script\_glm\_thr\_tuneado.R

Poitou

2020-07-09

library(glmnet)

## Loading required package: Matrix

## Loaded glmnet 3.0-2

# usar utils personalizado  
source('../utils/utils\_oblig.R')

## Loading required package: caret

## Loading required package: lattice

## Loading required package: ggplot2

set.seed(117)  
  
script.name <- 'glm\_thr'  
  
script.date <- 'tuneado'  
  
script.start <- Sys.time()  
  
print('Start')

## [1] "Start"

# leer el archivo dataset.csv de la carpeta  
  
dataset <- read.csv('../data/dataset.csv')  
  
# ver la estructura del dataset  
  
# str(dataset)  
  
# asignar el nombre del jugador como nombre de la fila  
  
rownames(dataset) <- dataset$CustomerID  
  
df <- na.omit(dataset[,-1])  
  
df$ServiceArea <- NULL  
  
print('\*\* Distribucion a-priori de la variable a predecir')

## [1] "\*\* Distribucion a-priori de la variable a predecir"

print(prop.table(table(df$Churn)))

##   
## No Yes   
## 0.7131871 0.2868129

df.part <- train\_dev\_partition(df, p = 0.8)  
  
# defino el espacio de valores posibles del umbral entre 0,2 y 0,4  
df.thr\_vec <- seq(0.1, 0.4, 0.025)  
  
df.fn\_summary <- function(data, lev = NULL, model = NULL) {  
 fn\_summaryUtilityThr(data, df.thr\_vec)  
}  
  
  
df.metric <- 'utility'  
  
df.form <- Churn ~ .  
  
print('\*\* GLM')

## [1] "\*\* GLM"

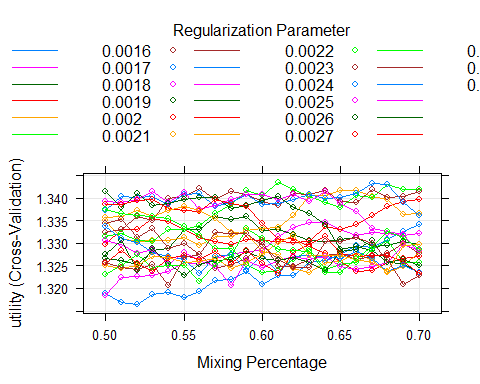
df.glm.ctrl <- trainControl(method = 'cv',  
 number = 5,  
 #returnResamp = "all",  
 verboseIter = TRUE,  
 classProbs = TRUE,  
 search = 'grid',  
 summaryFunction = df.fn\_summary)  
  
df.glm.grid <- expand.grid(alpha = seq(0.5, 0.7, 0.01),  
 lambda = seq(0.001, 0.003, 0.0001))  
   
  
df.glm <- train(form = df.form,   
 data = df.part$train,   
 method = 'glmnet',   
 family = 'binomial',  
 trControl = df.glm.ctrl,  
 tuneGrid = df.glm.grid,  
 #tuneLength = 20,  
 metric = df.metric)

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## Aggregating results  
## Selecting tuning parameters  
## Fitting alpha = 0.61, lambda = 0.0015 on full training set

print(df.glm)

