## :...campaign > 7: no (38.9/3.2)  
## campaign <= 7:  
## :...job in {housemaid,retired,unknown}: no (115.6/9.4)  
## job in {admin.,blue-collar,entrepreneur,management,self-employed,  
## : services,student,technician,unemployed}:  
## :...balance > 1317: no (71.5/7.8)  
## balance <= 1317:  
## :...campaign > 5: yes (71.8/25.4)  
## campaign <= 5:  
## :...contact in {telephone,unknown}: yes (79.5/33.4)  
## contact = cellular:  
## :...balance > 904: yes (104/46)  
## balance <= 904:  
## :...education = unknown: no (22.9)  
## education in {primary,secondary,tertiary}:  
## :...balance > 383: no (265.8/49.2)  
## balance <= 383:  
## :...poutcome = failure: yes (3.2)  
## poutcome = unknown:  
## :...day in {1,3,14,19,23,24,  
## : 25}: no (49.6)  
## day = 30: yes (24.3/1.2)  
## day in {2,4,5,6,7,8,9,10,11,12,13,15,  
## : 16,17,18,20,21,22,26,27,28,29,  
## : 31}:  
## :...balance > 263: yes (98.5/31.9)  
## balance <= 263: [S25]  
##   
## SubTree [S24]  
##   
## poutcome = other: no (9.9)  
## poutcome = unknown:  
## :...day in {8,14,20,21,27}: no (38.9/1.7)  
## day in {4,5,7,9,12,15,17,25,26,28,30}:  
## :...education = unknown: no (8.3/0.7)  
## education in {secondary,tertiary}:  
## :...age <= 25: no (42.3/10.4)  
## age > 25: yes (144.8/44.8)  
##   
## SubTree [S25]  
##   
## education = primary: no (34.7/5.4)  
## education in {secondary,tertiary}:  
## :...job in {admin.,blue-collar,entrepreneur,self-employed,student,  
## : unemployed}: yes (142.4/64.8)  
## job in {management,services,technician}: no (264.2/84)  
##   
## ----- Trial 9: -----  
##   
## Decision tree:  
##   
## poutcome = success:  
## :...age > 77: yes (50.3/5.9)  
## : age <= 77:  
## : :...duration > 177:  
## : :...education in {primary,unknown}:  
## : : :...day in {2,3,4,9,21,23,24,28,29,30}: yes (47.6)  
## : : : day in {1,5,6,7,8,10,11,12,13,14,15,16,17,18,19,20,22,25,26,27,  
## : : : : 31}:  
## : : : :...job = self-employed: no (0)  
## : : : job in {housemaid,services}: yes (28/4.1)  
## : : : job in {admin.,blue-collar,entrepreneur,management,retired,  
## : : : : student,technician,unemployed,unknown}:  
## : : : :...previous > 9: no (12.9)  
## : : : previous <= 9:  
## : : : :...campaign > 3: no (13.7/1.2)  
## : : : campaign <= 3:  
## : : : :...campaign > 2: yes (19.8/4.2)  
## : : : campaign <= 2:  
## : : : :...duration <= 188: yes (15.4/2.6)  
## : : : duration > 188:  
## : : : :...duration <= 208: no (22.7/0.9)  
## : : : duration > 208:  
## : : : :...month in {dec,mar}: no (0)  
## : : : month in {jan,oct}: yes (18.3)  
## : : : month in {apr,aug,feb,jul,jun,may,  
## : : : : nov,sep}:  
## : : : :...balance <= 5486: no (143.2/44.7)  
## : : : balance > 5486: yes (9.2)  
## : : education in {secondary,tertiary}:  
## : : :...pdays > 460: yes (31.7)  
## : : pdays <= 460:  
## : : :...day in {9,11,12,16,22,24,30,31}: yes (418.4/71.3)  
## : : day in {1,2,3,4,5,6,7,8,10,13,14,15,17,18,19,20,21,23,25,  
## : : : 26,27,28,29}:  
## : : :...pdays <= 96:  
## : : :...balance > 4216: no (48.6/19.2)  
## : : : balance <= 4216:  
## : : : :...month in {aug,dec,feb,jul,jun,mar,nov,  
## : : : : sep}: yes (234.4/33.6)  
## : : : month in {apr,jan,may,oct}:  
## : : : :...job in {blue-collar,self-employed,services,  
## : : : : student,unknown}: yes (30.8)  
## : : : job in {entrepreneur,  
## : : : : housemaid}: no (13)  
## : : : job in {admin.,management,retired,  
## : : : : technician,unemployed}:  
## : : : :...pdays <= 42: no (8.1)  
## : : : pdays > 42: yes (145.6/59.6)  
## : : pdays > 96:  
## : : :...month in {jan,nov}: no (95.9/23.3)  
## : : month in {apr,aug,dec,feb,jul,jun,mar,may,oct,sep}:  
## : : :...pdays <= 168:  
## : : :...duration <= 207: yes (13.4)  
## : : : duration > 207:  
## : : : :...day in {3,18,19,20}: no (0)  
## : : : day in {14,17,21,23,  
## : : : : 27}: yes (20.6)  
## : : : day in {1,2,4,5,6,7,8,10,13,15,25,26,  
## : : : : 28,29}:  
## : : : :...balance <= 744: yes (66.4/27.2)  
## : : : balance > 744: no (98.3/12.3)  
## : : pdays > 168:  
## : : :...pdays <= 187: yes (253.4/44.1)  
## : : pdays > 187:  
## : : :...balance > 7343: yes (19.4)  
## : : balance <= 7343:  
## : : :...pdays <= 188: no (22.2)  
## : : pdays > 188:  
## : : :...duration <= 195: no (25/1.6)  
## : : duration > 195: [S1]  
## : duration <= 177:  
## : :...duration <= 70: no (32.1)  
## : duration > 70:  
## : :...contact = telephone: no (40.4/9.5)  
## : contact = unknown: yes (6.2)  
## : contact = cellular:  
## : :...education in {primary,secondary}:  
## : :...previous > 6: no (22.8)  
## : : previous <= 6:  
## : : :...day in {19,31}: no (0)  
## : : day in {1,2,6,7,9,10,11,12,14,16,17,18,20,24,26,27,  
## : : : 28,29}:  
## : : :...job in {admin.,blue-collar,entrepreneur,  
## : : : : housemaid,management,retired,  
## : : : : self-employed,technician,  
## : : : : unknown}: no (177.9/22.7)  
## : : : job in {services,student,  
## : : : unemployed}: yes (24.9/8.2)  
## : : day in {3,4,5,8,13,15,21,22,23,25,30}:  
## : : :...duration <= 82: no (9)  
## : : duration > 82: yes (141.6/46.5)  
## : education in {tertiary,unknown}:  
## : :...age > 60: yes (36.3/2.5)  
## : age <= 60:  
## : :...day in {3,7,8,10,13,18,21,25,26,28,30,  
## : : 31}: no (68.7/8.6)  
## : day in {1,2,4,5,6,9,11,12,14,15,16,17,19,20,22,23,  
## : : 24,27,29}:  
## : :...job in {blue-collar,housemaid,retired,  
## : : self-employed,student,  
## : : unknown}: yes (52.7/2.8)  
## : job in {admin.,entrepreneur,management,  
## : : services,technician,unemployed}:  
## : :...balance > 14679: yes (15.8)  
## : balance <= 14679:  
## : :...duration <= 82: no (15.6)  
## : duration > 82:  
## : :...day in {14,15,17,19,20,22,  
## : : 23}: yes (47.1/0.2)  
## : day in {1,2,4,5,6,9,11,12,16,24,27,  
## : : 29}: [S2]  
## poutcome in {failure,other,unknown}:  
## :...duration > 605:  
## :...age <= 25:  
## : :...balance > 2123: yes (29.1)  
## : : balance <= 2123:  
## : : :...loan = yes: yes (33.2/3.5)  
## : : loan = no:  
## : : :...day in {1,3,7,8,9,11,13,14,19,22,31}: yes (62.2/4.5)  
## : : day in {2,5,6,10,12,17,25,29}: no (37.9)  
## : : day in {4,15,16,18,20,21,23,24,26,27,28,30}:  
## : : :...pdays > 185: yes (11.5)  
## : : pdays <= 185:  
## : : :...duration <= 646: yes (32.9/3.5)  
## : : duration > 646: no (122.7/38)  
## : age > 25:  
## : :...day in {1,5,6,7,8,9,13,14,17,19,21,22,24,26,28,29}:  
## : :...campaign > 11: no (41.5/6)  
## : : campaign <= 11:  
## : : :...age > 58:  
## : : :...default = yes: no (3.4)  
## : : : default = no:  
## : : : :...loan = yes: yes (16.7)  
## : : : loan = no:  
## : : : :...job = student: yes (0)  
## : : : job in {entrepreneur,self-employed,unemployed,  
## : : : : unknown}: no (19.6)  
## : : : job in {admin.,blue-collar,housemaid,  
## : : : : management,retired,services,technician}:  
## : : : :...month in {apr,aug,jul,mar,oct,  
## : : : : sep}: no (133.5/48.6)  
## : : : month in {dec,feb,jan,jun,may,  
## : : : nov}: yes (109.6/17.4)  
## : : age <= 58:  
## : : :...pdays > 347: no (97.7/20.7)  
## : : pdays <= 347:  
## : : :...contact = unknown:  
## : : :...duration <= 641: no (78.8/5.3)  
## : : : duration > 641:  
## : : : :...job in {retired,services,  
## : : : : unknown}: no (118.4/10.5)  
## : : : job in {admin.,blue-collar,entrepreneur,  
## : : : : housemaid,management,self-employed,  
## : : : : student,technician,unemployed}:  
## : : : :...default = yes: yes (32.5/13.2)  
## : : : default = no:  
## : : : :...education in {primary,unknown}:  
## : : : :...duration <= 666: yes (16.5/3.2)  
## : : : : duration > 666: no (226.8/53.6)  
## : : : education in {secondary,tertiary}:  
## : : : :...balance <= 54: no (146/27.3)  
## : : : balance > 54:  
## : : : :...month in {apr,aug,dec,feb,  
## : : : : jan,mar,nov,  
## : : : : sep}: no (7.4)  
## : : : month in {jul,  
## : : : : oct}: yes (5)  
## : : : month in {jun,may}: [S3]  
## : : contact in {cellular,telephone}:  
## : : :...month in {apr,dec,jan,jul,sep}:  
## : : :...education = unknown: yes (32/7.4)  
## : : : education in {primary,secondary,tertiary}:  
## : : : :...duration <= 863:  
## : : : :...default = yes: yes (20.4/8.8)  
## : : : : default = no:  
## : : : : :...pdays > 215: no (36.6)  
## : : : : pdays <= 215: [S4]  
## : : : duration > 863:  
## : : : :...campaign > 4: yes (68.1/10.5)  
## : : : campaign <= 4:  
## : : : :...duration <= 901: yes (80.8/25.7)  
## : : : duration > 901:  
## : : : :...day = 5: no (0)  
## : : : day in {13,14,19,21,26,  
## : : : : 29}: yes (143.8/56.3)  
## : : : day in {1,6,7,8,9,17,22,24,  
## : : : : 28}:  
## : : : :...default = yes: yes (2.6)  
## : : : default = no: [S5]  
## : : month in {aug,feb,jun,mar,may,nov,oct}:  
## : : :...campaign > 4:  
## : : :...education = primary: yes (4.5)  
## : : : education in {secondary,tertiary,  
## : : : unknown}: no (161.1/50.9)  
## : : campaign <= 4:  
## : : :...age <= 37:  
## : : :...day in {1,8,9,24,26,  
## : : : : 29}: yes (36.9)  
## : : : day in {5,6,7,13,14,17,19,21,22,28}: [S6]  
## : : age > 37:  
## : : :...default = yes: yes (7.9/1.4)  
## : : default = no: [S7]  
## : day in {2,3,4,10,11,12,15,16,18,20,23,25,27,30,31}:  
## : :...duration > 928:  
## : :...job in {housemaid,unknown}: no (78.7/17.9)  
## : : job in {admin.,blue-collar,services,student}:  
## : : :...month = mar: yes (0)  
## : : : month in {dec,oct}: no (8.7)  
## : : : month in {apr,aug,feb,jan,jul,jun,may,nov,sep}:  
## : : : :...campaign > 5: yes (134.6/63.2)  
## : : : campaign <= 5:  
## : : : :...education = tertiary: no (16.1/5.1)  
## : : : education in {primary,secondary,unknown}:  
## : : : :...day in {4,10,11,25,27,30}: yes (87)  
## : : : day in {2,3,12,15,16,18,20,23,31}:  
## : : : :...default = yes: no (3.1)  
## : : : default = no:  
## : : : :...poutcome = other: yes (14.5)  
## : : : poutcome in {failure,unknown}:  
## : : : :...loan = yes: yes (56.9/8.5)  
## : : : loan = no: [S8]  
## : : job in {entrepreneur,management,retired,self-employed,  
## : : : technician,unemployed}:  
## : : :...age > 64: no (32.9/7.4)  
## : : age <= 64:  
## : : :...day in {3,10,16,27}:  
## : : :...balance <= 1808: yes (121.9/16.1)  
## : : : balance > 1808: no (38.4/16.9)  
## : : day in {2,4,11,12,15,18,20,23,25,30,31}:  
## : : :...balance > 7279: yes (46.4/8.5)  
## : : balance <= 7279:  
## : : :...campaign > 10: no (28.5/5.1)  
## : : campaign <= 10:  
## : : :...month in {jan,may}: no (124.4/37.4)  
## : : month in {dec,mar,  
## : : : oct}: yes (0.2)  
## : : month in {apr,aug,feb,jul,jun,nov,sep}:  
## : : :...balance > 1412: no (115.6/38.1)  
## : : balance <= 1412: [S9]  
## : duration <= 928:  
## : :...month in {dec,sep}: yes (45.3/4.9)  
## : month in {apr,aug,feb,jan,jul,jun,mar,may,nov,oct}:  
## : :...previous > 4: yes (41.8/11.7)  
## : previous <= 4:  
## : :...balance > 9444: no (39.2/6)  
## : balance <= 9444:  
## : :...loan = yes:  
## : :...poutcome = other: no (8.2)  
## : : poutcome in {failure,unknown}:  
## : : :...education in {primary,  
## : : : unknown}: yes (42.6/14.9)  
## : : education in {secondary,tertiary}:  
## : : :...default = yes: no (25.5/2)  
## : : default = no:  
## : : :...month in {apr,aug,mar,  
## : : : oct}: no (18.8)  
## : : month in {feb,jan,jul,jun,may,  
## : : : nov}:  
## : : :...balance > 347: no (113.2/21.2)  
## : : balance <= 347:  
## : : :...day in {2,3,4,15,16,18,  
## : : : 23,25,30,  
## : : : 31}: no (105.9/34.8)  
## : : day in {10,11,12,20,  
## : : 27}: yes (46.4/6.8)  
## : loan = no:  
## : :...contact = telephone: no (68.4/21.7)  
## : contact = unknown:  
## : :...month in {apr,aug,feb,jan,jul,mar,nov,  
## : : : oct}: no (6)  
## : : month in {jun,may}:  
## : : :...job in {entrepreneur,housemaid,  
## : : : services,student,  
## : : : unknown}: no (72.5/9.3)  
## : : job in {admin.,blue-collar,  
