작업형2.R

LSG

2021-07-31

sessionInfo()

## R version 4.0.3 (2020-10-10)  
## Platform: x86\_64-w64-mingw32/x64 (64-bit)  
## Running under: Windows 10 x64 (build 19042)  
##   
## Matrix products: default  
##   
## locale:  
## [1] LC\_COLLATE=Korean\_Korea.949 LC\_CTYPE=Korean\_Korea.949   
## [3] LC\_MONETARY=Korean\_Korea.949 LC\_NUMERIC=C   
## [5] LC\_TIME=Korean\_Korea.949   
##   
## attached base packages:  
## [1] stats graphics grDevices utils datasets methods base   
##   
## loaded via a namespace (and not attached):  
## [1] compiler\_4.0.3 magrittr\_2.0.1 tools\_4.0.3 htmltools\_0.5.1.1  
## [5] yaml\_2.2.1 stringi\_1.5.3 rmarkdown\_2.9 highr\_0.8   
## [9] knitr\_1.30 stringr\_1.4.0 xfun\_0.24 digest\_0.6.27   
## [13] rlang\_0.4.10 evaluate\_0.14

library(tidyverse, verbose = FALSE, warn.conflicts = FALSE)

## -- Attaching packages --------------------------------------- tidyverse 1.3.0 --

## √ ggplot2 3.3.3 √ purrr 0.3.4  
## √ tibble 3.1.0 √ dplyr 1.0.2  
## √ tidyr 1.1.2 √ stringr 1.4.0  
## √ readr 1.4.0 √ forcats 0.5.0

## Warning: package 'ggplot2' was built under R version 4.0.5

## -- Conflicts ------------------------------------------ tidyverse\_conflicts() --  
## x dplyr::filter() masks stats::filter()  
## x dplyr::lag() masks stats::lag()

library(magrittr, verbose = FALSE, warn.conflicts = FALSE)  
library(recipes, verbose = FALSE, warn.conflicts = FALSE)  
library(caret, verbose = FALSE, warn.conflicts = FALSE)

## Loading required package: lattice

sessionInfo()

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##   
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## [5] LC\_TIME=Korean\_Korea.949   
##   
## attached base packages:  
## [1] stats graphics grDevices utils datasets methods base   
##   
## other attached packages:  
## [1] caret\_6.0-86 lattice\_0.20-41 recipes\_0.1.15 magrittr\_2.0.1   
## [5] forcats\_0.5.0 stringr\_1.4.0 dplyr\_1.0.2 purrr\_0.3.4   
## [9] readr\_1.4.0 tidyr\_1.1.2 tibble\_3.1.0 ggplot2\_3.3.3   
## [13] tidyverse\_1.3.0  
##   
## loaded via a namespace (and not attached):  
## [1] httr\_1.4.2 jsonlite\_1.7.2 splines\_4.0.3   
## [4] foreach\_1.5.1 prodlim\_2019.11.13 modelr\_0.1.8   
## [7] assertthat\_0.2.1 stats4\_4.0.3 highr\_0.8   
## [10] cellranger\_1.1.0 yaml\_2.2.1 ipred\_0.9-9   
## [13] pillar\_1.5.0 backports\_1.2.0 glue\_1.4.2   
## [16] pROC\_1.16.2 digest\_0.6.27 rvest\_0.3.6   
## [19] colorspace\_2.0-0 htmltools\_0.5.1.1 Matrix\_1.2-18   
## [22] plyr\_1.8.6 timeDate\_3043.102 pkgconfig\_2.0.3   
## [25] broom\_0.7.6 haven\_2.3.1 scales\_1.1.1   
## [28] gower\_0.2.2 lava\_1.6.8.1 generics\_0.1.0   
## [31] ellipsis\_0.3.1 withr\_2.3.0 nnet\_7.3-14   
## [34] cli\_2.2.0 survival\_3.2-7 crayon\_1.3.4   
## [37] readxl\_1.3.1 evaluate\_0.14 fs\_1.5.0   
## [40] fansi\_0.4.1 nlme\_3.1-149 MASS\_7.3-53   
## [43] xml2\_1.3.2 class\_7.3-17 data.table\_1.13.2   
## [46] tools\_4.0.3 hms\_0.5.3 lifecycle\_0.2.0   
## [49] munsell\_0.5.0 reprex\_0.3.0 compiler\_4.0.3   
## [52] rlang\_0.4.10 grid\_4.0.3 iterators\_1.0.13   
## [55] rstudioapi\_0.13 rmarkdown\_2.9 gtable\_0.3.0   
## [58] ModelMetrics\_1.2.2.2 codetools\_0.2-16 DBI\_1.1.0   
## [61] reshape2\_1.4.4 R6\_2.5.0 lubridate\_1.7.9.2   
## [64] knitr\_1.30 utf8\_1.1.4 stringi\_1.5.3   
## [67] Rcpp\_1.0.5 vctrs\_0.3.5 rpart\_4.1-15   
## [70] dbplyr\_2.0.0 tidyselect\_1.1.0 xfun\_0.24

rm(list=ls())  
options(sipen = 100) # 지수승 표현 안하도록   
setwd("D:/RPrj/Rkaggle/Rkaggle/스터디\_8월1일\_caret발표/data")  
# read.csv(), data.table::fread(), readr::read\_csv()  
  
####### 데이터 로딩 ###########  
left\_join( read.csv("X\_train.csv") -> X\_train,  
 read.csv("y\_train.csv") -> y\_train ) %>%  
 mutate(index = "train") -> train

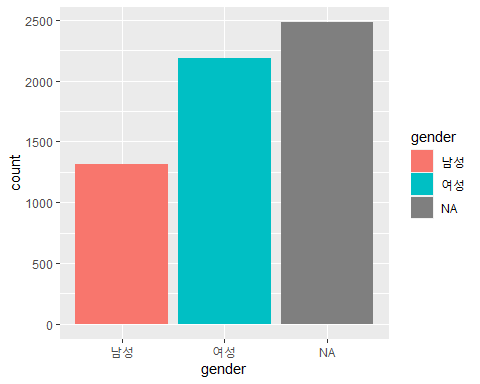
## Joining, by = "cust\_id"

read.csv("X\_test.csv") %>% mutate(index = "test") -> X\_test  
bind\_rows(train, X\_test) -> data

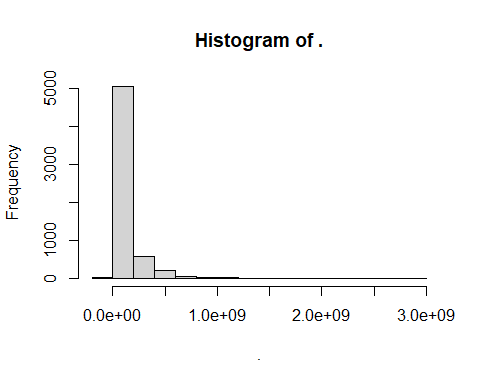
data$gender <- ifelse(data$gender == "1", "남성", "여성")  
data$gender %<>% as.factor()  
data$index %<>% as.factor()  
  
# write.csv(data, "data.csv")  
# read.csv("data.csv", stringsAsFactors =TRUE) -> data   
  
# 한글은 처리하기 불편하므로, 영어로 변경  
# full <- janitor::clean\_names(full)  
data$'총구매액' -> data$total   
data$'최대구매액' -> data$max  
data$'환불금액' -> data$refund  
data$'주구매상품' -> data$product  
data$'주구매지점' -> data$store  
data$'내점일수' -> data$days  
data$'내점당구매건수' -> data$counts  
data$'주말방문비율' -> data$week  
data$'구매주기' -> data$cycle   
  
data %>% dplyr::select(index, cust\_id, gender,   
 total, max, refund, product, store,   
 days, counts, week, cycle) -> data   
  
data %>% filter(index=="train") -> train  
data %>% filter(index=="test") -> test   
  
# y값부터 탐색   
data$gender %>% table()

## .  
## 남성 여성   
## 1316 2184

data %>% ggplot() +   
 geom\_bar(aes(x=gender, fill = gender))



# 수치형 변수부터 탐색   
data$total %>% hist()



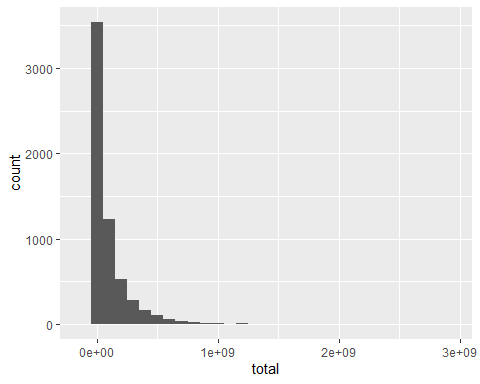
data$total %>% range()

## [1] -52421520 2861237540

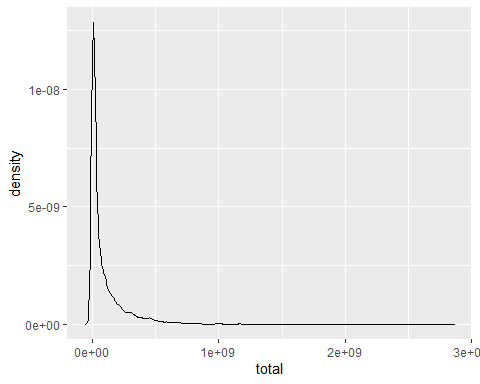
(max(data$total) - min(data$total))/100

## [1] 29136591

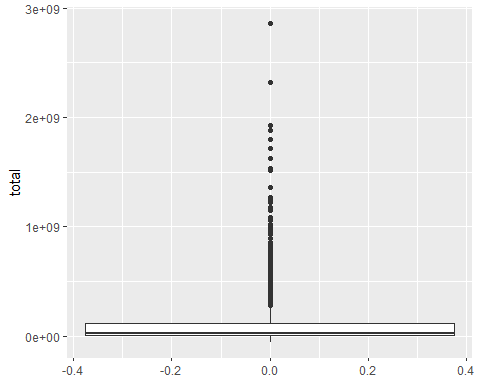
data %>% ggplot() +   
 geom\_histogram(aes(x=total), binwidth=100000000)



data %>% ggplot() +   
 geom\_density(aes(x=total))



data %>% ggplot() + geom\_boxplot(aes(y=total))



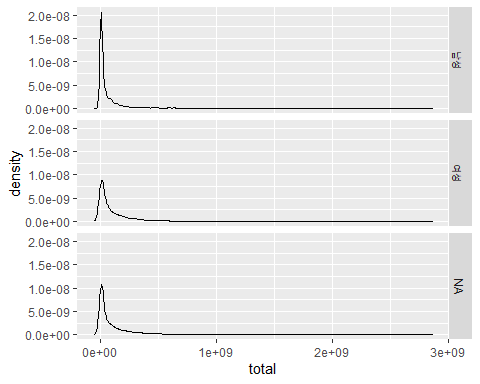
# 대분의 값이 0이고 .. 우측으로 꼬리가 김  
  
# RSiteSearch("skew")  
# install.packages("utilities")  
library(utilities,verbose = FALSE, warn.conflicts = FALSE)

## Warning: package 'utilities' was built under R version 4.0.5

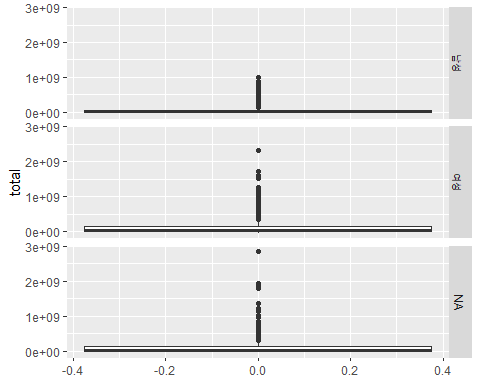
data$total %>% skewness()

## [1] 4.434145

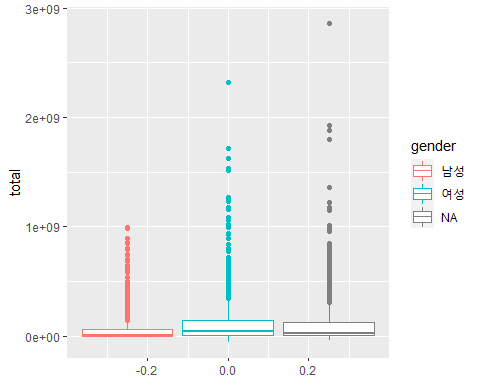
data %>% ggplot() +   
 geom\_density(aes(x=total)) + facet\_grid(gender ~ . )



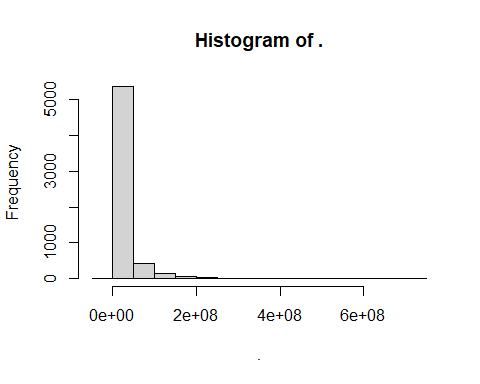
data %>% ggplot() +   
 geom\_boxplot(aes(y=total)) + facet\_grid(gender ~ . )



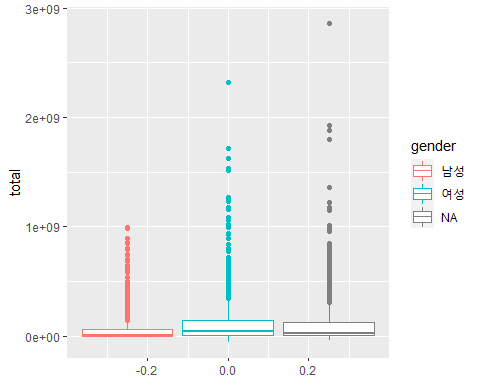
data %>% ggplot() +   
 geom\_boxplot(aes(y=total, group = gender, color = gender))



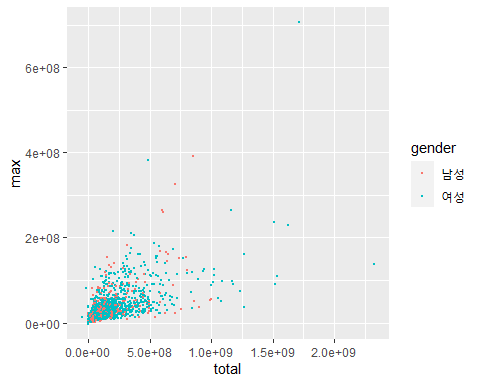
data$max %>% hist()



data %>% ggplot() +   
 geom\_boxplot(aes(y=total, group = gender, color = gender))



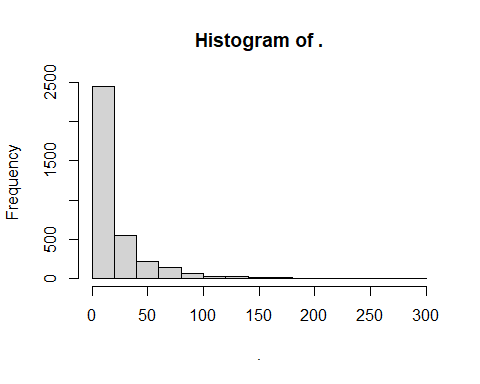
train %>% ggplot() + geom\_point(aes(x=total, y=max, color = gender), size =0.4)



train$product %>% table()

## .  
## 가공식품 가구 건강식품 골프 구두 기타   
## 546 10 47 82 54 595   
## 남성 캐주얼 남성 트랜디 남성정장 농산물 대형가전 디자이너   
## 55 2 22 339 8 193   
## 란제리/내의 명품 모피/피혁 보석 생활잡화 섬유잡화   
## 8 100 57 3 15 98   
## 셔츠 소형가전 수산품 스포츠 시티웨어 식기   
## 30 2 153 69 213 7   
## 아동 악기 액세서리 육류 일용잡화 젓갈/반찬   
## 40 2 5 57 64 29   
## 주류 주방가전 주방용품 차/커피 축산가공 침구/수예   
## 14 26 32 44 35 4   
## 캐주얼 커리어 통신/컴퓨터 트래디셔널 피혁잡화 화장품   
## 101 9 3 23 40 264

train$days %>% hist()



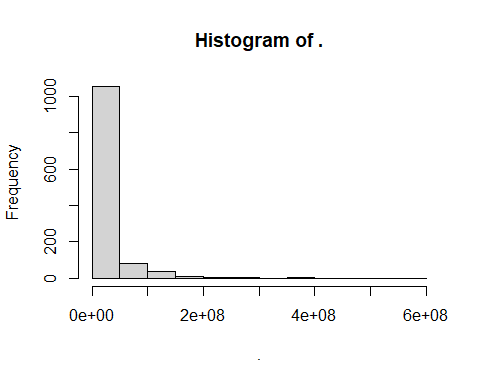
# refund 결측치 보정하는 것 .   
train %>% is.na() %>% colSums()/nrow(train)

## index cust\_id gender total max refund product store   
## 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.6557143 0.0000000 0.0000000   
## days counts week cycle   
## 0.0000000 0.0000000 0.0000000 0.0000000

test %>% is.na() %>% colSums()/nrow(test)

## index cust\_id gender total max refund product store   
## 0.0000000 0.0000000 1.0000000 0.0000000 0.0000000 0.6490733 0.0000000 0.0000000   
## days counts week cycle   
## 0.0000000 0.0000000 0.0000000 0.0000000

train$refund %>% hist()



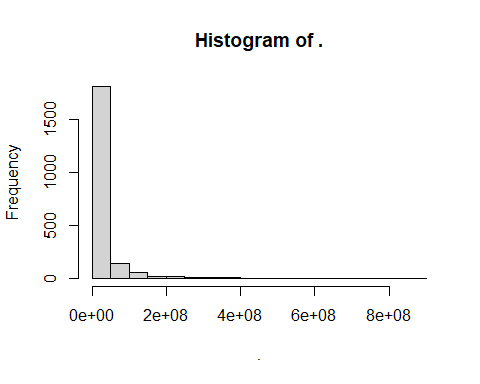
train$refund %>% range(na.rm=TRUE)

## [1] 5600 563753000

data$refund %>% range(na.rm=TRUE)

## [1] 5600 871514400

data$refund %>% hist()



data$refund %>% median(na.rm=TRUE)

## [1] 7627000

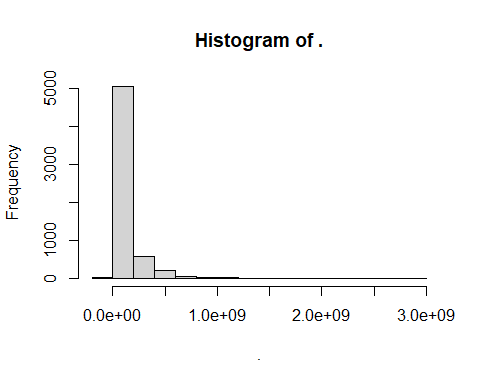
# refund 가 NA인 건.. 없다는 뜻이고, 그냥 0으로 보정하는 것이 좋을 듯  
data$refund <- ifelse(data$refund %>% is.na(), 0, data$refund)  
  
recipe(gender ~ ., data = data) %>%  
 # step\_log(total, max, refund, days, counts, week, cycle) %>%  
 # step\_BoxCox(total, max, refund, days, counts, week, cycle) %>%  
 step\_YeoJohnson(total, max, refund, days, counts, week, cycle) %>%  
 step\_center(total, max, refund, days, counts, week, cycle) %>%   
 step\_scale(total, max, refund, days, counts, week, cycle) %>%   
 prep() %>% juice() -> data2  
  
data2 %>% filter(index == "train") %>% dplyr::select(-c(index)) -> train  
data2 %>% filter(index == "test") %>% dplyr::select(-index) -> test  
  
data$total %>% skewness()

## [1] 4.434145

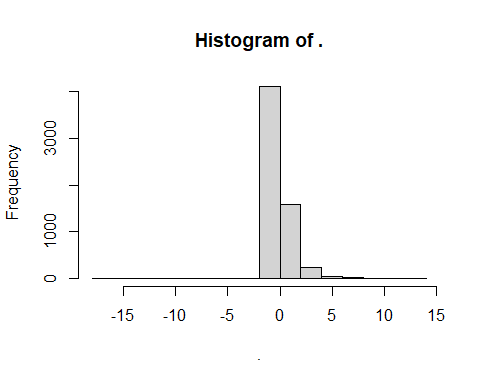
data2$total %>% skewness(na.rm=TRUE)

## [1] 2.173558

data$total %>% hist()



data2$total %>% hist()