## : : : management,retired,  
## : : : self-employed,technician,  
## : : : unemployed}:  
## : : :...campaign <= 1: yes (139.5/47.7)  
## : : campaign > 1: [S10]  
## : contact = cellular:  
## : :...campaign > 2:  
## : :...job in {entrepreneur,  
## : : : student}: yes (26.2)  
## : : job in {self-employed,services,  
## : : : technician,unemployed,  
## : : : unknown}: no (176.2/72.2)  
## : : job in {admin.,blue-collar,  
## : : : housemaid,management,  
## : : : retired}:  
## : : :...balance <= -123: no (16.6/4.1)  
## : : balance > -123:  
## : : :...day in {2,4,10,11,15,23,  
## : : : 27}: yes (115.4/6.2)  
## : : day in {3,12,16,18,20,25,  
## : : : 30,31}:  
## : : :...balance > 8180: yes (12.7)  
## : : balance <= 8180: [S11]  
## : campaign <= 2:  
## : :...duration > 907: no (40.9/6.6)  
## : duration <= 907:  
## : :...duration > 897: yes (34.5/6.7)  
## : duration <= 897:  
## : :...duration > 875: no (42.3/6.4)  
## : duration <= 875:  
## : :...month in {apr,feb,jan,  
## : : mar,nov}: [S12]  
## : month in {aug,jul,jun,  
## : : may,oct}: [S13]  
## duration <= 605:  
## :...month in {apr,dec,feb,jun,mar,oct,sep}:  
## :...duration <= 125:  
## : :...month = jun: no (362.5)  
## : : month in {apr,dec,feb,mar,oct,sep}:  
## : : :...duration <= 88: no (295.5/5.1)  
## : : duration > 88:  
## : : :...day in {2,3,4,5,6,7,8,9,10,12,13,14,15,16,17,20,23,24,  
## : : : 26,28,31}: no (643.7/110.9)  
## : : day in {1,11,18,19,21,22,25,27,29,30}:  
## : : :...job in {blue-collar,entrepreneur,housemaid,student,  
## : : : technician,unknown}: yes (85.9/15.7)  
## : : job in {admin.,management,retired,self-employed,  
## : : : services,unemployed}:  
## : : :...age > 72: yes (13.8/1.6)  
## : : age <= 72:  
## : : :...campaign > 6: yes (13.7/2.4)  
## : : campaign <= 6:  
## : : :...age <= 24: yes (12.2/2)  
## : : age > 24: no (156.5/40.2)  
## : duration > 125:  
## : :...housing = yes:  
## : :...age > 63: yes (25.6/4.2)  
## : : age <= 63:  
## : : :...day in {10,18,21,23,25,27,28,29,31}:  
## : : :...pdays > 317: no (36.7/9.2)  
## : : : pdays <= 317:  
## : : : :...contact = telephone: yes (29.6)  
## : : : contact = unknown: no (47.4/6)  
## : : : contact = cellular:  
## : : : :...age > 48: yes (31.3/0.2)  
## : : : age <= 48:  
## : : : :...month in {apr,jun,oct}: no (74.4/33.6)  
## : : : month in {dec,feb,mar,  
## : : : sep}: yes (104.4/16.2)  
## : : day in {1,2,3,4,5,6,7,8,9,11,12,13,14,15,16,17,19,20,  
## : : : 22,24,26,30}:  
## : : :...month in {apr,feb}:  
## : : :...age <= 25: yes (28.5/9.2)  
## : : : age > 25:  
## : : : :...day in {1,2,3,4,5,6,7,9,12,13,16,17,19,  
## : : : : 20}: no (854.2/42.5)  
## : : : day in {8,11,14,15,22,24,26,30}:  
## : : : :...duration <= 314: no (207.5/40.3)  
## : : : duration > 314: yes (118.6/51)  
## : : month in {dec,jun,mar,oct,sep}:  
## : : :...duration <= 181: no (224.4/31.7)  
## : : duration > 181:  
## : : :...contact = unknown:  
## : : :...month in {dec,mar}: no (0)  
## : : : month in {oct,sep}: yes (5.8)  
## : : : month = jun:  
## : : : :...loan = yes: no (58.2)  
## : : : loan = no:  
## : : : :...balance <= 56: yes (83.6/33.6)  
## : : : balance > 56: no (285/55.9)  
## : : contact in {cellular,telephone}:  
## : : :...campaign > 3: no (18.9/0.2)  
## : : campaign <= 3:  
## : : :...marital = divorced: yes (36.7)  
## : : marital in {married,single}:  
## : : :...month = oct: no (44.2/10.4)  
## : : month in {dec,jun,mar,sep}:  
## : : :...age > 48: yes (26.8/2.7)  
## : : age <= 48:  
## : : :...day in {1,3,4,5,6,7,11,  
## : : : 12,14,17,19,20,  
## : : : 22,24,  
## : : : 26}: yes (137.8/35)  
## : : day in {2,8,9,13,15,16,  
## : : 30}: no (88.2/24.2)  
## : housing = no:  
## : :...day in {2,3,4,5,6,7,19,25,26,28}:  
## : :...loan = yes: no (131.1/8.5)  
## : : loan = no:  
## : : :...month = feb:  
## : : :...age > 61: yes (81.8/33.5)  
## : : : age <= 61:  
## : : : :...pdays > 194: no (69.5)  
## : : : pdays <= 194:  
## : : : :...pdays > 41: yes (62.4/23)  
## : : : pdays <= 41:  
## : : : :...education in {primary,  
## : : : : secondary}: no (327.2/28.4)  
## : : : education in {tertiary,unknown}: [S14]  
## : : month in {apr,dec,jun,mar,oct,sep}:  
## : : :...duration <= 139: no (63.9/8.6)  
## : : duration > 139:  
## : : :...age > 69: no (76.8/15.1)  
## : : age <= 69:  
## : : :...age <= 24: no (64.7/11.6)  
## : : age > 24:  
## : : :...contact = unknown: no (91.1/12.2)  
## : : contact in {cellular,telephone}:  
## : : :...previous > 5: no (29.5/7.5)  
## : : previous <= 5:  
## : : :...month = oct: no (118.6/38.5)  
## : : month in {apr,dec,jun,mar,  
## : : : sep}:  
## : : :...age > 61: yes (33.5/4.1)  
## : : age <= 61: [S15]  
## : day in {1,8,9,10,11,12,13,14,15,16,17,18,20,21,22,23,24,27,  
## : : 29,30,31}:  
## : :...balance <= 22:  
## : :...pdays > 259: yes (27.5/5.5)  
## : : pdays <= 259:  
## : : :...default = yes: yes (6.5/2.4)  
## : : default = no:  
## : : :...campaign > 5: yes (24.4/8.4)  
## : : campaign <= 5:  
## : : :...balance > 1: no (68.7/5.4)  
## : : balance <= 1:  
## : : :...poutcome in {failure,  
## : : : unknown}: no (207.5/59.5)  
## : : poutcome = other: yes (11.2)  
## : balance > 22:  
## : :...duration <= 206:  
## : :...pdays > 184: no (95.4/18.2)  
## : : pdays <= 184:  
## : : :...duration <= 138:  
## : : :...previous > 7: no (9.2)  
## : : : previous <= 7:  
## : : : :...day in {1,13,14,16,20,  
## : : : : 21}: no (31.2/5.5)  
## : : : day in {8,9,10,11,12,15,17,18,22,  
## : : : 23,24,27,29,30,  
## : : : 31}: yes (123.6/20.8)  
## : : duration > 138:  
## : : :...job = services: yes (38.4/8)  
## : : job in {entrepreneur,self-employed,  
## : : : unknown}: no (31.5)  
## : : job in {admin.,blue-collar,housemaid,  
## : : : management,retired,student,  
## : : : technician,unemployed}:  
## : : :...day in {1,18,22,29,  
## : : : 30}: no (251/57.8)  
## : : day in {8,9,10,11,12,13,14,15,16,  
## : : : 17,20,21,23,24,27,31}:  
## : : :...duration <= 147: no (76.9/16.5)  
## : : duration > 147:  
## : : :...loan = yes: no (7.4)  
## : : loan = no: [S16]  
## : duration > 206:  
## : :...campaign > 7: yes (38.3/6.8)  
## : campaign <= 7:  
## : :...duration <= 216: yes (111.6/23.1)  
## : duration > 216:  
## : :...contact = unknown: no (139.9/42.8)  
## : contact in {cellular,telephone}:  
## : :...balance <= 139: yes (123.9/27.9)  
## : balance > 139:  
## : :...balance > 15904: no (36.6/10.2)  
## : balance <= 15904:  
## : :...balance > 8318: yes (66.1/6)  
## : balance <= 8318:  
## : :...campaign > 2: [S17]  
## : campaign <= 2: [S18]  
## month in {aug,jan,jul,may,nov}:  
## :...duration <= 130: no (1921.3/22.6)  
## duration > 130:  
## :...age > 60:  
## :...day = 23: yes (0)  
## : day in {1,6,7,13,15,16,17,18,20,21,24,25,26,27,29,30}:  
## : :...marital = single: no (8.8)  
## : : marital in {divorced,married}:  
## : : :...duration <= 198: no (70.3/30.4)  
## : : duration > 198: yes (258.1/61)  
## : day in {2,3,4,5,8,9,10,11,12,14,19,22,28,31}:  
## : :...balance > 2907: no (61.1)  
## : balance <= 2907:  
## : :...balance > 2303: yes (23.2/5.7)  
## : balance <= 2303:  
## : :...balance > 902: no (36.3/0.9)  
## : balance <= 902:  
## : :...balance <= 757: no (147.1/54.1)  
## : balance > 757: yes (7.9)  
## age <= 60:  
## :...pdays > 374:  
## :...month in {aug,jan,jul,may}: yes (146.2/34.3)  
## : month = nov: no (15.4)  
## pdays <= 374:  
## :...poutcome = other:  
## :...month in {aug,jul}: yes (158.5/48)  
## : month in {jan,may,nov}:  
## : :...day in {1,2,3,4,5,8,9,10,11,13,16,17,19,21,22,  
## : : 23,28,29,30,31}: no (231.4/24.3)  
## : day in {6,7,12,14,15,18,20,24,25,26,27}:  
## : :...pdays <= 94: yes (22.6/1.2)  
## : pdays > 94:  
## : :...duration <= 400: no (119.8/13.9)  
## : duration > 400: yes (114.8/39.6)  
## poutcome in {failure,unknown}:  
## :...contact = unknown:  
## :...month = aug: yes (13.4)  
## : month in {jan,jul,may,nov}: no (1287.1/48)  
## contact in {cellular,telephone}:  
## :...duration <= 440:  
## :...day in {5,7,8,9,11,13,14,15,17,18,19,20,21,  
## : : 22,23,28,29,30}:  
## : :...education = unknown: no (175.7/46.6)  
## : : education in {primary,secondary,  
## : : : tertiary}:  
## : : :...age > 27: no (3360.2/193.7)  
## : : age <= 27:  
## : : :...month in {aug,  
## : : : nov}: yes (61/17.1)  
## : : month in {jan,jul,  
## : : may}: no (303.9/25.5)  
## : day in {1,2,3,4,6,10,12,16,24,25,26,27,31}:  
## : :...month in {jan,nov}:  
## : :...education in {primary,  
## : : : unknown}: no (18.5)  
## : : education in {secondary,tertiary}:  
## : : :...day in {1,2,24,26,  
## : : : 31}: no (24.6/3.6)  
## : : day in {3,4,6,10,12,16,25,  
## : : 27}: yes (211.2/57)  
## : month in {aug,jul,may}:  
## : :...pdays > 288: no (85.5)  
## : pdays <= 288:  
## : :...day in {1,2,  
## : : 3}: yes (112.4/48.2)  
## : day in {4,6,10,12,16,24,25,26,  
## : : 27,31}:  
## : :...pdays <= 87: no (1232.2/212.4)  
## : pdays > 87: [S19]  
## duration > 440:  
## :...previous > 6: yes (26.1/6.2)  
## previous <= 6:  
## :...duration > 603: no (30.4)  
## duration <= 603:  
## :...marital = divorced:  
## :...previous > 1: no (17.8)  
## : previous <= 1:  
## : :...campaign > 6: no (15.9)  
## : campaign <= 6: [S20]  
## marital in {married,single}:  
## :...day in {2,23,24,  
## : 29}: no (78.4)  
## day in {5,6,7,10,11,12,14,15,  
## : 17,18,19,20,21,22,25,  
## : 27,28}:  
## :...duration <= 485: no (443.8/80.5)  
## : duration > 485: [S21]  
## day in {1,3,4,8,9,13,16,26,30,  
## : 31}:  
## :...campaign > 6: yes (28.7/8.4)  
## campaign <= 6:  
## :...balance <= 63: no (74.8/7.1)  
## balance > 63: [S22]  
##   
## SubTree [S1]  
##   
## marital in {divorced,single}: yes (128.7/34.8)  
## marital = married:  
## :...day in {1,2,4,5,6,7,10,13,14,17,18,20,23,26,29}: no (125.3/38.3)  
## day in {3,8,15,19,21,25,27,28}: yes (28.1)  
##   
## SubTree [S2]  
##   
## marital = divorced: no (11.8)  
## marital in {married,single}:  
## :...duration > 175: no (11.5)  
## duration <= 175:  
## :...pdays > 271: yes (14.2/0.2)  
## pdays <= 271:  
## :...age <= 28: no (20.7)  
## age > 28: yes (142.2/56.6)  
##   
## SubTree [S3]  
##   
## marital = divorced: yes (79.9/32.6)  
## marital = single:  
## :...job = housemaid: yes (0)  
## : job in {entrepreneur,self-employed}: no (22.2)  
## : job in {admin.,blue-collar,management,student,technician,unemployed}:  
## : :...day in {1,5,6,8,22,24,28}: yes (45.5)  
## : day in {7,9,13,14,17,19,21,26,29}: no (125.5/54.8)  
## marital = married:  
## :...duration <= 672: no (27.8)  
## duration > 672:  
## :...job in {student,unemployed}: no (0)  
## job in {entrepreneur,self-employed,technician}: yes (77.4/20.3)  
## job in {admin.,blue-collar,housemaid,management}:  
## :...day in {1,8,9,13,17,22,24}: no (51.8)  
## day in {5,6,7,14,19,21,26,28,29}:  
## :...age > 46: yes (29.8/2.5)  
## age <= 46:  
## :...duration <= 1550: no (137.1/38.3)  
## duration > 1550: yes (13.6)  
##   
## SubTree [S4]  
##   
## job in {entrepreneur,housemaid,retired,technician,unemployed,  
## : unknown}: yes (146/72.3)  
## job in {admin.,blue-collar,management,self-employed,services,student}:  
## :...day = 19: no (0)  
## day in {6,26}: yes (8.6)  
## day in {1,5,7,8,9,13,14,17,21,22,24,28,29}:  
## :...month in {apr,dec}: no (95.3/8.9)  
## month = sep: yes (7.7/2.6)  
## month in {jan,jul}:  
## :...poutcome = failure: no (0)  
## poutcome = other: yes (6.2)  
## poutcome = unknown:  
## :...balance > 1301: no (102.3/39.7)  
## balance <= 1301:  
## :...balance <= -123: yes (15.3/3.6)  
## balance > -123: no (276.3/39.1)  
##   
## SubTree [S5]  
##   
## duration > 1663: no (30.4/0.2)  
## duration <= 1663:  
## :...balance > 855: no (153.7/27)  
## balance <= 855:  
## :...job in {student,unknown}: no (0)  
## job in {housemaid,management,unemployed}: yes (34.3)  
## job in {admin.,blue-collar,entrepreneur,retired,self-employed,services,  
## : technician}:  
## :...poutcome = failure: no (18.7)  
## poutcome in {other,unknown}:  
## :...pdays > 221: yes (9)  
## pdays <= 221:  
## :...marital in {divorced,married}: no (132/38.3)  
## marital = single: yes (30.1/6.6)  
##   
## SubTree [S6]  
##   
## job in {entrepreneur,housemaid,retired,services,unknown}: yes (78.3/12.8)  
## job in {admin.,blue-collar,management,self-employed,student,technician,  
## : unemployed}:  
## :...education = unknown: no (11.8)  
## education in {primary,secondary,tertiary}:  
## :...age <= 31:  
## :...contact = telephone: no (13.6)  
## : contact = cellular:  
## : :...poutcome = other: yes (4.7)  
## : poutcome in {failure,unknown}:  
## : :...loan = yes: yes (22.7/7.7)  
## : loan = no:  
## : :...day in {5,6,17,22}: no (62/10.6)  
## : day in {7,13,14,19,21,28}: yes (134.3/64.2)  
## age > 31:  
## :...contact = telephone: yes (12.1)  
## contact = cellular:  
## :...day in {6,22}: yes (37.9/2)  
## day in {5,7,13,14,17,19,21,28}:  
## :...duration <= 772: no (111.7/38.7)  
## duration > 772:  
## :...campaign <= 3: yes (147.7/45.2)  
## campaign > 3: no (8.4/1.9)  
##   
## SubTree [S7]  
##   
## job in {entrepreneur,housemaid,self-employed,student}: no (108.8/25.5)  
## job in {admin.,blue-collar,management,retired,services,technician,unemployed,  
## : unknown}:  
## :...previous > 2: yes (59.9/16.9)  
## previous <= 2:  
## :...previous > 0: no (90.9/29.5)  
## previous <= 0:  
## :...day = 24: no (0)  
## day in {1,5,22,28}: yes (128.7/36.7)  
## day in {6,7,8,9,13,14,17,19,21,26,29}:  
## :...education = unknown: no (21.7/2)  
## education in {primary,secondary,tertiary}:  
## :...balance <= 2: no (78.4/13.4)  
## balance > 2:  
## :...loan = yes: no (48.2/13.4)  
## loan = no:  
## :...campaign > 2: yes (136/44.2)  
## campaign <= 2:  
## :...day in {6,7,9,19,21,29}: no (134.3/34)  
## day in {8,13,14,17,26}: yes (79.8/24.2)  
##   
## SubTree [S8]  
##   
## job in {admin.,services,student}: yes (154.4/31)  
## job = blue-collar:  
## :...previous > 0: no (15.6)  
## previous <= 0:  
## :...duration > 1416: yes (25.9)  
## duration <= 1416:  
## :...marital = single: no (26.5/6.1)  
## marital in {divorced,married}:  
## :...day in {2,3,16,20,23}: yes (118.5/23.1)  
## day in {12,15,18,31}: no (42.2/12.6)  
##   
## SubTree [S9]  
##   
## marital = divorced: no (35.4/13)  
## marital in {married,single}:  
## :...default = yes: no (2.1)  
## default = no:  
## :...balance > 1200: yes (21)  
## balance <= 1200:  
## :...day in {15,23,30}: yes (28.5)  
## day in {2,4,11,12,18,20,25,31}:  
## :...job = entrepreneur: no (8.1)  
## job in {management,retired,self-employed,technician,unemployed}:  
## :...poutcome = other: yes (0)  
## poutcome = failure: no (5.5/0.7)  
## poutcome = unknown:  
## :...balance <= 1154: yes (177.4/61.1)  
## balance > 1154: no (13.2/1.6)  
##   
## SubTree [S10]  
##   
## education = primary: no (54.7/8.5)  
## education in {secondary,tertiary,unknown}:  
## :...day in {10,25,31}: no (0)  
## day in {12,23,30}: yes (85.2/29.2)  
## day in {2,3,4,11,15,16,18,20,27}:  
## :...age > 51: no (15.8)  
## age <= 51:  
## :...balance <= 4488: no (180/55.2)  
## balance > 4488: yes (12.4/1.5)  
##   
## SubTree [S11]  
##   
## duration > 898: yes (16.6)  
## duration <= 898:  
## :...balance > 5828: no (9)  
## balance <= 5828:  
## :...housing = no: yes (103.1/24)  
## housing = yes: no (73.9/31.7)  
##   
## SubTree [S12]  
##   
## default = yes: yes (8.7)  
## default = no:  
## :...marital = divorced: no (32.3/3.1)  
## marital in {married,single}:  
## :...day in {3,10,12,15,16,25,31}: no (75.1/9.3)  
## day in {2,4,11,18,20,23,27,30}:  
## :...duration > 860: no (16.5)  
## duration <= 860:  
## :...age > 37: yes (87.8/19.8)  
## age <= 37:  
## :...education in {primary,secondary,tertiary}: no (158.8/50.8)  
## education = unknown: yes (4.6)  
##   
## SubTree [S13]  
##   
## default = yes: no (11.7)  
## default = no:  
## :...duration > 804: yes (43.6/2.2)  
## duration <= 804:  
## :...duration > 769: no (44.3/10.3)  
## duration <= 769:  
## :...day in {3,12,16,20}: yes (62.8/10.2)  
## day in {2,4,10,11,15,18,23,25,27,30,31}:  
## :...age > 55: yes (27.1/3.5)  
## age <= 55:  
## :...duration <= 611: yes (13.1)  
## duration > 611:  
## :...balance <= 89: yes (55.6/14.9)  
## balance > 89:  
## :...job = retired: no (0)  
## job in {entrepreneur,student,  
## : unknown}: yes (14)  
## job in {admin.,blue-collar,housemaid,management,  
## : self-employed,services,technician,  
## : unemployed}:  
## :...education in {primary,secondary,  
## : tertiary}: no (133.9/24)  
## education = unknown: yes (20.7/8.4)  
##   
## SubTree [S14]  
##   
## job in {admin.,blue-collar,entrepreneur,housemaid,self-employed,services,  
## : unemployed,unknown}: no (51.1)  
## job in {management,retired,student,technician}:  
## :...contact in {telephone,unknown}: no (6.8)  
## contact = cellular:  
## :...balance <= 3208: no (134.7/39.3)  
## balance > 3208: yes (52.8/14.9)  
##   
## SubTree [S15]  
##   
## job in {housemaid,self-employed,services}: no (83.3/23.3)  
## job in {admin.,blue-collar,entrepreneur,management,retired,student,technician,  
## : unemployed,unknown}:  
## :...balance <= 357: yes (196.5/51.7)  
## balance > 357:  
## :...duration > 457: yes (49/6.5)  
## duration <= 457:  
## :...campaign > 2: no (54.5/8.7)  
## campaign <= 2:  
## :...balance <= 544: no (54.3/15.3)  
## balance > 544:  
## :...balance <= 617: yes (17.6/0.6)  
## balance > 617:  
## :...age <= 29: yes (31.5/5.4)  
## age > 29:  
## :...age <= 31: no (22.9/2.5)  
## age > 31:  
## :...education in {primary,  
## : tertiary}: yes (129.2/40.1)  
## education in {secondary,  
## unknown}: no (106.5/38.2)  
##   
## SubTree [S16]  
##   
## month = feb: yes (82/14.4)  
## month in {apr,dec,jun,mar,oct,sep}:  
## :...day in {9,17,20,21,31}: yes (118.9/37.2)  
## day in {8,10,11,12,13,14,15,16,23,24,27}:  
## :...duration > 204: no (18)  
## duration <= 204:  
## :...campaign > 2: yes (35.6/10.5)  
## campaign <= 2:  
## :...previous > 3: yes (21.9/6.3)  
## previous <= 3:  
## :...day in {10,11,13,24}: no (22.7)  
## day in {8,12,14,15,16,23,27}:  
## :...duration <= 168: no (114/36.7)  
## duration > 168: yes (131.9/58.9)  
##   
## SubTree [S17]  
##   
## day in {10,11,12,13,20,23,24,29,30,31}: yes (57.4)  
## day in {1,8,9,14,15,16,17,18,21,22,27}:  
## :...duration > 456: yes (45.9/2.6)  
## duration <= 456:  
## :...loan = no: no (145.7/64.1)  
## loan = yes: yes (9.7)  
##   
## SubTree [S18]  
##   
## job in {admin.,entrepreneur,housemaid,retired,student}:  
## :...loan = yes: no (12)  
## : loan = no:  
## : :...pdays > 89: no (123.5/29.6)  
## : pdays <= 89:  
## : :...day in {13,14,23,29}: yes (24.7)  
## : day in {18,21,31}: no (32.3/1.7)  
## : day in {1,8,9,10,11,12,15,16,17,20,22,24,27,30}:  
## : :...campaign > 1: yes (103.3/31.9)  
## : campaign <= 1:  
## : :...month in {jun,mar,sep}: no (107.1/29.7)  
## : month in {apr,dec,feb,oct}:  
## : :...age > 76: yes (16.7)  
## : age <= 76:  
## : :...duration > 542: yes (12.3)  
## : duration <= 542:  
## : :...poutcome = failure: yes (5.5)  
## : poutcome in {other,unknown}:  
## : :...balance <= 1407: no (140.5/55.8)  
## : balance > 1407: yes (50.9/14.7)  
## job in {blue-collar,management,self-employed,services,technician,unemployed,  
## : unknown}:  
## :...age <= 26: yes (49.8/4.3)  
## age > 26:  
## :...month in {dec,oct}: no (120.4/48.5)  
## month in {apr,feb,jun,mar,sep}:  
## :...day in {8,10,15}: yes (58.4/1.2)  
## day in {1,9,11,12,13,14,16,17,18,20,21,22,23,24,27,29,30,31}:  
## :...loan = yes: yes (21.3/3.5)  
## loan = no:  
## :...duration <= 223: no (31.8/6.8)  
## duration > 223:  
## :...age > 41:  
## :...job in {blue-collar,self-employed,services,  
## : : unknown}: no (32.3)  
## : job in {management,technician,  
## : unemployed}: yes (141/66.7)  
## age <= 41:  
## :...age > 35: yes (102.7/8.9)  
## age <= 35:  
## :...previous > 3: no (19/1.4)  
## previous <= 3:  
## :...job in {blue-collar,management,  
## : self-employed,technician,  
## : unknown}: yes (200.2/62.5)  
## job in {services,  
## unemployed}: no (29/3.8)  
##   
## SubTree [S19]  
##   
## marital = divorced: no (12.7)  
## marital in {married,single}:  
## :...age <= 26: no (9.1)  
## age > 26:  
## :...balance <= 116: no (25.2/2.6)  
## balance > 116: yes (145.6/61.5)  
##   
## SubTree [S20]  
##   
## contact = telephone: no (6)  
## contact = cellular:  
## :...day in {1,2,3,4,8,9,10,11,16,23,24,26}: no (49.6)  
## day in {5,6,7,12,13,14,15,17,18,19,20,21,22,25,27,28,29,30,31}:  
## :...age > 59: yes (19)  
## age <= 59:  
## :...loan = yes: no (23.3/3.7)  
## loan = no:  
## :...balance <= -28: no (9.4)  
## balance > -28:  
## :...balance <= 2457: yes (161.6/54.4)  
## balance > 2457: no (22/4.1)  
##   
## SubTree [S21]  
##   
## campaign > 7: yes (33.5/14.2)  
## campaign <= 7:  
## :...duration > 594: no (52.4/9.2)  
## duration <= 594:  
## :...age <= 32:  
## :...contact = telephone: yes (4.7/0.6)  
## : contact = cellular:  
## : :...previous > 1: yes (23.9/7.5)  
## : previous <= 1:  
## : :...balance > 3886: yes (41/11.1)  
## : balance <= 3886:  
## : :...month in {jan,nov}: no (33.3)  
## : month in {aug,jul,may}:  
## : :...education in {primary,unknown}: yes (20.3/5.3)  
## : education in {secondary,tertiary}:  
## : :...day in {5,6,12,17,18,22,25}: yes (140/60.7)  
## : day in {7,10,11,14,15,19,20,21,27,  
## : 28}: no (137.5/19.2)  
## age > 32:  
## :...previous > 2: no (32.3/3.1)  
## previous <= 2:  
## :...balance > 1512:  
## :...age > 58: yes (19.2/2.9)  
## : age <= 58:  
## : :...day in {5,10,12,14,19,27}: yes (52.9/13.8)  
## : day in {6,7,11,15,17,18,20,21,22,25,28}: no (190.3/43)  
## balance <= 1512:  
## :...day in {5,10,17,19,25}: no (101.7)  
## day in {6,7,11,12,14,15,18,20,21,22,27,28}:  
## :...housing = no: no (223.1/75.1)  
## housing = yes:  
## :...duration <= 494: yes (15.2/1.7)  
## duration > 494:  
## :...age <= 33: yes (14.5/5.2)  
## age > 33: no (157.8/23)  
##   
## SubTree [S22]  
##   
## balance <= 167: yes (50.9/8)  
## balance > 167:  
## :...education = unknown: no (10.1)  
## education in {primary,secondary,tertiary}:  
## :...balance > 6844: no (16.5)  
## balance <= 6844:  
## :...job in {entrepreneur,self-employed}: yes (18.3/0.6)  
## job in {housemaid,unknown}: no (0.2)  
## job in {admin.,blue-collar,management,retired,services,student,  
## : technician,unemployed}:  
## :...balance <= 227: no (14.4)  
## balance > 227:  
## :...previous > 2: yes (16/2.3)  
## previous <= 2:  
## :...day in {30,31}: no (21.8)  
## day in {1,3,4,8,9,13,16,26}:  
## :...duration > 529: yes (72.2/20.8)  
## duration <= 529:  
## :...month = jan: no (0)  
## month = nov: yes (7.7)  
## month in {aug,jul,may}:  
## :...day in {3,26}: yes (8.4)  
## day in {1,4,8,9,13,16}: no (145.9/46)  
##   
##   
## Evaluation on training data (36168 cases):  
##   
## Trial Decision Tree   
## ----- ----------------   
## Size Errors   
##   
## 0 334 2585( 7.1%)  
## 1 184 4537(12.5%)  
## 2 250 3660(10.1%)  
## 3 314 3758(10.4%)  
## 4 368 3610(10.0%)  
## 5 343 4022(11.1%)  
## 6 355 3570( 9.9%)  
## 7 432 3217( 8.9%)  
## 8 335 3162( 8.7%)  
## 9 396 2920( 8.1%)  
## boost 976( 2.7%) <<  
##   
##   
## (a) (b) <-classified as  
## ---- ----  
## 31737 177 (a): class no  
## 799 3455 (b): class yes  
##   
##   
## Attribute usage:  
##   
## 100.00% age  
## 100.00% duration  
## 100.00% poutcome  
## 100.00% month  
## 99.91% contact  
## 98.82% pdays  
## 98.82% day  
## 93.00% balance  
## 92.27% campaign  
## 85.98% housing  
## 64.40% job  
## 59.58% education  
## 59.48% default  
## 56.70% loan  
## 56.63% previous  
## 36.70% marital  
##   
##   
## Time: 3.6 secs