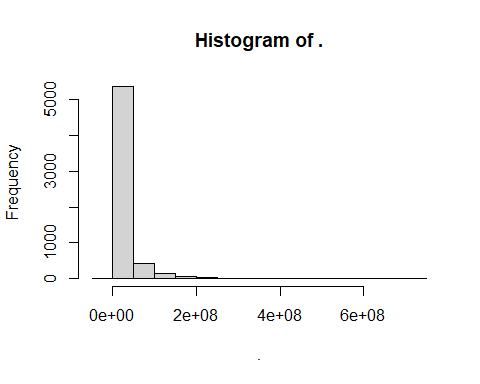
data$max %>% skewness()

## [1] 5.694044

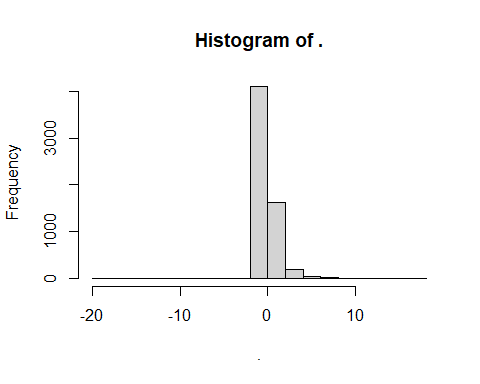
data2$max %>% skewness(na.rm=TRUE)

## [1] 3.07475

data$max %>% hist()



data2$max %>% hist()



# conrol은 공통으로   
ctrl <- trainControl(  
 method = "repeatedcv",  
 repeats = 3, # (10 fold, repeated 3 times)  
 classProbs = TRUE,  
 summaryFunction = twoClassSummary,  
 # sampling = "down",  
 )  
  
getModelInfo() %>% names()

## [1] "ada" "AdaBag" "AdaBoost.M1"   
## [4] "adaboost" "amdai" "ANFIS"   
## [7] "avNNet" "awnb" "awtan"   
## [10] "bag" "bagEarth" "bagEarthGCV"   
## [13] "bagFDA" "bagFDAGCV" "bam"   
## [16] "bartMachine" "bayesglm" "binda"   
## [19] "blackboost" "blasso" "blassoAveraged"   
## [22] "bridge" "brnn" "BstLm"   
## [25] "bstSm" "bstTree" "C5.0"   
## [28] "C5.0Cost" "C5.0Rules" "C5.0Tree"   
## [31] "cforest" "chaid" "CSimca"   
## [34] "ctree" "ctree2" "cubist"   
## [37] "dda" "deepboost" "DENFIS"   
## [40] "dnn" "dwdLinear" "dwdPoly"   
## [43] "dwdRadial" "earth" "elm"   
## [46] "enet" "evtree" "extraTrees"   
## [49] "fda" "FH.GBML" "FIR.DM"   
## [52] "foba" "FRBCS.CHI" "FRBCS.W"   
## [55] "FS.HGD" "gam" "gamboost"   
## [58] "gamLoess" "gamSpline" "gaussprLinear"   
## [61] "gaussprPoly" "gaussprRadial" "gbm\_h2o"   
## [64] "gbm" "gcvEarth" "GFS.FR.MOGUL"   
## [67] "GFS.LT.RS" "GFS.THRIFT" "glm.nb"   
## [70] "glm" "glmboost" "glmnet\_h2o"   
## [73] "glmnet" "glmStepAIC" "gpls"   
## [76] "hda" "hdda" "hdrda"   
## [79] "HYFIS" "icr" "J48"   
## [82] "JRip" "kernelpls" "kknn"   
## [85] "knn" "krlsPoly" "krlsRadial"   
## [88] "lars" "lars2" "lasso"   
## [91] "lda" "lda2" "leapBackward"   
## [94] "leapForward" "leapSeq" "Linda"   
## [97] "lm" "lmStepAIC" "LMT"   
## [100] "loclda" "logicBag" "LogitBoost"   
## [103] "logreg" "lssvmLinear" "lssvmPoly"   
## [106] "lssvmRadial" "lvq" "M5"   
## [109] "M5Rules" "manb" "mda"   
## [112] "Mlda" "mlp" "mlpKerasDecay"   
## [115] "mlpKerasDecayCost" "mlpKerasDropout" "mlpKerasDropoutCost"  
## [118] "mlpML" "mlpSGD" "mlpWeightDecay"   
## [121] "mlpWeightDecayML" "monmlp" "msaenet"   
## [124] "multinom" "mxnet" "mxnetAdam"   
## [127] "naive\_bayes" "nb" "nbDiscrete"   
## [130] "nbSearch" "neuralnet" "nnet"   
## [133] "nnls" "nodeHarvest" "null"   
## [136] "OneR" "ordinalNet" "ordinalRF"   
## [139] "ORFlog" "ORFpls" "ORFridge"   
## [142] "ORFsvm" "ownn" "pam"   
## [145] "parRF" "PART" "partDSA"   
## [148] "pcaNNet" "pcr" "pda"   
## [151] "pda2" "penalized" "PenalizedLDA"   
## [154] "plr" "pls" "plsRglm"   
## [157] "polr" "ppr" "PRIM"   
## [160] "protoclass" "qda" "QdaCov"   
## [163] "qrf" "qrnn" "randomGLM"   
## [166] "ranger" "rbf" "rbfDDA"   
## [169] "Rborist" "rda" "regLogistic"   
## [172] "relaxo" "rf" "rFerns"   
## [175] "RFlda" "rfRules" "ridge"   
## [178] "rlda" "rlm" "rmda"   
## [181] "rocc" "rotationForest" "rotationForestCp"   
## [184] "rpart" "rpart1SE" "rpart2"   
## [187] "rpartCost" "rpartScore" "rqlasso"   
## [190] "rqnc" "RRF" "RRFglobal"   
## [193] "rrlda" "RSimca" "rvmLinear"   
## [196] "rvmPoly" "rvmRadial" "SBC"   
## [199] "sda" "sdwd" "simpls"   
## [202] "SLAVE" "slda" "smda"   
## [205] "snn" "sparseLDA" "spikeslab"   
## [208] "spls" "stepLDA" "stepQDA"   
## [211] "superpc" "svmBoundrangeString" "svmExpoString"   
## [214] "svmLinear" "svmLinear2" "svmLinear3"   
## [217] "svmLinearWeights" "svmLinearWeights2" "svmPoly"   
## [220] "svmRadial" "svmRadialCost" "svmRadialSigma"   
## [223] "svmRadialWeights" "svmSpectrumString" "tan"   
## [226] "tanSearch" "treebag" "vbmpRadial"   
## [229] "vglmAdjCat" "vglmContRatio" "vglmCumulative"   
## [232] "widekernelpls" "WM" "wsrf"   
## [235] "xgbDART" "xgbLinear" "xgbTree"   
## [238] "xyf"

# caret vignette 에서 샘플 코드 찾아서 활용   
 ##### glm   
 modelLookup("glm")

## model parameter label forReg forClass probModel  
## 1 glm parameter parameter TRUE TRUE TRUE

# model parameter label forReg forClass probModel  
 # 1 glm parameter parameter TRUE TRUE TRUE  
   
 set.seed(123)  
 train(  
 gender ~ .,  
 data = train,  
 method = "glm",  
 trControl = ctrl,  
 metric = "ROC"  
 ) -> glmFit

## Warning in predict.lm(object, newdata, se.fit, scale = 1, type = if (type == :  
## prediction from a rank-deficient fit may be misleading

## Warning in predict.lm(object, newdata, se.fit, scale = 1, type = if (type == :  
## prediction from a rank-deficient fit may be misleading  
  
## Warning in predict.lm(object, newdata, se.fit, scale = 1, type = if (type == :  
## prediction from a rank-deficient fit may be misleading  
  
## Warning in predict.lm(object, newdata, se.fit, scale = 1, type = if (type == :  
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## prediction from a rank-deficient fit may be misleading  
  
## Warning in predict.lm(object, newdata, se.fit, scale = 1, type = if (type == :  
## prediction from a rank-deficient fit may be misleading  
  
## Warning in predict.lm(object, newdata, se.fit, scale = 1, type = if (type == :  
## prediction from a rank-deficient fit may be misleading

glmFit

## Generalized Linear Model   
##   
## 3500 samples  
## 10 predictor  
## 2 classes: '남성', '여성'   
##   
## No pre-processing  
## Resampling: Cross-Validated (10 fold, repeated 3 times)   
## Summary of sample sizes: 3149, 3150, 3151, 3151, 3150, 3150, ...   
## Resampling results:  
##   
## ROC Sens Spec   
## 0.6798622 0.3733595 0.8441714

# ROC Sens Spec   
 # 0.6798622 0.3733595 0.8441714  
 glmFit %>% summary()

##   
## Call:  
## NULL  
##   
## Deviance Residuals:   
## Min 1Q Median 3Q Max   
## -2.4234 -1.1351 0.6528 0.9375 2.0943   
##   
## Coefficients:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 7.683e-01 2.299e-01 3.342 0.000831 \*\*\*  
## cust\_id 1.866e-05 3.737e-05 0.499 0.617518   
## total 9.849e-03 6.962e-02 0.141 0.887500   
## max 5.455e-02 6.350e-02 0.859 0.390287   
## refund 2.665e-01 4.940e-02 5.396 6.81e-08 \*\*\*  
## product가구 3.404e-01 6.552e-01 0.520 0.603354   
## product건강식품 9.554e-02 3.235e-01 0.295 0.767777   
## product골프 -3.786e-01 2.548e-01 -1.486 0.137307   
## product구두 7.261e-02 3.013e-01 0.241 0.809585   
## product기타 9.046e-03 1.286e-01 0.070 0.943913   
## `product남성 캐주얼` -1.080e+00 3.445e-01 -3.136 0.001715 \*\*   
## `product남성 트랜디` -1.200e-01 1.540e+00 -0.078 0.937883   
## product남성정장 -1.150e+00 5.808e-01 -1.981 0.047637 \*   
## product농산물 5.039e-01 1.585e-01 3.179 0.001475 \*\*   
## product대형가전 -6.400e-02 7.534e-01 -0.085 0.932301   
## product디자이너 1.443e+00 2.472e-01 5.839 5.27e-09 \*\*\*  
## `product란제리/내의` 1.188e+00 8.383e-01 1.417 0.156450   
## product명품 3.652e-02 2.431e-01 0.150 0.880585   
## `product모피/피혁` 8.409e-01 3.152e-01 2.668 0.007626 \*\*   
## product보석 9.327e-01 1.233e+00 0.756 0.449504   
## product생활잡화 2.117e-01 5.401e-01 0.392 0.695051   
## product섬유잡화 7.473e-02 2.338e-01 0.320 0.749213   
## product셔츠 -3.839e-01 4.065e-01 -0.944 0.344940   
## product소형가전 5.468e-01 1.445e+00 0.378 0.705070   
## product수산품 4.102e-01 1.953e-01 2.100 0.035729 \*   
## product스포츠 -2.458e-01 2.748e-01 -0.894 0.371135   
## product시티웨어 1.266e+00 2.083e-01 6.076 1.23e-09 \*\*\*  
## product식기 -9.127e-01 8.579e-01 -1.064 0.287401   
## product아동 4.311e-01 3.620e-01 1.191 0.233803   
## product악기 -1.404e+01 6.192e+02 -0.023 0.981910   
## product액세서리 1.741e+00 1.140e+00 1.527 0.126642   
## product육류 2.702e-01 2.927e-01 0.923 0.356043   
## product일용잡화 6.546e-01 2.939e-01 2.227 0.025947 \*   
## `product젓갈/반찬` -1.136e-01 3.904e-01 -0.291 0.771039   
## product주류 -1.381e+00 6.701e-01 -2.060 0.039386 \*   
## product주방가전 -5.794e-01 4.545e-01 -1.275 0.202379   
## product주방용품 5.134e-01 3.863e-01 1.329 0.183794   
## `product차/커피` 3.145e-01 3.301e-01 0.953 0.340833   
## product축산가공 7.001e-02 3.672e-01 0.191 0.848781   
## `product침구/수예` 1.458e+01 4.175e+02 0.035 0.972137   
## product캐주얼 1.401e-01 2.345e-01 0.597 0.550223   
## product커리어 6.522e-01 7.479e-01 0.872 0.383207   
## `product통신/컴퓨터` -1.627e-01 1.268e+00 -0.128 0.897885   
## product트래디셔널 6.825e-02 4.504e-01 0.152 0.879556   
## product피혁잡화 3.244e-01 3.479e-01 0.932 0.351144   
## product화장품 9.969e-01 1.812e-01 5.502 3.75e-08 \*\*\*  
## store관악점 -7.346e-01 3.818e-01 -1.924 0.054314 .   
## store광주점 -8.842e-01 2.886e-01 -3.064 0.002184 \*\*   
## store노원점 -2.597e-01 3.143e-01 -0.826 0.408561   
## store대구점 -1.711e+00 8.949e-01 -1.912 0.055845 .   
## store대전점 -5.906e-01 3.345e-01 -1.766 0.077446 .   
## store동래점 -4.682e-01 3.813e-01 -1.228 0.219455   
## store미아점 -7.838e-01 3.244e-01 -2.416 0.015686 \*   
## `store본 점` -6.394e-01 2.127e-01 -3.007 0.002643 \*\*   
## store부산본점 -3.450e-01 2.490e-01 -1.385 0.165995   
## store부평점 -1.513e-01 3.663e-01 -0.413 0.679521   
## store분당점 -4.416e-01 2.272e-01 -1.943 0.051975 .   
## store상인점 1.167e+01 8.827e+02 0.013 0.989450   
## store센텀시티점 -9.424e-01 9.381e-01 -1.005 0.315074   
## store안양점 -9.199e-01 4.456e-01 -2.064 0.038993 \*   
## store영등포점 -6.861e-01 2.474e-01 -2.773 0.005558 \*\*   
## store울산점 -8.666e-01 9.090e-01 -0.953 0.340425   
## store인천점 -1.205e+00 4.257e-01 -2.832 0.004629 \*\*   
## store일산점 -4.452e-01 2.557e-01 -1.742 0.081584 .   
## store잠실점 -3.480e-01 2.257e-01 -1.542 0.123035   
## store전주점 -1.514e+01 3.596e+02 -0.042 0.966410   
## store창원점 2.249e-01 1.201e+00 0.187 0.851508   
## store청량리점 -6.324e-01 3.077e-01 -2.055 0.039840 \*   
## store포항점 -6.511e-01 6.748e-01 -0.965 0.334588   
## days 2.895e-01 6.305e-02 4.591 4.41e-06 \*\*\*  
## counts 8.599e-02 4.812e-02 1.787 0.073961 .   
## week -1.269e-01 3.752e-02 -3.381 0.000722 \*\*\*  
## cycle 2.691e-02 3.872e-02 0.695 0.487040   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## (Dispersion parameter for binomial family taken to be 1)  
##   
## Null deviance: 4634.5 on 3499 degrees of freedom  
## Residual deviance: 4167.3 on 3427 degrees of freedom  
## AIC: 4313.3  
##   
## Number of Fisher Scoring iterations: 13

# ##### lda  
 # modelLookup("lda")  
 # # model parameter label forReg forClass probModel  
 # # 1 lda parameter parameter FALSE TRUE TRUE  
 # set.seed(123)  
 # train(  
 # gender ~ .,  
 # data = train,  
 # method = "lda",  
 # trControl = ctrl,  
 # metric = "ROC"  
 # ) -> ldaFit   
 # ldaFit   
 # # ROC Sens Spec   
 # # 0.6777653 0.3578 0.8517343  
 # ladFit   
 #   
 ##### qda -> 에러 남 ㅠㅠㅠ  
 modelLookup("qda")

## model parameter label forReg forClass probModel  
## 1 qda parameter parameter FALSE TRUE TRUE

# model parameter label forReg forClass probModel  
 # 1 qda parameter parameter FALSE TRUE TRUE  
 # set.seed(123)  
 # train(  
 # gender ~ .,  
 # data = train,  
 # method = "qda",  
 # trControl = ctrl,  
 # metric = "ROC"  
 # ) -> qdaFit   
 # # Error -> 각 모델의 정확한 의미를 모를 경우 에러가 발생할 수 있음.   
   
 #### slda   
 modelLookup("slda")

## model parameter label forReg forClass probModel  
## 1 slda parameter none FALSE TRUE TRUE

# model parameter label forReg forClass probModel  
 # 1 slda parameter none FALSE TRUE TRUE  
 # library(ipred)  
 # set.seed(123)  
 # train(  
 # gender ~ .,  
 # data = train,  
 # method = "slda",  
 # trControl = ctrl,  
 # metric = "ROC"  
 # ) -> sldaFit   
   
 #### knn   
 modelLookup("knn")

## model parameter label forReg forClass probModel  
## 1 knn k #Neighbors TRUE TRUE TRUE

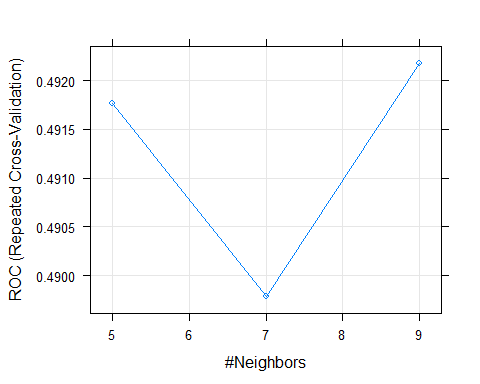
# model parameter label forReg forClass probModel  
 # 1 knn k #Neighbors TRUE TRUE TRUE  
 set.seed(123)  
 train(  
 gender ~ .,  
 data = train,  
 method = "knn",  
 trControl = ctrl,  
 metric = "ROC"  
 ) -> knnFit   
 knnFit

## k-Nearest Neighbors   
##   
## 3500 samples  
## 10 predictor  
## 2 classes: '남성', '여성'   
##   
## No pre-processing  
## Resampling: Cross-Validated (10 fold, repeated 3 times)   
## Summary of sample sizes: 3149, 3150, 3151, 3151, 3150, 3150, ...   
## Resampling results across tuning parameters:  
##   
## k ROC Sens Spec   
## 5 0.4917632 0.2773094 0.7204006  
## 7 0.4897811 0.2476945 0.7547387  
## 9 0.4921807 0.2170368 0.7849594  
##   
## ROC was used to select the optimal model using the largest value.  
## The final value used for the model was k = 9.

# k ROC Sens Spec   
 # 5 0.4891084 0.2778799 0.7202414  
 # 7 0.4911776 0.2507711 0.7487733  
 # 9 0.4924157 0.2201056 0.7780913  
 knnFit %>% summary()

## Length Class Mode   
## learn 2 -none- list   
## k 1 -none- numeric   
## theDots 0 -none- list   
## xNames 72 -none- character  
## problemType 1 -none- character  
## tuneValue 1 data.frame list   
## obsLevels 2 -none- character  
## param 0 -none- list

knnFit %>% plot()



#### naiveBayes : naive\_bayes  
 modelLookup("naive\_bayes")

## model parameter label forReg forClass probModel  
## 1 naive\_bayes laplace Laplace Correction FALSE TRUE TRUE  
## 2 naive\_bayes usekernel Distribution Type FALSE TRUE TRUE  
## 3 naive\_bayes adjust Bandwidth Adjustment FALSE TRUE TRUE

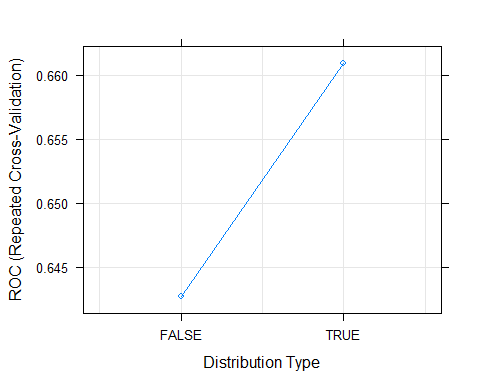
# model parameter label forReg forClass probModel  
 # 1 naive\_bayes laplace Laplace Correction FALSE TRUE TRUE  
 # 2 naive\_bayes usekernel Distribution Type FALSE TRUE TRUE  
 # 3 naive\_bayes adjust Bandwidth Adjustment FALSE TRUE TRUE  
   
 # library(e1071)  
 set.seed(123)  
 train(  
 gender ~ .,  
 data = train,   
 method = "naive\_bayes",  
 trControl = ctrl,  
 metric = "ROC"  
 ) -> nbFit   
 nbFit

## Naive Bayes   
##   
## 3500 samples  
## 10 predictor  
## 2 classes: '남성', '여성'   
##   
## No pre-processing  
## Resampling: Cross-Validated (10 fold, repeated 3 times)   
## Summary of sample sizes: 3149, 3150, 3151, 3151, 3150, 3150, ...   
## Resampling results across tuning parameters:  
##   
## usekernel ROC Sens Spec   
## FALSE 0.6426785 0.3120807 0.8240571  
## TRUE 0.6609508 0.0000000 0.9990826  
##   
## Tuning parameter 'laplace' was held constant at a value of 0  
## Tuning  
## parameter 'adjust' was held constant at a value of 1  
## ROC was used to select the optimal model using the largest value.  
## The final values used for the model were laplace = 0, usekernel = TRUE  
## and adjust = 1.