Evaluate the performance

bank\_boost\_pred10 <- predict(bank\_boost10, bank\_test)  
CrossTable(bank\_test$y, bank\_boost\_pred10,  
 prop.chisq = FALSE, prop.c = FALSE, prop.r = FALSE,  
 dnn = c('actual', 'predicted'))

##   
##   
## Cell Contents  
## |-------------------------|  
## | N |  
## | N / Table Total |  
## |-------------------------|  
##   
##   
## Total Observations in Table: 9043   
##   
##   
## | predicted   
## actual | no | yes | Row Total |   
## -------------|-----------|-----------|-----------|  
## no | 7680 | 328 | 8008 |   
## | 0.849 | 0.036 | |   
## -------------|-----------|-----------|-----------|  
## yes | 546 | 489 | 1035 |   
## | 0.060 | 0.054 | |   
## -------------|-----------|-----------|-----------|  
## Column Total | 8226 | 817 | 9043 |   
## -------------|-----------|-----------|-----------|  
##   
##

# compute accuracy  
accuracy=mean(bank\_test$y==bank\_boost\_pred10)  
accuracy

## [1] 0.9033507

# KPPA  
Kappa(table(bank\_test$y, bank\_boost\_pred10))

## value ASE z Pr(>|z|)  
## Unweighted 0.4751 0.01511 31.43 7.617e-217  
## Weighted 0.4751 0.01511 31.43 7.617e-217

# sensitivity  
sens <- sum(bank\_test$y=="yes" & bank\_boost\_pred10=="yes")/sum(bank\_test$y=="yes")  
sens

## [1] 0.4724638

# assign a penalty to different types of errors

Failing to identify a client of a term deposit can be an expensive mistake. Fortunately,the C5.0 algorithm allows us to assign a penalty to different types of errors.

From the results, the accuracy for a C5.0 model with a cost function is 86.7%, KAPPA is 0.515, and sensitivity is 0.812.This model makes a little more mistakes overall: accuracy decreases by 3.5%. However, the types of mistakes are very different. The previous models classified about 45 percent of actual subscrbers correctly, while, 81.2 percent of the actual subscribers were predicted correctly in this model. The sensitivity increases by 36.2%. This trade resulting in a reduction of false negatives at the expense of increasing false positives may be acceptable if our cost estimates were accurate. The performance of this model meet my goal. Therefore, I prefer this model as my final model.

Training the model

# create dimensions for a cost matrix  
matrix\_dimensions <- list(c("no", "yes"), c("no", "yes"))  
names(matrix\_dimensions) <- c("predicted", "actual")  
matrix\_dimensions

## $predicted  
## [1] "no" "yes"  
##   
## $actual  
## [1] "no" "yes"

# build the matrix  
error\_cost <- matrix(c(0, 1, 4, 0), nrow = 2, dimnames = matrix\_dimensions)  
error\_cost

## actual  
## predicted no yes  
## no 0 4  
## yes 1 0

# apply the cost matrix to the tree  
bank\_cost <- C5.0(bank\_train[-17], bank\_train$y,  
 costs = error\_cost)  
  
# display simple facts about the tree  
bank\_cost

##   
## Call:  
## C5.0.default(x = bank\_train[-17], y = bank\_train$y, costs = error\_cost)  
##   
## Classification Tree  
## Number of samples: 36168   
## Number of predictors: 16   
##   
## Tree size: 411   
##   
## Non-standard options: attempt to group attributes  
##   
## Cost Matrix:  
## actual  
## predicted no yes  
## no 0 4  
## yes 1 0