# usekernel ROC Sens Spec   
 # FALSE 0.6426785 0.3120807 0.8240571  
 # TRUE 0.6609508 0.0000000 0.9990826  
 nbFit %>% summary()

##   
## ================================== Naive Bayes ==================================   
##   
## - Call: naive\_bayes.default(x = x, y = y, laplace = param$laplace, usekernel = TRUE, adjust = param$adjust)   
## - Laplace: 0   
## - Classes: 2   
## - Samples: 3500   
## - Features: 72   
## - Conditional distributions:   
## - KDE: 72  
## - Prior probabilities:   
## - 남성: 0.376  
## - 여성: 0.624  
##   
## ---------------------------------------------------------------------------------

nbFit %>% plot()



#### svm linear :   
 modelLookup("svmLinear2")

## model parameter label forReg forClass probModel  
## 1 svmLinear2 cost Cost TRUE TRUE TRUE

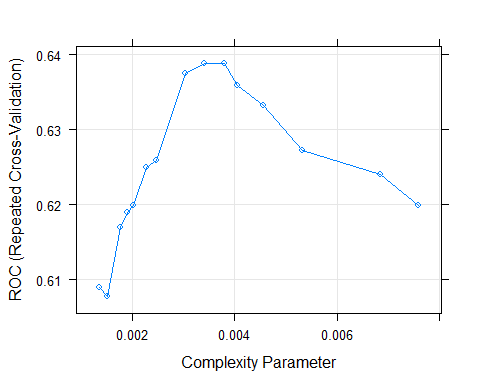
# model parameter label forReg forClass probModel  
 # 1 svmLinear2 cost Cost TRUE TRUE TRUE  
 # set.seed(123)  
 # train(  
 # gender ~ .,  
 # data = train,  
 # method = "svmLinear2",  
 # trControl = ctrl,  
 # metric = "ROC"  
 # ) -> svmlinearFit   
 # # WARNING: reaching max number of iterations  
 # svmlinearFit  
 # svmlinearFit %>% summary()  
 # svmlinearFit %>% plot()   
   
   
 # #### svm linear weights :   
 # modelLookup("svmLinearWeights")  
 #   
 # set.seed(123)  
 # train(  
 # gender ~ .,  
 # data = train2,  
 # method = "svmLinearWeights",  
 # trControl = ctrl,  
 # metric = "ROC"  
 # ) -> svmLinearWeightsFit   
 #   
 # ##### rf  
 # library(randomForest)  
 #   
 #   
 #   
 # set.seed(123)  
 # rfFit <- train(  
 # gender ~ .,  
 # data = train2,  
 # method = "rf",  
 # # preProc = c("center", "scale"),  
 # tuneLength = 3,  
 # trControl = ctrl,  
 # metric = "ROC"  
 # )  
 # rfFit  
  
 # #### rpart  
 # library(rpart)  
 # # Cross Validation & ROC Metric 을 위한 조치 필요   
 # ctrl <- trainControl(  
 # method = "repeatedcv",   
 # # repeats = 3, # (10 fold, repeated 3 times)   
 # classProbs = TRUE,   
 # summaryFunction = twoClassSummary,   
 # sampling = "up"  
 # # sampling = "rose"   
 # # sampling = "smote"  
 # )  
 #   
 # set.seed(123)  
 # rpartFit <- train(  
 # gender ~ .,  
 # data = train2,  
 # method = "rpart",  
 # # preProc = c("center", "scale"),  
 # tuneLength = 15,  
 # trControl = ctrl,  
 # metric = "ROC"  
 # )  
 # rpartFit   
 # # cp 0.003419453일 때, 0.6377514  
 # # sampling="up" cp 0.005319149일 때, 0.6376410  
 # # sampling="down" cp 0.005319149일 때, 0.6341834  
 # rpartFit %>% plot()  
   
 #### rpart  
 set.seed(123)  
 rpartFit <- train(  
 gender ~ .,  
 data = train,  
 method = "rpart",  
 # preProc = c("center", "scale"),  
 tuneLength = 15,  
 trControl = ctrl,  
 metric = "ROC"  
 )  
 rpartFit

## CART   
##   
## 3500 samples  
## 10 predictor  
## 2 classes: '남성', '여성'   
##   
## No pre-processing  
## Resampling: Cross-Validated (10 fold, repeated 3 times)   
## Summary of sample sizes: 3149, 3150, 3151, 3151, 3150, 3150, ...   
## Resampling results across tuning parameters:  
##   
## cp ROC Sens Spec   
## 0.001350895 0.6090223 0.3946237 0.7480374  
## 0.001519757 0.6077221 0.3898180 0.7556603  
## 0.001773050 0.6169982 0.3804438 0.7742686  
## 0.001899696 0.6190070 0.3834837 0.7750332  
## 0.002026342 0.6198988 0.3842509 0.7777862  
## 0.002279635 0.6250070 0.3781286 0.7829717  
## 0.002469605 0.6258926 0.3811666 0.7817484  
## 0.003039514 0.6375436 0.3819416 0.7903034  
## 0.003419453 0.6389074 0.3755899 0.7932072  
## 0.003799392 0.6389008 0.3804187 0.7895382  
## 0.004052685 0.6359538 0.3657799 0.7950372  
## 0.004559271 0.6332393 0.3601935 0.7988605  
## 0.005319149 0.6272232 0.3449456 0.8058711  
## 0.006838906 0.6240894 0.3596133 0.7942943  
## 0.007598784 0.6198983 0.3510390 0.8019347  
##   
## ROC was used to select the optimal model using the largest value.  
## The final value used for the model was cp = 0.003419453.

rpartFit %>% summary()

## Call:  
## (function (formula, data, weights, subset, na.action = na.rpart,   
## method, model = FALSE, x = FALSE, y = TRUE, parms, control,   
## cost, ...)   
## {  
## Call <- match.call()  
## if (is.data.frame(model)) {  
## m <- model  
## model <- FALSE  
## }  
## else {  
## indx <- match(c("formula", "data", "weights", "subset"),   
## names(Call), nomatch = 0)  
## if (indx[1] == 0)   
## stop("a 'formula' argument is required")  
## temp <- Call[c(1, indx)]  
## temp$na.action <- na.action  
## temp[[1]] <- quote(stats::model.frame)  
## m <- eval.parent(temp)  
## }  
## Terms <- attr(m, "terms")  
## if (any(attr(Terms, "order") > 1))   
## stop("Trees cannot handle interaction terms")  
## Y <- model.response(m)  
## wt <- model.weights(m)  
## if (any(wt < 0))   
## stop("negative weights not allowed")  
## if (!length(wt))   
## wt <- rep(1, nrow(m))  
## offset <- model.offset(m)  
## X <- rpart.matrix(m)  
## nobs <- nrow(X)  
## nvar <- ncol(X)  
## if (missing(method)) {  
## method <- if (is.factor(Y) || is.character(Y))   
## "class"  
## else if (inherits(Y, "Surv"))   
## "exp"  
## else if (is.matrix(Y))   
## "poisson"  
## else "anova"  
## }  
## if (is.list(method)) {  
## mlist <- method  
## method <- "user"  
## init <- if (missing(parms))   
## mlist$init(Y, offset, wt = wt)  
## else mlist$init(Y, offset, parms, wt)  
## keep <- rpartcallback(mlist, nobs, init)  
## method.int <- 4  
## parms <- init$parms  
## }  
## else {  
## method.int <- pmatch(method, c("anova", "poisson", "class",   
## "exp"))  
## if (is.na(method.int))   
## stop("Invalid method")  
## method <- c("anova", "poisson", "class", "exp")[method.int]  
## if (method.int == 4)   
## method.int <- 2  
## init <- if (missing(parms))   
## get(paste("rpart", method, sep = "."), envir = environment())(Y,   
## offset, , wt)  
## else get(paste("rpart", method, sep = "."), envir = environment())(Y,   
## offset, parms, wt)  
## ns <- asNamespace("rpart")  
## if (!is.null(init$print))   
## environment(init$print) <- ns  
## if (!is.null(init$summary))   
## environment(init$summary) <- ns  
## if (!is.null(init$text))   
## environment(init$text) <- ns  
## }  
## Y <- init$y  
## xlevels <- .getXlevels(Terms, m)  
## cats <- rep(0, ncol(X))  
## if (!is.null(xlevels))   
## cats[match(names(xlevels), colnames(X))] <- unlist(lapply(xlevels,   
## length))  
## extraArgs <- list(...)  
## if (length(extraArgs)) {  
## controlargs <- names(formals(rpart.control))  
## indx <- match(names(extraArgs), controlargs, nomatch = 0)  
## if (any(indx == 0))   
## stop(gettextf("Argument %s not matched", names(extraArgs)[indx ==   
## 0]), domain = NA)  
## }  
## controls <- rpart.control(...)  
## if (!missing(control))   
## controls[names(control)] <- control  
## xval <- controls$xval  
## if (is.null(xval) || (length(xval) == 1 && xval == 0) ||   
## method == "user") {  
## xgroups <- 0  
## xval <- 0  
## }  
## else if (length(xval) == 1) {  
## xgroups <- sample(rep(1:xval, length = nobs), nobs, replace = FALSE)  
## }  
## else if (length(xval) == nobs) {  
## xgroups <- xval  
## xval <- length(unique(xgroups))  
## }  
## else {  
## if (!is.null(attr(m, "na.action"))) {  
## temp <- as.integer(attr(m, "na.action"))  
## xval <- xval[-temp]  
## if (length(xval) == nobs) {  
## xgroups <- xval  
## xval <- length(unique(xgroups))  
## }  
## else stop("Wrong length for 'xval'")  
## }  
## else stop("Wrong length for 'xval'")  
## }  
## if (missing(cost))   
## cost <- rep(1, nvar)  
## else {  
## if (length(cost) != nvar)   
## stop("Cost vector is the wrong length")  
## if (any(cost <= 0))   
## stop("Cost vector must be positive")  
## }  
## tfun <- function(x) if (is.matrix(x))   
## rep(is.ordered(x), ncol(x))  
## else is.ordered(x)  
## labs <- sub("^`(.\*)`$", "\\1", attr(Terms, "term.labels"))  
## isord <- unlist(lapply(m[labs], tfun))  
## storage.mode(X) <- "double"  
## storage.mode(wt) <- "double"  
## temp <- as.double(unlist(init$parms))  
## if (!length(temp))   
## temp <- 0  
## rpfit <- .Call(C\_rpart, ncat = as.integer(cats \* !isord),   
## method = as.integer(method.int), as.double(unlist(controls)),   
## temp, as.integer(xval), as.integer(xgroups), as.double(t(init$y)),   
## X, wt, as.integer(init$numy), as.double(cost))  
## nsplit <- nrow(rpfit$isplit)  
## ncat <- if (!is.null(rpfit$csplit))   
## nrow(rpfit$csplit)  
## else 0  
## if (nsplit == 0)   
## xval <- 0  
## numcp <- ncol(rpfit$cptable)  
## temp <- if (nrow(rpfit$cptable) == 3)   
## c("CP", "nsplit", "rel error")  
## else c("CP", "nsplit", "rel error", "xerror", "xstd")  
## dimnames(rpfit$cptable) <- list(temp, 1:numcp)  
## tname <- c("<leaf>", colnames(X))  
## splits <- matrix(c(rpfit$isplit[, 2:3], rpfit$dsplit), ncol = 5,   
## dimnames = list(tname[rpfit$isplit[, 1] + 1], c("count",   
## "ncat", "improve", "index", "adj")))  
## index <- rpfit$inode[, 2]  
## nadd <- sum(isord[rpfit$isplit[, 1]])  
## if (nadd > 0) {  
## newc <- matrix(0, nadd, max(cats))  
## cvar <- rpfit$isplit[, 1]  
## indx <- isord[cvar]  
## cdir <- splits[indx, 2]  
## ccut <- floor(splits[indx, 4])  
## splits[indx, 2] <- cats[cvar[indx]]  
## splits[indx, 4] <- ncat + 1:nadd  
## for (i in 1:nadd) {  
## newc[i, 1:(cats[(cvar[indx])[i]])] <- -as.integer(cdir[i])  
## newc[i, 1:ccut[i]] <- as.integer(cdir[i])  
## }  
## catmat <- if (ncat == 0)   
## newc  
## else {  
## cs <- rpfit$csplit  
## ncs <- ncol(cs)  
## ncc <- ncol(newc)  
## if (ncs < ncc)   
## cs <- cbind(cs, matrix(0, nrow(cs), ncc - ncs))  
## rbind(cs, newc)  
## }  
## ncat <- ncat + nadd  
## }  
## else catmat <- rpfit$csplit  
## if (nsplit == 0) {  
## frame <- data.frame(row.names = 1, var = "<leaf>", n = rpfit$inode[,   
## 5], wt = rpfit$dnode[, 3], dev = rpfit$dnode[, 1],   
## yval = rpfit$dnode[, 4], complexity = rpfit$dnode[,   
## 2], ncompete = 0, nsurrogate = 0)  
## }  
## else {  
## temp <- ifelse(index == 0, 1, index)  
## svar <- ifelse(index == 0, 0, rpfit$isplit[temp, 1])  
## frame <- data.frame(row.names = rpfit$inode[, 1], var = tname[svar +   
## 1], n = rpfit$inode[, 5], wt = rpfit$dnode[, 3],   
## dev = rpfit$dnode[, 1], yval = rpfit$dnode[, 4],   
## complexity = rpfit$dnode[, 2], ncompete = pmax(0,   
## rpfit$inode[, 3] - 1), nsurrogate = rpfit$inode[,   
## 4])  
## }  
## if (method.int == 3) {  
## numclass <- init$numresp - 2  
## nodeprob <- rpfit$dnode[, numclass + 5]/sum(wt)  
## temp <- pmax(1, init$counts)  
## temp <- rpfit$dnode[, 4 + (1:numclass)] %\*% diag(init$parms$prior/temp)  
## yprob <- temp/rowSums(temp)  
## yval2 <- matrix(rpfit$dnode[, 4 + (0:numclass)], ncol = numclass +   
## 1)  
## frame$yval2 <- cbind(yval2, yprob, nodeprob)  
## }  
## else if (init$numresp > 1)   
## frame$yval2 <- rpfit$dnode[, -(1:3), drop = FALSE]  
## if (is.null(init$summary))   
## stop("Initialization routine is missing the 'summary' function")  
## functions <- if (is.null(init$print))   
## list(summary = init$summary)  
## else list(summary = init$summary, print = init$print)  
## if (!is.null(init$text))   
## functions <- c(functions, list(text = init$text))  
## if (method == "user")   
## functions <- c(functions, mlist)  
## where <- rpfit$which  
## names(where) <- row.names(m)  
## ans <- list(frame = frame, where = where, call = Call, terms = Terms,   
## cptable = t(rpfit$cptable), method = method, parms = init$parms,   
## control = controls, functions = functions, numresp = init$numresp)  
## if (nsplit)   
## ans$splits = splits  
## if (ncat > 0)   
## ans$csplit <- catmat + 2  
## if (nsplit)   
## ans$variable.importance <- importance(ans)  
## if (model) {  
## ans$model <- m  
## if (missing(y))   
## y <- FALSE  
## }  
## if (y)   
## ans$y <- Y  
## if (x) {  
## ans$x <- X  
## ans$wt <- wt  
## }  
## ans$ordered <- isord  
## if (!is.null(attr(m, "na.action")))   
## ans$na.action <- attr(m, "na.action")  
## if (!is.null(xlevels))   
## attr(ans, "xlevels") <- xlevels  
## if (method == "class")   
## attr(ans, "ylevels") <- init$ylevels  
## class(ans) <- "rpart"  
## ans  
## })(formula = .outcome ~ ., data = list(c(0, 1, 2, 3, 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, 32, 33, 34, 35, 36, 37, 38,   
## 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54,   
## 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,   
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## -0.529316585706688, 0.872852473871614, -1.55008510332199, 1.02281874880678,   
## -1.55008510332199, 0.999120741714686, -0.246722836808319), c(2,   
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## CP nsplit rel error  
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## 2 0.006838906 13 0.8639818  
## 3 0.005319149 14 0.8571429  
## 4 0.004559271 15 0.8518237  
## 5 0.004052685 17 0.8427052  
## 6 0.003799392 21 0.8259878  
## 7 0.003419453 23 0.8183891  
##   
## Variable importance  
## days total max refund   
## 20 18 15 14   
## cycle counts product시티웨어 product화장품   
## 9 6 4 3   
## product디자이너 store본 점 cust\_id week   
## 3 2 1 1   
## product농산물 product남성정장 product모피/피혁   
## 1 1 1   
##   
## Node number 1: 3500 observations, complexity param=0.007598784  
## predicted class=여성 expected loss=0.376 P(node) =1  
## class counts: 1316 2184  
## probabilities: 0.376 0.624   
## left son=2 (1971 obs) right son=3 (1529 obs)  
## Primary splits:  
## days < 0.258942 to the left, improve=68.63978, (0 missing)  
## refund < 0.9425003 to the left, improve=67.86069, (0 missing)  
## total < -0.4784772 to the left, improve=61.54586, (0 missing)  
## max < -0.4876727 to the left, improve=58.81761, (0 missing)  
## cycle < -1.372684 to the left, improve=33.78606, (0 missing)  
## Surrogate splits:  
## total < -0.3488383 to the left, agree=0.862, adj=0.685, (0 split)  
## refund < 0.07886504 to the left, agree=0.762, adj=0.455, (0 split)  
## max < -0.2758551 to the left, agree=0.761, adj=0.454, (0 split)  
## cycle < 0.6195964 to the right, agree=0.700, adj=0.313, (0 split)  
## counts < -0.3153074 to the left, agree=0.682, adj=0.271, (0 split)  
##   
## Node number 2: 1971 observations, complexity param=0.007598784  
## predicted class=여성 expected loss=0.4632166 P(node) =0.5631429  
## class counts: 913 1058  
## probabilities: 0.463 0.537   
## left son=4 (1826 obs) right son=5 (145 obs)  
## Primary