# display detailed information about the tree  
summary(bank\_cost)

##   
## Call:  
## C5.0.default(x = bank\_train[-17], y = bank\_train$y, costs = error\_cost)  
##   
##   
## C5.0 [Release 2.07 GPL Edition] Mon Nov 13 16:19:01 2017  
## -------------------------------  
##   
## Class specified by attribute `outcome'  
##   
## Read 36168 cases (17 attributes) from undefined.data  
## Read misclassification costs from undefined.costs  
##   
## Decision tree:  
##   
## poutcome = success:  
## :...duration > 161: yes (926/232)  
## : duration <= 161:  
## : :...contact = telephone: no (12/1)  
## : contact in {cellular,unknown}:  
## : :...duration > 125: yes (115/60)  
## : duration <= 125:  
## : :...month in {apr,aug,dec,feb,jul,jun,mar,nov,oct,  
## : : sep}: yes (134/99)  
## : month in {jan,may}: no (28)  
## poutcome in {failure,other,unknown}:  
## :...duration > 408:  
## :...duration > 633:  
## : :...duration > 836: yes (1307/554)  
## : : duration <= 836:  
## : : :...month in {apr,jan,mar,nov}:  
## : : :...default = yes: yes (8/2)  
## : : : default = no:  
## : : : :...pdays > 166:  
## : : : :...job in {admin.,blue-collar,entrepreneur,housemaid,  
## : : : : : retired,self-employed,services,student,  
## : : : : : technician,unemployed,  
## : : : : : unknown}: no (23)  
## : : : : job = management: yes (5/3)  
## : : : pdays <= 166:  
## : : : :...contact in {cellular,unknown}: yes (206/131)  
## : : : contact = telephone:  
## : : : :...month in {apr,mar}: yes (6/3)  
## : : : month in {jan,nov}: no (9)  
## : : month in {aug,dec,feb,jul,jun,may,oct,sep}:  
## : : :...contact in {cellular,telephone}: yes (631/302)  
## : : contact = unknown:  
## : : :...marital = married:  
## : : :...balance <= 709: yes (138/96)  
## : : : balance > 709:  
## : : : :...month in {aug,dec,feb,jul,jun,may,  
## : : : : sep}: no (77/8)  
## : : : month = oct: yes (1)  
## : : marital in {divorced,single}:  
## : : :...housing = yes: yes (112/62)  
## : : housing = no:  
## : : :...loan = yes: no (8)  
## : : loan = no:  
## : : :...campaign <= 3: yes (23/15)  
## : : campaign > 3: no (5)  
## : duration <= 633:  
## : :...pdays > 370: yes (25/3)  
## : pdays <= 370:  
## : :...month in {dec,mar,oct,sep}: yes (129/43)  
## : month in {apr,aug,feb,jan,jul,jun,may,nov}:  
## : :...age > 61: yes (60/27)  
## : age <= 61:  
## : :...contact = unknown:  
## : :...default = yes:  
## : : :...marital = single: yes (7/1)  
## : : : marital in {divorced,married}:  
## : : : :...job in {admin.,blue-collar,entrepreneur,  
## : : : : housemaid,retired,self-employed,  
## : : : : services,student,technician,  
## : : : : unemployed,unknown}: no (15)  
## : : : job = management: yes (1)  
## : : default = no:  
## : : :...duration <= 478:  
## : : :...month in {apr,feb,jan}: no (0)  
## : : : month = aug: yes (1)  
## : : : month in {jul,jun,may,nov}:  
## : : : :...balance > -258: no (372/8)  
## : : : balance <= -258:  
## : : : :...campaign > 5: yes (2)  
## : : : campaign <= 5: [S1]  
## : : duration > 478:  
## : : :...month in {apr,aug,jul}: yes (12/7)  
## : : month in {feb,jan,may,nov}: no (331/32)  
## : : month = jun:  
## : : :...day in {1,3,6,7,8,10,13,14,15,21,22,23,  
## : : : 25,27,28,29,30,  
## : : : 31}: no (23/1)  
## : : day in {4,5,12,17,24,  
## : : : 26}: yes (45/31)  
## : : day = 2:  
## : : :...job in {admin.,blue-collar,  
## : : : : entrepreneur,housemaid,  
## : : : : retired,self-employed,  
## : : : : services,student,  
## : : : : technician,  
## : : : : unknown}: no (14)  
## : : : job in {management,  
## : : : unemployed}: yes (3/1)  
## : : day = 9:  
## : : :...duration <= 492: yes (2)  
## : : : duration > 492: no (15)  
## : : day = 11:  
## : : :...duration <= 572: no (5)  
## : : : duration > 572: yes (5/1)  
## : : day = 16:  
## : : :...campaign <= 2: yes (7/5)  
## : : : campaign > 2: no (5)  
## : : day = 18:  
## : : :...age <= 35: yes (2)  
## : : : age > 35: no (9)  
## : : day = 19:  
## : : :...duration <= 518: yes (3/1)  
## : : : duration > 518: no (10)  
## : : day = 20:  
## : : :...duration <= 557: no (11)  
## : : duration > 557:  
## : : :...duration <= 586: yes (4/1)  
## : : duration > 586: no (5)  
## : contact in {cellular,telephone}:  
## : :...month = jun: yes (51/18)  
## : month in {apr,aug,feb,jan,jul,may,nov}:  
## : :...age <= 25: yes (71/39)  
## : age > 25:  
## : :...duration > 524:  
## : :...day in {1,4,5,6,7,8,9,11,12,13,14,15,  
## : : : 16,17,18,20,21,22,25,26,27,28,  
## : : : 30,31}:  
## : : :...loan = yes: [S2]  
## : : : loan = no:  
## : : : :...day in {1,9,18,21,25,26,  
## : : : : 27}: yes (133/79)  
## : : : day = 4: [S3]  
## : : : day = 5:  
## : : : :...duration <= 603: yes (15/8)  
## : : : : duration > 603: no (10)  
## : : : day = 6:  
## : : : :...age <= 34: yes (7/2)  
## : : : : age > 34: no (14)  
## : : : day = 8: [S4]  
## : : : day = 12: [S5]  
## : : : day = 13:  
## : : : :...pdays <= 223: yes (17/4)  
## : : : : pdays > 223: no (5)  
## : : : day = 14:  
## : : : :...month in {apr,aug,feb,jan,  
## : : : : : may,  
## : : : : : nov}: yes (28/16)  
## : : : : month = jul: no (7)  
## : : : day = 15:  
## : : : :...balance <= 1020: yes (14/7)  
## : : : : balance > 1020: no (7)  
## : : : day = 16: [S6]  
## : : : day = 31: [S7]  
## : : : day = 11: [S8]  
## : : : day = 17: [S9]  
## : : : day = 22:  
## : : : :...duration > 598: no (8)  
## : : : : duration <= 598:  
## : : : : :...balance <= 89: no (5)  
## : : : : balance > 89: yes (12/5)  
## : : : day = 28: [S10]  
## : : : day = 30:  
## : : : :...age > 50: no (4)  
## : : : : age <= 50: [S11]  
## : : : day = 7: [S12]  
## : : : day = 20:  
## : : : :...campaign <= 1: yes (10/3)  
## : : : campaign > 1: [S13]  
## : : day in {2,3,10,19,23,24,29}:  
## : : :...balance > 9277: yes (4/1)  
## : : balance <= 9277:  
## : : :...contact = telephone:  
## : : :...duration <= 608: no (8)  
## : : : duration > 608: yes (2)  
## : : contact = cellular:  
## : : :...duration > 625: [S14]  
## : : duration <= 625: [S15]  
## : duration <= 524:  
## : :...housing = no:  
## : :...month in {apr,may}:  
## : : :...campaign <= 1: yes (40/13)  
## : : : campaign > 1: [S16]  
## : : month in {aug,feb,jan,jul,nov}:  
## : : :...poutcome = other:  
## : : :...duration > 470: no (6)  
## : : : duration <= 470:  
## : : : :...day in {1,2,3,5,6,7,8,  
## : : : : 9,10,11,12,13,  
## : : : : 14,15,16,17,18,  
## : : : : 19,20,22,23,24,  
## : : : : 25,26,27,  
## : : : : 31}: yes (11)  
## : : : day in {4,21,28,29,  
## : : : 30}: no (5)  
## : : poutcome in {failure,unknown}:  
## : : :...loan = yes:  
## : : :...default = yes: yes (6/4)  
## : : : default = no: [S17]  
## : : loan = no:  
## : : :...day in {2,3,9,12,15,  
## : : : 16}: yes (53/29)  
## : : day in {1,4,18,23,  
## : : : 24}: no (56/5)  
## : : day = 5: [S18]  
## : : day = 6:  
## : : :...age <= 42: no (13)  
## : : : age > 42: yes (6/3)  
## : : day = 7: [S19]  
## : : day = 8:  
## : : :...age <= 38: yes (6/2)  
## : : : age > 38: no (14)  
## : : day = 10: [S20]  
## : : day = 11: [S21]  
## : : day = 13:  
## : : :...age <= 42: no (5)  
## : : : age > 42: yes (6/2)  
## : : day = 14: [S22]  
## : : day = 17: [S23]  
## : : day = 19: [S24]  
## : : day = 22: [S25]  
## : : day = 25: [S26]  
## : : day = 27: [S27]  
## : : day = 30: [S28]  
## : : day = 31: [S29]  
## : : day = 20: [S30]  
## : : day = 21: [S31]  
## : : day = 26: [S32]  
## : : day = 28: [S33]  
## : : day = 29: [S34]  
## : housing = yes:  
## : :...day in {1,5,9,11,26,27,  
## : : 31}: no (80)  
## : day in {2,3,4,6,7,8,10,12,13,14,15,  
## : : 16,17,18,19,20,21,22,23,24,  
## : : 25,28,29,30}:  
## : :...month = jan: no (24)  
## : month in {apr,aug}: [S35]  
## : month in {feb,jul,may,nov}: [S36]  
## duration <= 408:  
## :...age > 60:  
## :...duration <= 126:  
## : :...day in {1,2,3,4,5,6,7,8,9,12,13,14,16,18,19,20,23,24,26,28,30,  
## : : : 31}: no (119)  
## : : day in {10,11,15,17,21,22,25,27,29}:  
## : : :...education = secondary: no (15)  
## : : education in {primary,tertiary,unknown}:  
## : : :...campaign <= 2: yes (25/15)  
## : : campaign > 2: no (7)  
## : duration > 126:  
## : :...pdays <= 91:  
## : :...campaign <= 3: yes (315/166)  
## : : campaign > 3:  
## : : :...duration <= 195: no (15)  
## : : duration > 195: yes (23/14)  
## : pdays > 91:  
## : :...day = 17: yes (0)  
## : day in {1,4,5,6,7,8,9,10,18,19,20,22,23,25,29,  
## : : 31}: no (38)  
## : day in {2,3,11,12,13,14,15,16,21,24,26,27,28,30}:  
## : :...balance <= 5368: yes (46/24)  
## : balance > 5368: no (8)  
## age <= 60:  
## :...month in {apr,dec,feb,mar,oct,sep}:  
## :...day in {8,10,11,12,13,15,18,21,22,23,24,25,26,27,28,29,30,31}:  
## : :...duration <= 103:  
## : : :...duration <= 60: no (70/1)  
## : : : duration > 60:  
## : : : :...month in {feb,mar}: yes (66/46)  
## : : : month in {apr,dec,oct,sep}:  
## : : : :...day in {8,10,12,15,18,22,25,26,28,29,30,  
## : : : : 31}: no (77)  
## : : : day in {11,13,21,23,24,27}:  
## : : : :...loan = yes: no (10)  
## : : : loan = no:  
## : : : :...age <= 42:  
## : : : :...day in {11,27}: yes (4/2)  
## : : : : day in {13,21,23,24}: no (16)  
## : : : age > 42:  
## : : : :...poutcome = failure: no (7)  
## : : : poutcome in {other,  
## : : : unknown}: yes (10/4)  
## : : duration > 103:  
## : : :...duration > 201:  
## : : :...contact = unknown: yes (11/1)  
## : : : contact in {cellular,telephone}:  
## : : : :...housing = no: yes (277/115)  
## : : : housing = yes:  
## : : : :...day in {10,11,18,21,22,27,  
## : : : : 28}: yes (35/4)  
## : : : day in {8,12,13,15,23,24,25,26,29,30,31}:  
## : : : :...education in {primary,  
## : : : : tertiary}: yes (52/31)  
## : : : education = unknown: no (3)  
## : : : education = secondary:  
## : : : :...age <= 44: no (39/4)  
## : : : age > 44: yes (19/10)  
## : : duration <= 201:  
## : : :...month in {feb,mar,oct}:  
## : : :...previous > 1:  
## : : : :...balance > 3832: no (10)  
## : : : : balance <= 3832:  
## : : : : :...marital = divorced: no (5)  
## : : : : marital in {married,  
## : : : : single}: yes (28/17)  
## : : : previous <= 1:  
## : : : :...campaign <= 1: yes (77/24)  
## : : : campaign > 1:  
## : : : :...poutcome = failure: no (5)  
## : : : poutcome in {other,unknown}:  