splits:  
## product시티웨어 < 0.5 to the left, improve=17.37987, (0 missing)  
## max < -0.530442 to the left, improve=14.60671, (0 missing)  
## total < -0.5411865 to the left, improve=11.83589, (0 missing)  
## product디자이너 < 0.5 to the left, improve=11.22926, (0 missing)  
## refund < 0.2012133 to the left, improve=11.11154, (0 missing)  
##   
## Node number 3: 1529 observations, complexity param=0.004559271  
## predicted class=여성 expected loss=0.263571 P(node) =0.4368571  
## class counts: 403 1126  
## probabilities: 0.264 0.736   
## left son=6 (692 obs) right son=7 (837 obs)  
## Primary splits:  
## refund < 1.283162 to the left, improve=13.522580, (0 missing)  
## max < -0.5765099 to the left, improve= 9.099417, (0 missing)  
## week < 0.4601749 to the right, improve= 8.106956, (0 missing)  
## counts < -1.282978 to the left, improve= 7.080080, (0 missing)  
## product디자이너 < 0.5 to the left, improve= 6.773422, (0 missing)  
## Surrogate splits:  
## cycle < 0.1140056 to the right, agree=0.671, adj=0.273, (0 split)  
## days < 0.8369973 to the left, agree=0.664, adj=0.259, (0 split)  
## total < -0.02958324 to the left, agree=0.636, adj=0.195, (0 split)  
## max < 0.1611442 to the left, agree=0.622, adj=0.165, (0 split)  
## product화장품 < 0.5 to the right, agree=0.575, adj=0.061, (0 split)  
##   
## Node number 4: 1826 observations, complexity param=0.007598784  
## predicted class=여성 expected loss=0.4819277 P(node) =0.5217143  
## class counts: 880 946  
## probabilities: 0.482 0.518   
## left son=8 (1762 obs) right son=9 (64 obs)  
## Primary splits:  
## product디자이너 < 0.5 to the left, improve=12.751930, (0 missing)  
## max < -0.530442 to the left, improve=11.310780, (0 missing)  
## product화장품 < 0.5 to the left, improve=11.145780, (0 missing)  
## total < -0.5411865 to the left, improve= 9.066497, (0 missing)  
## product남성 캐주얼 < 0.5 to the right, improve= 8.679600, (0 missing)  
##   
## Node number 5: 145 observations  
## predicted class=여성 expected loss=0.2275862 P(node) =0.04142857  
## class counts: 33 112  
## probabilities: 0.228 0.772   
##   
## Node number 6: 692 observations, complexity param=0.004559271  
## predicted class=여성 expected loss=0.3367052 P(node) =0.1977143  
## class counts: 233 459  
## probabilities: 0.337 0.663   
## left son=12 (24 obs) right son=13 (668 obs)  
## Primary splits:  
## max < -0.6000145 to the left, improve=8.493579, (0 missing)  
## week < 0.5099564 to the right, improve=5.656320, (0 missing)  
## total < -0.4417405 to the left, improve=5.045734, (0 missing)  
## counts < -1.191903 to the left, improve=3.830725, (0 missing)  
## cust\_id < 652 to the left, improve=3.704972, (0 missing)  
## Surrogate splits:  
## total < -0.5507938 to the left, agree=0.98, adj=0.417, (0 split)  
##   
## Node number 7: 837 observations  
## predicted class=여성 expected loss=0.2031063 P(node) =0.2391429  
## class counts: 170 667  
## probabilities: 0.203 0.797   
##   
## Node number 8: 1762 observations, complexity param=0.007598784  
## predicted class=여성 expected loss=0.4931896 P(node) =0.5034286  
## class counts: 869 893  
## probabilities: 0.493 0.507   
## left son=16 (1596 obs) right son=17 (166 obs)  
## Primary splits:  
## product화장품 < 0.5 to the left, improve=12.675150, (0 missing)  
## product남성 캐주얼 < 0.5 to the right, improve= 8.034519, (0 missing)  
## refund < 0.2012133 to the left, improve= 7.959888, (0 missing)  
## max < -0.530442 to the left, improve= 7.790201, (0 missing)  
## week < 1.490285 to the right, improve= 7.290944, (0 missing)  
##   
## Node number 9: 64 observations  
## predicted class=여성 expected loss=0.171875 P(node) =0.01828571  
## class counts: 11 53  
## probabilities: 0.172 0.828   
##   
## Node number 12: 24 observations  
## predicted class=남성 expected loss=0.25 P(node) =0.006857143  
## class counts: 18 6  
## probabilities: 0.750 0.250   
##   
## Node number 13: 668 observations  
## predicted class=여성 expected loss=0.3218563 P(node) =0.1908571  
## class counts: 215 453  
## probabilities: 0.322 0.678   
##   
## Node number 16: 1596 observations, complexity param=0.007598784  
## predicted class=남성 expected loss=0.4874687 P(node) =0.456  
## class counts: 818 778  
## probabilities: 0.513 0.487   
## left son=32 (1499 obs) right son=33 (97 obs)  
## Primary splits:  
## refund < 1.341551 to the left, improve=9.420674, (0 missing)  
## product남성 캐주얼 < 0.5 to the right, improve=6.992144, (0 missing)  
## week < 1.471767 to the right, improve=6.153290, (0 missing)  
## days < -1.184281 to the left, improve=5.546762, (0 missing)  
## cycle < -1.372684 to the left, improve=5.389421, (0 missing)  
##   
## Node number 17: 166 observations  
## predicted class=여성 expected loss=0.3072289 P(node) =0.04742857  
## class counts: 51 115  
## probabilities: 0.307 0.693   
##   
## Node number 32: 1499 observations, complexity param=0.007598784  
## predicted class=남성 expected loss=0.4736491 P(node) =0.4282857  
## class counts: 789 710  
## probabilities: 0.526 0.474   
## left son=64 (462 obs) right son=65 (1037 obs)  
## Primary splits:  
## store본 점 < 0.5 to the right, improve=5.946234, (0 missing)  
## product남성 캐주얼 < 0.5 to the right, improve=5.865474, (0 missing)  
## product농산물 < 0.5 to the left, improve=5.419837, (0 missing)  
## counts < -0.2228717 to the left, improve=4.829699, (0 missing)  
## week < 1.471767 to the right, improve=4.799646, (0 missing)  
## Surrogate splits:  
## product명품 < 0.5 to the right, agree=0.702, adj=0.035, (0 split)  
## total < 0.366875 to the right, agree=0.696, adj=0.013, (0 split)  
## refund < 1.335888 to the right, agree=0.693, adj=0.004, (0 split)  
## product주방용품 < 0.5 to the right, agree=0.693, adj=0.004, (0 split)  
## max < 3.068317 to the right, agree=0.692, adj=0.002, (0 split)  
##   
## Node number 33: 97 observations  
## predicted class=여성 expected loss=0.2989691 P(node) =0.02771429  
## class counts: 29 68  
## probabilities: 0.299 0.701   
##   
## Node number 64: 462 observations, complexity param=0.006838906  
## predicted class=남성 expected loss=0.4069264 P(node) =0.132  
## class counts: 274 188  
## probabilities: 0.593 0.407   
## left son=128 (437 obs) right son=129 (25 obs)  
## Primary splits:  
## product농산물 < 0.5 to the left, improve=3.941758, (0 missing)  
## product남성 캐주얼 < 0.5 to the right, improve=3.589854, (0 missing)  
## counts < -0.9823344 to the left, improve=3.491710, (0 missing)  
## days < -0.05867708 to the left, improve=3.181600, (0 missing)  
## week < 1.459171 to the right, improve=3.144397, (0 missing)  
##   
## Node number 65: 1037 observations, complexity param=0.007598784  
## predicted class=여성 expected loss=0.4966249 P(node) =0.2962857  
## class counts: 515 522  
## probabilities: 0.497 0.503   
## left son=130 (1009 obs) right son=131 (28 obs)  
## Primary splits:  
## counts < 2.066225 to the left, improve=4.587941, (0 missing)  
## product남성정장 < 0.5 to the right, improve=4.168220, (0 missing)  
## max < -0.6665279 to the left, improve=3.154558, (0 missing)  
## product모피/피혁 < 0.5 to the left, improve=3.064697, (0 missing)  
## product트래디셔널 < 0.5 to the right, improve=2.793927, (0 missing)  
##   
## Node number 128: 437 observations  
## predicted class=남성 expected loss=0.3913043 P(node) =0.1248571  
## class counts: 266 171  
## probabilities: 0.609 0.391   
##   
## Node number 129: 25 observations  
## predicted class=여성 expected loss=0.32 P(node) =0.007142857  
## class counts: 8 17  
## probabilities: 0.320 0.680   
##   
## Node number 130: 1009 observations, complexity param=0.007598784  
## predicted class=남성 expected loss=0.4955401 P(node) =0.2882857  
## class counts: 509 500  
## probabilities: 0.504 0.496   
## left son=260 (15 obs) right son=261 (994 obs)  
## Primary splits:  
## product남성정장 < 0.5 to the right, improve=3.995207, (0 missing)  
## max < -0.6665279 to the left, improve=3.641888, (0 missing)  
## product모피/피혁 < 0.5 to the left, improve=3.330645, (0 missing)  
## product트래디셔널 < 0.5 to the right, improve=2.684083, (0 missing)  
## cycle < 0.6525499 to the left, improve=2.626237, (0 missing)  
##   
## Node number 131: 28 observations  
## predicted class=여성 expected loss=0.2142857 P(node) =0.008  
## class counts: 6 22  
## probabilities: 0.214 0.786   
##   
## Node number 260: 15 observations  
## predicted class=남성 expected loss=0.1333333 P(node) =0.004285714  
## class counts: 13 2  
## probabilities: 0.867 0.133   
##   
## Node number 261: 994 observations, complexity param=0.007598784  
## predicted class=여성 expected loss=0.498994 P(node) =0.284  
## class counts: 496 498  
## probabilities: 0.499 0.501   
## left son=522 (23 obs) right son=523 (971 obs)  
## Primary splits:  
## max < -0.6665279 to the left, improve=3.787761, (0 missing)  
## product모피/피혁 < 0.5 to the left, improve=3.148548, (0 missing)  
## total < -0.5270434 to the left, improve=3.112343, (0 missing)  
## product트래디셔널 < 0.5 to the right, improve=2.761327, (0 missing)  
## cust\_id < 647.5 to the right, improve=2.614451, (0 missing)  
## Surrogate splits:  
## total < -0.6188049 to the left, agree=0.993, adj=0.696, (0 split)  
##   
## Node number 522: 23 observations  
## predicted class=남성 expected loss=0.2173913 P(node) =0.006571429  
## class counts: 18 5  
## probabilities: 0.783 0.217   
##   
## Node number 523: 971 observations, complexity param=0.007598784  
## predicted class=여성 expected loss=0.492276 P(node) =0.2774286  
## class counts: 478 493  
## probabilities: 0.492 0.508   
## left son=1046 (900 obs) right son=1047 (71 obs)  
## Primary splits:  
## max < -0.6607091 to the right, improve=3.645048, (0 missing)  
## total < -0.6173394 to the right, improve=3.098426, (0 missing)  
## product모피/피혁 < 0.5 to the left, improve=2.932297, (0 missing)  
## product트래디셔널 < 0.5 to the right, improve=2.857922, (0 missing)  
## cust\_id < 647.5 to the right, improve=2.854082, (0 missing)  
## Surrogate splits:  
## total < -0.6163017 to the right, agree=0.968, adj=0.563, (0 split)  
##   
## Node number 1046: 900 observations, complexity param=0.007598784  
## predicted class=남성 expected loss=0.4955556 P(node) =0.2571429  
## class counts: 454 446  
## probabilities: 0.504 0.496   
## left son=2092 (560 obs) right son=2093 (340 obs)  
## Primary splits:  
## total < -0.5270434 to the left, improve=3.977260, (0 missing)  
## product트래디셔널 < 0.5 to the right, improve=3.964444, (0 missing)  
## max < -0.4818695 to the left, improve=3.718349, (0 missing)  
## cycle < -0.3777217 to the left, improve=3.121111, (0 missing)  
## product모피/피혁 < 0.5 to the left, improve=3.016263, (0 missing)  
## Surrogate splits:  
## max < -0.4463278 to the left, agree=0.914, adj=0.774, (0 split)  
## days < -0.4362412 to the left, agree=0.762, adj=0.371, (0 split)  
## cycle < 0.3553095 to the left, agree=0.658, adj=0.094, (0 split)  
## product기타 < 0.5 to the left, agree=0.647, adj=0.065, (0 split)  
## product명품 < 0.5 to the left, agree=0.628, adj=0.015, (0 split)  
##   
## Node number 1047: 71 observations  
## predicted class=여성 expected loss=0.3380282 P(node) =0.02028571  
## class counts: 24 47  
## probabilities: 0.338 0.662   
##   
## Node number 2092: 560 observations, complexity param=0.007598784  
## predicted class=남성 expected loss=0.4589286 P(node) =0.16  
## class counts: 303 257  
## probabilities: 0.541 0.459   
## left son=4184 (530 obs) right son=4185 (30 obs)  
## Primary splits:  
## product모피/피혁 < 0.5 to the left, improve=2.735872, (0 missing)  
## product남성 캐주얼 < 0.5 to the right, improve=2.427087, (0 missing)  
## max < -0.6560413 to the left, improve=2.395099, (0 missing)  
## cycle < 2.132326 to the left, improve=2.077868, (0 missing)  
## total < -0.6114045 to the left, improve=1.581274, (0 missing)  
## Surrogate splits:  
## cust\_id < 3469 to the left, agree=0.95, adj=0.067, (0 split)  
##   
## Node number 2093: 340 observations, complexity param=0.007598784  
## predicted class=여성 expected loss=0.4441176 P(node) =0.09714286  
## class counts: 151 189  
## probabilities: 0.444 0.556   
## left son=4186 (67 obs) right son=4187 (273 obs)  
## Primary splits:  
## cycle < 0.5142684 to the left, improve=3.901401, (0 missing)  
## cust\_id < 618.5 to the right, improve=3.587076, (0 missing)  
## total < -0.520723 to the right, improve=2.650353, (0 missing)  
## max < -0.3112355 to the right, improve=1.784745, (0 missing)  
## product캐주얼 < 0.5 to the left, improve=1.564230, (0 missing)  
## Surrogate splits:  
## days < -1.184281 to the left, agree=0.868, adj=0.328, (0 split)  
## week < 1.714627 to the right, agree=0.818, adj=0.075, (0 split)  
## counts < -1.578986 to the left, agree=0.815, adj=0.060, (0 split)  
## product가구 < 0.5 to the right, agree=0.812, adj=0.045, (0 split)  
## product대형가전 < 0.5 to the right, agree=0.809, adj=0.030, (0 split)  
##   
## Node number 4184: 530 observations, complexity param=0.005319149  
## predicted class=남성 expected loss=0.4471698 P(node) =0.1514286  
## class counts: 293 237  
## probabilities: 0.553 0.447   
## left son=8368 (519 obs) right son=8369 (11 obs)  
## Primary splits:  
## cycle < 2.132326 to the left, improve=3.092482, (0 missing)  
## product남성 캐주얼 < 0.5 to the right, improve=2.207129, (0 missing)  
## max < -0.6560413 to the left, improve=2.054984, (0 missing)  
## days < -1.184281 to the left, improve=1.985882, (0 missing)  
## product농산물 < 0.5 to the left, improve=1.750600, (0 missing)  
##   
## Node number 4185: 30 observations  
## predicted class=여성 expected loss=0.3333333 P(node) =0.008571429  
## class counts: 10 20  
## probabilities: 0.333 0.667   
##   
## Node number 4186: 67 observations, complexity param=0.003799392  
## predicted class=남성 expected loss=0.4029851 P(node) =0.01914286  
## class counts: 40 27  
## probabilities: 0.597 0.403   
## left son=8372 (34 obs) right son=8373 (33 obs)  
## Primary splits:  
## week < -0.4227213 to the right, improve=3.882300, (0 missing)  
## max < -0.4085596 to the left, improve=1.771373, (0 missing)  
## cycle < -1.080299 to the right, improve=1.438418, (0 missing)  
## days < -1.184281 to the right, improve=1.329715, (0 missing)  
## total < -0.2203937 to the right, improve=1.287507, (0 missing)  
## Surrogate splits:  
## cycle < -1.080299 to the right, agree=0.657, adj=0.303, (0 split)  
## cust\_id < 1912.5 to the right, agree=0.627, adj=0.242, (0 split)  
## total < -0.3682116 to the right, agree=0.627, adj=0.242, (0 split)  
## days < -1.184281 to the right, agree=0.627, adj=0.242, (0 split)  
## max < -0.04165679 to the left, agree=0.567, adj=0.121, (0 split)  
##   
## Node number 4187: 273 observations, complexity param=0.004052685  
## predicted class=여성 expected loss=0.4065934 P(node) =0.078  
## class counts: 111 162  
## probabilities: 0.407 0.593   
## left son=8374 (220 obs) right son=8375 (53 obs)  
## Primary splits:  
## cust\_id < 618.5 to the right, improve=3.422713, (0 missing)  
## total < -0.520723 to the right, improve=2.623237, (0 missing)  
## max < -0.3533302 to the right, improve=1.911491, (0 missing)  
## product모피/피혁 < 0.5 to the left, improve=1.307018, (0 missing)  
## store대전점 < 0.5 to the left, improve=1.307018, (0 missing)  
## Surrogate splits:  
## product생활잡화 < 0.5 to the left, agree=0.81, adj=0.019, (0 split)  
##   
## Node number 8368: 519 observations  
## predicted class=남성 expected loss=0.4393064 P(node) =0.1482857  
## class counts: 291 228  
## probabilities: 0.561 0.439   
##   
## Node number 8369: 11 observations  
## predicted class=여성 expected loss=0.1818182 P(node) =0.003142857  
## class counts: 2 9  
## probabilities: 0.182 0.818   
##   
## Node number 8372: 34 observations  
## predicted class=남성 expected loss=0.2352941 P(node) =0.009714286  
## class counts: 26 8  
## probabilities: 0.765 0.235   
##   
## Node number 8373: 33 observations  
## predicted class=여성 expected loss=0.4242424 P(node) =0.009428571  
## class counts: 14 19  
## probabilities: 0.424 0.576   
##   
## Node number 8374: 220 observations, complexity param=0.004052685  
## predicted class=여성 expected loss=0.4454545 P(node) =0.06285714  
## class counts: 98 122  
## probabilities: 0.445 0.555   
## left son=16748 (148 obs) right son=16749 (72 obs)  
## Primary splits:  
## max < -0.3538098 to the right, improve=3.398867, (0 missing)  
## cust\_id < 673.5 to the left, improve=2.072689, (0 missing)  
## days < -0.6178742 to the left, improve=2.014497, (0 missing)  
## counts < -0.8199575 to the left, improve=1.978754, (0 missing)  
## total < -0.5209031 to the right, improve=1.705060, (0 missing)  
## Surrogate splits:  
## total < -0.4631809 to the right, agree=0.764, adj=0.278, (0 split)  
## counts < 1.657377 to the left, agree=0.686, adj=0.042, (0 split)  
## cust\_id < 655.5 to the right, agree=0.682, adj=0.028, (0 split)  
## product주류 < 0.5 to the left, agree=0.682, adj=0.028, (0 split)  
## product건강식품 < 0.5 to the left, agree=0.677, adj=0.014, (0 split)  
##   
## Node number 8375: 53 observations  
## predicted class=여성 expected loss=0.245283 P(node) =0.01514286  
## class counts: 13 40  
## probabilities: 0.245 0.755   
##   
## Node number 16748: 148 observations, complexity param=0.004052685  
## predicted class=남성 expected loss=0.4932432 P(node) =0.04228571  
## class counts: 75 73  
## probabilities: 0.507 0.493   
## left son=33496 (80 obs) right son=33497 (68 obs)  
## Primary splits:  
## max < -0.09722264 to the left, improve=3.027663, (0 missing)  
## counts < 0.2546089 to the right, improve=2.133778, (0 missing)  
## total < -0.5089462 to the right, improve=2.018371, (0 missing)  
## cust\_id < 1177.5 to the left, improve=1.502340, (0 missing)  
## refund < 1.2622 to the left, improve=1.232640, (0 missing)  
## Surrogate splits:  
## total < -0.3841089 to the left, agree=0.750, adj=0.456, (0 split)  
## product농산물 < 0.5 to the left, agree=0.574, adj=0.074, (0 split)  
## product모피/피혁 < 0.5 to the left, agree=0.574, adj=0.074, (0 split)  
## product스포츠 < 0.5 to the left, agree=0.574, adj=0.074, (0 split)  
## store부산본점 < 0.5 to the left, agree=0.574, adj=0.074, (0 split)  
##   
## Node number 16749: 72 observations  
## predicted class=여성 expected loss=0.3194444 P(node) =0.02057143  
## class counts: 23 49  
## probabilities: 0.319 0.681   
##   
## Node number 33496: 80 observations, complexity param=0.004052685  
## predicted class=남성 expected loss=0.4 P(node) =0.02285714  
## class counts: 48 32  
## probabilities: 0.600 0.400   
## left son=66992 (70 obs) right son=66993 (10 obs)  
## Primary splits:  
## total < -0.5089462 to the right, improve=3.657143, (0 missing)  
## days < -0.8530992 to the right, improve=2.894523, (0 missing)  
## max < -0.1324468 to the right, improve=2.454795, (0 missing)  
## cust\_id < 1217.5 to the left, improve=1.200000, (0 missing)  
## cycle < 0.8320327 to the left, improve=1.047273, (0 missing)  
## Surrogate splits:  
## cycle < 2.190308 to the left, agree=0.887, adj=0.1, (0 split)  
##   
## Node number 33497: 68 observations  
## predicted class=여성 expected loss=0.3970588 P(node) =0.01942857  
## class counts: 27 41  
## probabilities: 0.397 0.603   
##   
## Node number 66992: 70 observations, complexity param=0.003799392  
## predicted class=남성 expected loss=0.3428571 P(node) =0.02  
## class counts: 46 24  
## probabilities: 0.657 0.343   
## left son=133984 (63 obs) right son=133985 (7 obs)  
## Primary splits:  
## days < -0.8530992 to the right, improve=4.1142860, (0 missing)  
## max < -0.1324468 to the right, improve=1.8285710, (0 missing)  
## cust\_id < 1515 to the left, improve=1.3931970, (0 missing)  
## cycle < 1.057446 to the right, improve=0.8228571, (0 missing)  
## total < -0.2860002 to the left, improve=0.7326463, (0 missing)  
##   
## Node number 66993: 10 observations  
## predicted class=여성 expected loss=0.2 P(node) =0.002857143  
## class counts: 2 8  
## probabilities: 0.200 0.800   
##   
## Node number 133984: 63 observations  
## predicted class=남성 expected loss=0.2857143 P(node) =0.018  
## class counts: 45 18  
## probabilities: 0.714 0.286   
##   
## Node number 133985: 7 observations  
## predicted class=여성 expected loss=0.1428571 P(node) =0.002  
## class counts: 1 6  
## probabilities: 0.143 0.857

rpartFit %>% plot()



predict(rpartFit, test, type = "prob") -> pred\_rpart  
   
 # rpartFit %>% predict(., test2, type = "raw") -> pred\_rpart\_raw  
 # rfFit %>% predict(., test2, type = "raw")  
   
 bind\_cols(X\_test, pred\_rpart ) %>%   
 select(cust\_id, 남성) %>%   
 # rename(gender = "남성") %>%   
 write.csv(., "2017026.csv", row.names = FALSE)  
  
 read.csv("2017026.csv") %>% head()

## cust\_id 남성  
## 1 3500 0.2031063  
## 2 3501 0.2031063  
## 3 3502 0.2031063  
## 4 3503 0.5606936  
## 5 3504 0.5606936  
## 6 3505 0.3072289