## : : : :...job in {admin.,blue-collar,  
## : : : : management,services,  
## : : : : technician}: yes (39/21)  
## : : : job in {entrepreneur,housemaid,  
## : : : retired,self-employed,  
## : : : student,unemployed,  
## : : : unknown}: no (10)  
## : : month in {apr,dec,sep}:  
## : : :...day = 31: yes (0)  
## : : day in {10,13,25,28,29,30}:  
## : : :...contact = unknown: yes (1)  
## : : : contact in {cellular,telephone}:  
## : : : :...duration <= 174: no (73)  
## : : : duration > 174:  
## : : : :...duration <= 178: yes (2)  
## : : : duration > 178: no (17)  
## : : day in {8,11,12,15,18,21,22,23,24,26,27}:  
## : : :...housing = no: yes (69/37)  
## : : housing = yes:  
## : : :...duration > 164: no (18)  
## : : duration <= 164:  
## : : :...previous > 3: yes (6/3)  
## : : previous <= 3: [S37]  
## : day in {1,2,3,4,5,6,7,9,14,16,17,19,20}:  
## : :...month in {dec,mar,oct,sep}:  
## : :...duration > 135:  
## : : :...month = oct:  
## : : : :...job = entrepreneur: yes (0)  
## : : : : job in {admin.,housemaid,retired,  
## : : : : : unemployed}: no (17)  
## : : : : job in {blue-collar,management,self-employed,  
## : : : : : services,student,technician,unknown}:  
## : : : : :...previous <= 5: yes (40/20)  
## : : : : previous > 5: no (5)  
## : : : month in {dec,mar,sep}:  
## : : : :...duration > 172: yes (128/47)  
## : : : duration <= 172:  
## : : : :...campaign > 2: no (9)  
## : : : campaign <= 2:  
## : : : :...day in {1,4,5,6,14,17}: no (11)  
## : : : day in {2,3,7,9,16,19,  
## : : : 20}: yes (15/5)  
## : : duration <= 135:  
## : : :...day in {4,6,7,14,16,17,20}: no (76)  
## : : day in {1,2,3,5,9,19}:  
## : : :...pdays > 113: no (16)  
## : : pdays <= 113:  
## : : :...duration <= 81: no (30/1)  
## : : duration > 81:  
## : : :...month in {dec,mar,sep}: yes (34/21)  
## : : month = oct:  
## : : :...age <= 46: no (9)  
## : : age > 46: yes (4/1)  
## : month in {apr,feb}:  
## : :...housing = yes:  
## : :...education = tertiary: no (441/17)  
## : : education in {primary,secondary,unknown}:  
## : : :...day in {1,2,4,5,6,7,19,20}: no (728/1)  
## : : day in {3,9,14,16,17}:  
## : : :...month = apr:  
## : : :...previous <= 2: no (393/2)  
## : : : previous > 2:  
## : : : :...job in {admin.,blue-collar,  
## : : : : management,self-employed,  
## : : : : services,student,  
## : : : : unemployed,  
## : : : : unknown}: no (43)  
## : : : job in {entrepreneur,housemaid,  
## : : : retired,  
## : : : technician}: yes (12/8)  
## : : month = feb:  
## : : :...campaign <= 1: yes (25/17)  
## : : campaign > 1:  
## : : :...day in {3,9,14,17}: no (96)  
## : : day = 16: yes (1)  
## : housing = no:  
## : :...day in {1,7,14,16,17,19,20}:  
## : :...previous > 1: no (25)  
## : : previous <= 1:  
## : : :...duration <= 89: no (20)  
## : : duration > 89: yes (101/52)  
## : day in {2,3,4,5,6,9}:  
## : :...duration <= 116: no (291/1)  
## : duration > 116:  
## : :...contact in {telephone,  
## : : unknown}: no (51)  
## : contact = cellular:  
## : :...month = apr:  
## : :...previous <= 0: yes (19/8)  
## : : previous > 0: no (12)  
## : month = feb:  
## : :...education = primary: no (46)  
## : education = tertiary:  
## : :...balance <= 3154: no (115/15)  
## : : balance > 3154: yes (13/6)  
## : education in {secondary,unknown}:  
## : :...previous > 4: yes (9/6)  
## : previous <= 4:  
## : :...day in {2,4,5,6}:  
## : :...campaign <= 5: no (178/4)  
## : : campaign > 5:  
## : : :...age <= 26: yes (2)  
## : : age > 26: no (7)  
## : day in {3,9}:  
## : :...campaign > 1: no (32/1)  
## : campaign <= 1: [S38]  
## month in {aug,jan,jul,jun,may,nov}:  
## :...duration <= 159:  
## :...age <= 26:  
## : :...housing = yes:  
## : : :...month = aug: yes (4/3)  
## : : : month in {jan,jul,jun,may,nov}: no (316/1)  
## : : housing = no:  
## : : :...duration <= 88: no (67)  
## : : duration > 88:  
## : : :...previous > 1: no (13)  
## : : previous <= 1:  
## : : :...poutcome = failure: no (3)  
## : : poutcome = other: yes (3/2)  
## : : poutcome = unknown:  
## : : :...day in {1,2,3,5,6,7,9,11,16,17,18,19,  
## : : : 20,22,23,27,28,30,  
## : : : 31}: no (44)  
## : : day in {4,8,10,12,13,14,15,21,24,25,26,  
## : : : 29}:  
## : : :...month in {aug,jan,  
## : : : jun}: yes (28/17)  
## : : month = nov: no (1)  
## : : month = jul: [S39]  
## : : month = may:  
## : : :...age <= 22: yes (3/2)  
## : : age > 22: no (10)  
## : age > 26:  
## : :...poutcome = unknown: no (11209/42)  
## : poutcome in {failure,other}:  
## : :...contact = unknown:  
## : :...day in {1,2,3,4,5,6,7,8,9,11,13,14,15,16,17,18,  
## : : : 20,21,22,23,24,25,26,28,29,30,  
## : : : 31}: no (17)  
## : : day in {10,12,19,27}: yes (4)  
## : contact in {cellular,telephone}:  
## : :...housing = yes:  
## : :...pdays > 89: no (1137/1)  
## : : pdays <= 89:  
## : : :...duration <= 116: no (25)  
## : : duration > 116:  
## : : :...month in {aug,jul,may,  
## : : : nov}: yes (6/2)  
## : : month in {jan,jun}: no (9)  
## : housing = no:  
## : :...day in {1,3,4,9,10,12,14,16,27}:  
## : :...month = may: no (21)  
## : : month in {aug,jan,jul,jun,nov}:  
## : : :...job = entrepreneur: yes (0)  
## : : job in {retired,services,  
## : : : technician}: no (11)  
## : : job in {admin.,blue-collar,  
## : : : housemaid,management,  
## : : : self-employed,student,  
## : : : unemployed,unknown}:  
## : : :...balance <= 43: no (5)  
## : : balance > 43: yes (35/17)  
## : day in {2,5,6,7,8,11,13,15,17,18,19,20,21,  
## : : 22,23,24,25,26,28,29,30,31}:  
## : :...duration > 130:  
## : :...job in {admin.,housemaid,retired,  
## : : : services}: yes (17/12)  
## : : job in {blue-collar,entrepreneur,  
## : : management,self-employed,  
## : : student,technician,  
## : : unemployed,  
## : : unknown}: no (40)  
## : duration <= 130:  
## : :...pdays <= 283: no (180)  
## : pdays > 283:  
## : :...month = aug: yes (1)  
## : month in {jan,jul,jun,may,nov}:  
## : :...pdays <= 286: yes (1)  
## : pdays > 286: no (43)  
## duration > 159:  
## :...contact = unknown:  
## :...month in {jan,jul,jun,may}: no (4119/10)  
## : month in {aug,nov}:  
## : :...day in {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,19,  
## : : 20,21,22,23,24,25,26,27,28,29,30,  
## : : 31}: yes (5)  
## : day in {17,18}: no (12)  
## contact in {cellular,telephone}:  
## :...month = jun: yes (249/120)  
## month in {aug,jan,jul,may,nov}:  
## :...pdays > 374: yes (42/13)  
## pdays <= 374:  
## :...age <= 25:  
## :...housing = yes: no (80/2)  
## : housing = no:  
## : :...loan = no: yes (78/42)  
## : loan = yes: no (8)  
## age > 25:  
## :...day in {1,2,3}:  
## :...previous <= 2: yes (43/18)  
## : previous > 2: no (7)  
## day in {4,5,12,16,25,26,27}:  
## :...month in {jan,nov}:  
## : :...campaign <= 1: yes (29/12)  
## : : campaign > 1:  
## : : :...balance <= 1384: no (8)  
## : : balance > 1384: yes (3/1)  
## : month in {aug,jul,may}:  
## : :...contact = telephone: no (64)  
## : contact = cellular:  
## : :...poutcome = other:  
## : :...loan = no: yes (39/28)  
## : : loan = yes: no (5)  
## : poutcome in {failure,unknown}:  
## : :...duration <= 187: no (180/1)  
## : duration > 187:  
## : :...pdays > 272: no (68)  
## : pdays <= 272:  
## : :...pdays > 72: [S40]  
## : pdays <= 72: [S41]  
## day in {6,7,8,9,10,11,13,14,15,17,18,19,20,  
## : 21,22,23,24,28,29,30,31}:  
## :...age > 59:  
## :...loan = yes: no (11)  
## : loan = no: [S42]  
## age <= 59:  
## :...previous > 1:  
## :...month in {aug,jul}:  
## : :...loan = no: yes (61/31)  
## : : loan = yes: no (6)  
## : month in {jan,may,nov}:  
## : :...pdays > 99: no (551/15)  
## : pdays <= 99:  
## : :...pdays <= 86: no (14)  
## : pdays > 86: [S43]  
## previous <= 1:  
## :...duration > 313: [S44]  
## duration <= 313:  
## :...housing = yes: no (1853/20)  
## housing = no:  
## :...previous > 0: [S45]  
## previous <= 0:  
## :...month = may: [S46]  
## month in {aug,jan,  
## : jul,nov}: [S47]  
##   
## SubTree [S1]  
##   
## marital = divorced: yes (1)  
## marital in {married,single}: no (9)  
##   
## SubTree [S2]  
##   
## education in {primary,unknown}: no (12)  
## education in {secondary,tertiary}:  
## :...month in {aug,jan}: no (11)  
## month in {apr,feb,jul,may,nov}:  
## :...day in {4,8,11,13,14,16,20}: no (25)  
## day in {1,5,6,7,9,12,15,17,18,21,22,25,26,27,28,30,31}: yes (66/40)  
##   
## SubTree [S3]  
##   
## marital in {divorced,married}: yes (14/7)  
## marital = single: no (5)  
##   
## SubTree [S4]  
##   
## job in {admin.,blue-collar,services}: no (8)  
## job in {entrepreneur,housemaid,management,retired,self-employed,student,  
## technician,unemployed,unknown}: yes (11/3)  
##   
## SubTree [S5]  
##   
## job in {admin.,blue-collar,entrepreneur,self-employed,services,student,  
## : technician,unknown}: yes (11/1)  
## job in {housemaid,management,retired,unemployed}: no (7)  
##   
## SubTree [S6]  
##   
## marital in {divorced,married}: no (15/1)  
## marital = single: yes (6/2)  
##   
## SubTree [S7]  
##   
## marital = divorced: yes (3/1)  
## marital in {married,single}: no (6)  
##   
## SubTree [S8]  
##   
## marital = divorced: no (1)  
## marital = single: yes (8/3)  
## marital = married:  
## :...month = aug: yes (7/5)  
## month in {apr,feb,jan,jul,may,nov}: no (10)  
##   
## SubTree [S9]  
##   
## poutcome in {failure,other}: no (12)  
## poutcome = unknown:  
## :...duration <= 596: yes (16/11)  
## duration > 596: no (5)  
##   
## SubTree [S10]  
##   
## marital in {divorced,single}: yes (9/4)  
## marital = married:  
## :...month = aug: yes (2/1)  
## month in {apr,feb,jan,jul,may,nov}: no (13)  
##   
## SubTree [S11]  
##   
## job in {admin.,entrepreneur,housemaid,management,retired,self-employed,student,  
## : unknown}: yes (16/4)  
## job in {blue-collar,services,technician,unemployed}: no (6)  
##   
## SubTree [S12]  
##   
## marital = single: no (11)  
## marital in {divorced,married}:  
## :...duration > 584: yes (9/4)  
## duration <= 584:  
## :...education = primary: yes (2/1)  
## education in {secondary,tertiary,unknown}: no (9)  
##   
## SubTree [S13]  
##   
## month in {feb,jan,jul,may}: no (0)  
## month = aug: yes (8/4)  
## month in {apr,nov}:  
## :...marital = divorced: yes (3/2)  
## marital in {married,single}: no (20)  
##   
## SubTree [S14]  
##   
## duration <= 628: yes (2)  
## duration > 628: no (5)  
##   
## SubTree [S15]  
##   
## marital in {married,single}: no (74)  
## marital = divorced:  
## :...housing = no: yes (4/2)  
## housing = yes: no (13)  
##   
## SubTree [S16]  
##   
## contact = telephone: yes (4/1)  
## contact = cellular:  
## :...campaign <= 2: no (17/1)  
## campaign > 2: yes (15/8)  
##   
## SubTree [S17]  
##   
## month = aug: yes (14/11)  
## month in {feb,jan,jul,nov}: no (68/1)  
##   
## SubTree [S18]  
##   
## campaign <= 2: no (14)  
## campaign > 2: yes (5/3)  
##   
## SubTree [S19]  
##   
## job in {admin.,blue-collar,entrepreneur,housemaid,management,retired,  
## : self-employed,services,technician,unknown}: no (15)  
## job in {student,unemployed}: yes (2)  
##   
## SubTree [S20]  
##   
## month in {aug,feb}: yes (3/1)  
## month in {jan,jul,nov}: no (8)  
##   
## SubTree [S21]  
##   
## campaign <= 1: yes (5/2)  
## campaign > 1: no (5)  
##   
## SubTree [S22]  
##   
## duration <= 488: no (13)  
## duration > 488: yes (4/2)  
##   
## SubTree [S23]  
##   
## duration <= 470: yes (3)  
## duration > 470: no (7)  
##   
## SubTree [S24]  
##   
## education in {primary,secondary,tertiary}: no (17)  
## education = unknown: yes (1)  
##   
## SubTree [S25]  
##   
## duration <= 515: no (9)  
## duration > 515: yes (1)  
##   
## SubTree [S26]  
##   
## marital in {divorced,married}: no (11)  
## marital = single: yes (3/2)  
##   
## SubTree [S27]  
##   
## balance <= 2449: no (5)  
## balance > 2449: yes (2)  
##   
## SubTree [S28]  
##   
## month in {aug,feb,jan,nov}: no (12)  
## month = jul: yes (8/4)  
##   
## SubTree [S29]  
##   
## month = aug: yes (1)  
## month in {feb,jan,jul,nov}: no (4)  
##   
## SubTree [S30]  
##   
## marital = divorced: yes (1)  
## marital = married: no (8)  
## marital = single:  
## :...month = aug: yes (5/3)  
## month in {feb,jan,jul,nov}: no (5)  
##   
## SubTree [S31]  
##   
## month in {aug,feb,jan,jul}: no (8)  
## month = nov:  
## :...job in {admin.,blue-collar,unemployed}: no (5)  
## job in {entrepreneur,housemaid,management,retired,self-employed,services,  
## student,technician,unknown}: yes (3)  
##   
## SubTree [S32]  
##   
## campaign <= 1: yes (1)  
## campaign > 1:  
## :...month in {aug,feb,jan,nov}: no (10)  
## month = jul: yes (1)  
##   
## SubTree [S33]  
##   
## month in {feb,nov}: no (0)  
## month = jul: yes (3)  
## month in {aug,jan}:  
## :...campaign <= 3: no (15)  
## campaign > 3: yes (4/3)  
##   
## SubTree [S34]  
##   
## default = yes: yes (1)  
## default = no:  
## :...previous > 5: yes (1)  
## previous <= 5:  
## :...campaign <= 5: no (19)  
## campaign > 5: yes (1)  
##   
## SubTree [S35]  
##   
## education = unknown: yes (4/1)  
## education in {primary,secondary,tertiary}:  
## :...marital = divorced: yes (8/6)  
## marital in {married,single}: no (116/3)  
##   
## SubTree [S36]  
##   
## job in {blue-collar,housemaid,unemployed,unknown}: no (105/11)  
## job in {self-employed,student}: yes (11/5)  
## job = entrepreneur:  
## :...loan = no: no (11)  
## : loan = yes: yes (4/3)  
## job = retired:  
## :...month = feb: yes (1)  
## : month in {jul,may,nov}: no (8)  
## job = admin.:  
## :...campaign > 2: no (8)  
## : campaign <= 2:  
## : :...day in {2,3,6,8,12,13,16,17,18,19,22,24,25,28,29,30}: yes (21/12)  
## : day in {4,7,10,14,15,20,21,23}: no (19)  
## job = technician:  
## :...campaign <= 2: yes (45/31)  
## : campaign > 2:  
## : :...age <= 50: no (17)  
## : age > 50: yes (1)  
## job = management:  
## :...marital = divorced: no (12)  
## : marital in {married,single}:  
## : :...duration <= 435: no (13)  
## : duration > 435:  
## : :...day in {2,8,12,15,17,20,22,23,24}: no (24)  
## : day in {3,4,6,7,10,13,14,16,18,19,21,25,28,29,30}: yes (34/20)  
## job = services:  
## :...poutcome = failure: yes (3/1)  
## poutcome = other: no (7)  
## poutcome = unknown:  
## :...default = yes: yes (1)  
## default = no:  
## :...month in {feb,nov}: yes (4/1)  
## month in {jul,may}:  
## :...education = primary: yes (3/1)  
## education in {secondary,tertiary,unknown}: no (27/1)  
##   
## SubTree [S37]  
##   
## job in {admin.,blue-collar}: yes (12/7)  
## job in {entrepreneur,housemaid,management,retired,self-employed,services,  
## student,technician,unemployed,unknown}: no (16)  
##   
## SubTree [S38]  
##   
## job in {admin.,blue-collar,entrepreneur,housemaid,management,self-employed,  
## : student,unemployed}: yes (9/3)  
## job in {retired,services,technician,unknown}: no (7)  
##   
## SubTree [S39]  
##   
## job in {blue-collar,management,services,technician,unemployed}: no (13)  
## job in {admin.,entrepreneur,housemaid,retired,self-employed,student,  
## unknown}: yes (3)  
##   
## SubTree [S40]  
##   
## age <= 36: yes (27/14)  
## age > 36:  
## :...campaign <= 2: no (14)  
## campaign > 2: yes (5/3)  
##   
## SubTree [S41]  
##   
## month in {aug,jul}:  
## :...marital in {married,single}: no (359/12)  
## : marital = divorced:  
## : :...balance <= 351: no (23)  
## : balance > 351: yes (16/11)  
## month = may:  
## :...day = 16: no (0)  
## day in {4,25,27}: yes (61/39)  
## day in {5,12,26}:  
## :...housing = yes:  
## :...balance <= -487: yes (3/2)  
## : balance > -487: no (122/3)  
## housing = no:  
## :...balance > 768: no (12)  
## balance <= 768:  
## :...job in {blue-collar,student}: no (5)  
## job in {admin.,entrepreneur,housemaid,management,retired,  
## self-employed,services,technician,unemployed,  
## unknown}: yes (9/4)  
##   
## SubTree [S42]  
##   
## job in {blue-collar,entrepreneur,housemaid,self-employed,services,student,  
## : technician,unemployed,unknown}: no (20)  
## job in {admin.,management,retired}:  
## :...campaign <= 3: yes (28/18)  
## campaign > 3: no (6)  
##   
## SubTree [S43]  
##   
## month = jan: yes (3)  
## month in {may,nov}:  
## :...education in {primary,secondary,unknown}: no (10)  
## education = tertiary: yes (12/7)  
##   
## SubTree [S44]  
##   
## poutcome = failure: no (55)  
## poutcome = other:  
## :...age <= 36: no (6)  
## : age > 36: yes (9/5)  
## poutcome = unknown:  
## :...month in {aug,may}:  
## :...education = unknown: yes (6/3)  
## : education = primary:  
## : :...job in {admin.,blue-collar,entrepreneur,housemaid,retired,  
## : : : self-employed,services,student,technician,unemployed,  
## : : : unknown}: no (40)  
## : : job = management: yes (2/1)  
## : education in {secondary,tertiary}:  
## : :...campaign > 1:  
## : :...day in {9,10,15,17,19,20,21,23,24,28,29,30,31}: no (66)  
## : : day in {6,7,8,11,13,14,18,22}:  
## : : :...campaign <= 5: no (147/11)  
## : : campaign > 5: yes (20/14)  
## : campaign <= 1:  
## : :...balance > 3677: yes (3)  
## : balance <= 3677:  
## : :...balance > 949: no (21)  
## : balance <= 949:  
## : :...loan = yes: yes (7/4)  
## : loan = no:  
## : :...job in {blue-collar,housemaid,self-employed,  
## : : student,unemployed,unknown}: no (10)  
## : job in {entrepreneur,retired,  
## : : services}: yes (12/6)  
## : job = admin.:  
## : :...duration <= 383: no (6)  
## : : duration > 383: yes (3/1)  
## : job = management:  
## : :...age <= 26: yes (1)  
## : : age > 26: no (13)  
## : job = technician:  
## : :...age <= 29: yes (1)  
## : age > 29: no (11)  
## month in {jan,jul,nov}:  
## :...job in {blue-collar,entrepreneur,retired,self-employed,student,  
## : unknown}: no (194)  
## job in {admin.,housemaid,management,services,technician,unemployed}:  
## :...housing = yes: no (191/3)  
## housing = no:  
## :...day in {6,10,11,17,18,23,29,30}: no (78)  
## day in {7,8,9,13,14,15,19,20,21,22,24,28,31}:  
## :...balance <= 291:  
## :...age <= 27: yes (3/2)  
## : age > 27: no (52/1)  
## balance > 291:  
## :...loan = yes: no (14)  
## loan = no:  
## :...duration <= 317: yes (4)  
## duration > 317:  
## :...age <= 31: no (10)  
## age > 31:  
## :...day in {7,8,9,13,14,15,22,24,  
## : 31}: yes (20/11)  
## day = 19:  
## :...marital in {divorced,  
## : : married}: no (7)  
## : marital = single: yes (2/1)  
## day = 20:  
## :...balance <= 1487: yes (1)  
## : balance > 1487: no (8)  
## day = 21:  
## :...age <= 55: no (4)  
## : age > 55: yes (1)  
## day = 28:  
## :...marital = divorced: yes (3/1)  
## marital in {married,  
## single}: no (8)  
##   
## SubTree [S45]  
##   
## month = aug: yes (11/6)  
## month in {jan,jul,may,nov}: no (33)  
##   
## SubTree [S46]  
##   
## day in {6,8,9,10,11,13,14,15,17,18,19,20,21,23,24,29,30,31}: no (33)  
## day in {7,22,28}: yes (10/4)  
##   
## SubTree [S47]  
##   
## loan = yes: no (384)  
## loan = no:  
## :...campaign > 1: no (1004/21)  
## campaign <= 1:  
## :...day = 15: no (0)  
## day in {6,7,11,13,14}:  
## :...contact = telephone: yes (8/2)  
## : contact = cellular:  
## : :...age > 46: no (9)  
## : age <= 46:  
## : :...duration <= 185: no (7)  
## : duration > 185: yes (25/16)  
## day in {8,9,10,17,18,19,20,21,22,23,24,28,29,30,31}:  
## :...job in {blue-collar,entrepreneur,housemaid,retired,self-employed,  
## : services,student,unemployed,unknown}: no (138)  
## job in {admin.,management,technician}:  
## :...duration > 270: no (32)  
## duration <= 270:  
## :...day in {10,22,23,24,28,29,30,31}: no (47)  
## day in {8,9,17,18,19,20,21}:  
## :...month = jan: yes (1)  
## month = aug:  
## :...education = secondary: no (5)  
## : education in {primary,tertiary,  
## : unknown}: yes (10/5)  
## month in {jul,nov}:  
## :...balance <= 230: no (27)  
## balance > 230:  
## :...day in {8,9,17,19}: yes (17/12)  
## day in {18,20,21}: no (15)  
##   
##   
## Evaluation on training data (36168 cases):  
##   
## Decision Tree   
## -----------------------   
## Size Errors Cost   
##   
## 402 3641(10.1%) 0.12 <<  
##   
##   
## (a) (b) <-classified as  
## ---- ----  
## 28536 3378 (a): class no  
## 263 3991 (b): class yes  
##   
##   
## Attribute usage:  
##   
## 100.00% duration  
## 100.00% poutcome  
## 91.72% month  
## 89.14% age  
## 50.41% contact  
## 37.09% day  
## 33.63% pdays  
## 30.48% housing  
## 18.47% previous  
## 9.38% loan  
## 8.37% campaign  
## 8.36% education  
## 5.30% job  
## 4.17% balance  
## 3.68% marital  
## 3.65% default  
##   
##   
## Time: 0.5 secs

#Generate predictions on the test data  
bank\_cost\_pred <- predict(bank\_cost, bank\_test)

Evaluation of the cost model

# evaluatation the cost model  
# confussion matrix  
CrossTable(bank\_test$y, bank\_cost\_pred,  
 prop.chisq = FALSE, prop.c = FALSE, prop.r = FALSE,  
 dnn = c('actual', 'predicted'))

##   
##   
## Cell Contents  
## |-------------------------|  
## | N |  
## | N / Table Total |  
## |-------------------------|  
##   
##   
## Total Observations in Table: 9043   
##   
##   
## | predicted   
## actual | no | yes | Row Total |   
## -------------|-----------|-----------|-----------|  
## no | 7047 | 961 | 8008 |   
## | 0.779 | 0.106 | |   
## -------------|-----------|-----------|-----------|  
## yes | 209 | 826 | 1035 |   
## | 0.023 | 0.091 | |   
## -------------|-----------|-----------|-----------|  
## Column Total | 7256 | 1787 | 9043 |   
## -------------|-----------|-----------|-----------|  
##   
##

# compute accuracy  
accuracy=mean(bank\_test$y==bank\_cost\_pred)  
accuracy

## [1] 0.8706182

# KPPA  
Kappa(table(bank\_test$y, bank\_cost\_pred))

## value ASE z Pr(>|z|)  
## Unweighted 0.5151 0.01204 42.77 0  
## Weighted 0.5151 0.01204 42.77 0

# sensitivity  
sens <- sum(bank\_test$y=="yes" & bank\_cost\_pred=="yes")/sum(bank\_test$y=="yes")  
sens

## [1] 0.7980676

Combine predictions made from the test data using this final model, C5.0 with cost function, into the bank test data and present the predictions. From the result, the classes of the first 6 examples in the test data are all nos, and the predictions for those are also all nos. The model predicts them correctly.

bank\_test$prediction=bank\_cost\_pred  
  
head(bank\_test)

## age job marital education default balance housing loan contact  
## 6 35 management married tertiary no 231 yes no unknown  
## 14 58 technician married unknown no 71 yes no unknown  
## 16 51 retired married primary no 229 yes no unknown  
## 17 45 admin. single unknown no 13 yes no unknown  
## 20 33 services married secondary no 0 yes no unknown  
## 23 32 blue-collar single primary no 23 yes yes unknown  
## day month duration campaign pdays previous poutcome y prediction  
## 6 5 may 139 1 -1 0 unknown no no  
## 14 5 may 71 1 -1 0 unknown no no  
## 16 5 may 353 1 -1 0 unknown no no  
## 17 5 may 98 1 -1 0 unknown no no  
## 20 5 may 54 1 -1 0 unknown no no  
## 23 5 may 160 1 -1 0 unknown no no