## glmnet   
##   
## 37449 samples  
## 55 predictor  
## 2 classes: 'No', 'Yes'   
##   
## No pre-processing  
## Resampling: Cross-Validated (5 fold)   
## Summary of sample sizes: 29960, 29960, 29959, 29958, 29959   
## Resampling results across tuning parameters:  
##   
## alpha lambda utility prob\_thr  
## 0.50 0.0010 1.318795 0.275   
## 0.50 0.0011 1.318462 0.275   
## 0.50 0.0012 1.326727 0.275   
## 0.50 0.0013 1.329717 0.275   
## 0.50 0.0014 1.335044 0.275   
## 0.50 0.0015 1.331573 0.275   
## 0.50 0.0016 1.332428 0.275   
## 0.50 0.0017 1.337194 0.275   
## 0.50 0.0018 1.339356 0.275   
## 0.50 0.0019 1.341546 0.275   
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## 0.50 0.0022 1.337528 0.275   
## 0.50 0.0023 1.334324 0.275   
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## 0.50 0.0026 1.327607 0.275   
## 0.50 0.0027 1.325591 0.275   
## 0.50 0.0028 1.325057 0.275   
## 0.50 0.0029 1.323187 0.275   
## 0.50 0.0030 1.325817 0.275   
## 0.51 0.0010 1.316927 0.275   
## 0.51 0.0011 1.322508 0.270   
## 0.51 0.0012 1.326219 0.275   
## 0.51 0.0013 1.333121 0.275   
## 0.51 0.0014 1.331159 0.275   
## 0.51 0.0015 1.332281 0.275   
## 0.51 0.0016 1.333109 0.275   
## 0.51 0.0017 1.340452 0.275   
## 0.51 0.0018 1.339090 0.275   
## 0.51 0.0019 1.338021 0.275   
## 0.51 0.0020 1.338663 0.275   
## 0.51 0.0021 1.335992 0.275   
## 0.51 0.0022 1.336727 0.275   
## 0.51 0.0023 1.335178 0.275   
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## 0.51 0.0027 1.328434 0.275   
## 0.51 0.0028 1.324522 0.275   
## 0.51 0.0029 1.325110 0.275   
## 0.51 0.0030 1.324629 0.275   
## 0.52 0.0010 1.316393 0.275   
## 0.52 0.0011 1.322628 0.270   
## 0.52 0.0012 1.325271 0.275   
## 0.52 0.0013 1.333001 0.275   
## 0.52 0.0014 1.330358 0.275   
## 0.52 0.0015 1.330532 0.275   
## 0.52 0.0016 1.335952 0.275   
## 0.52 0.0017 1.340185 0.275   
## 0.52 0.0018 1.339771 0.275   
## 0.52 0.0019 1.341039 0.275   
## 0.52 0.0020 1.339491 0.275   
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## 0.58 0.0021 1.332335 0.275   
## 0.58 0.0022 1.328769 0.275   
## 0.58 0.0023 1.325418 0.275   
## 0.58 0.0024 1.327581 0.275   
## 0.58 0.0025 1.320704 0.275   
## 0.58 0.0026 1.326471 0.275   
## 0.58 0.0027 1.325484 0.275   
## 0.58 0.0028 1.324496 0.275   
## 0.58 0.0029 1.327247 0.275   
## 0.58 0.0030 1.332094 0.275   
## 0.59 0.0010 1.323870 0.270   
## 0.59 0.0011 1.328089 0.275   
## 0.59 0.0012 1.335965 0.275   
## 0.59 0.0013 1.330919 0.275   
## 0.59 0.0014 1.332841 0.275   
## 0.59 0.0015 1.341787 0.275   
## 0.59 0.0016 1.340719 0.275   
## 0.59 0.0017 1.340772 0.275   
## 0.59 0.0018 1.340852 0.275   
## 0.59 0.0019 1.338449 0.275   
## 0.59 0.0020 1.338116 0.275   
## 0.59 0.0021 1.332214 0.275   
## 0.59 0.0022 1.325391 0.275   
## 0.59 0.0023 1.326753 0.275   
## 0.59 0.0024 1.324082 0.275   
## 0.59 0.0025 1.326298 0.275   
## 0.59 0.0026 1.328127 0.275   
## 0.59 0.0027 1.328355 0.275   
## 0.59 0.0028 1.325712 0.275   
## 0.59 0.0029 1.333256 0.275   
## 0.59 0.0030 1.332148 0.275   
## 0.60 0.0010 1.320919 0.275   
## 0.60 0.0011 1.328356 0.275   
## 0.60 0.0012 1.332761 0.275   
## 0.60 0.0013 1.330678 0.275   
## 0.60 0.0014 1.333229 0.275   
## 0.60 0.0015 1.340692 0.275   
## 0.60 0.0016 1.339384 0.275   
## 0.60 0.0017 1.338636 0.275   
## 0.60 0.0018 1.340759 0.275   
## 0.60 0.0019 1.339571 0.275   
## 0.60 0.0020 1.334378 0.275   
## 0.60 0.0021 1.328182 0.275   
## 0.60 0.0022 1.323642 0.275   
## 0.60 0.0023 1.330157 0.275   
## 0.60 0.0024 1.327607 0.275   
## 0.60 0.0025 1.324549 0.275   
## 0.60 0.0026 1.326552 0.275   
## 0.60 0.0027 1.325538 0.275   
## 0.60 0.0028 1.327488 0.275   
## 0.60 0.0029 1.331120 0.275   
## 0.60 0.0030 1.329424 0.275   
## 0.61 0.0010 1.322961 0.275   
## 0.61 0.0011 1.331493 0.275   
## 0.61 0.0012 1.333028 0.275   
## 0.61 0.0013 1.330505 0.275   
## 0.61 0.0014 1.333496 0.275   
## 0.61 0.0015 1.343536 0.275   
## 0.61 0.0016 1.338436 0.275   
## 0.61 0.0017 1.338903 0.275   
## 0.61 0.0018 1.339664 0.275   
## 0.61 0.0019 1.340399 0.275   
## 0.61 0.0020 1.330853 0.275   
## 0.61 0.0021 1.327527 0.275   
## 0.61 0.0022 1.324056 0.275   
## 0.61 0.0023 1.324884 0.275   
## 0.61 0.0024 1.323428 0.275   
## 0.61 0.0025 1.326204 0.275   
## 0.61 0.0026 1.326165 0.275   
## 0.61 0.0027 1.323281 0.275   
## 0.61 0.0028 1.330118 0.275   
## 0.61 0.0029 1.328623 0.275   
## 0.61 0.0030 1.326340 0.275   
## 0.62 0.0010 1.322962 0.275   
## 0.62 0.0011 1.333536 0.275   
## 0.62 0.0012 1.331960 0.275   
## 0.62 0.0013 1.330238 0.275   
## 0.62 0.0014 1.336219 0.275   
## 0.62 0.0015 1.341907 0.275   
## 0.62 0.0016 1.341039 0.275   
## 0.62 0.0017 1.339611 0.275   
## 0.62 0.0018 1.340759 0.275   
## 0.62 0.0019 1.337849 0.275   
## 0.62 0.0020 1.331120 0.275   
## 0.62 0.0021 1.324443 0.275   
## 0.62 0.0022 1.326486 0.275   
## 0.62 0.0023 1.324883 0.275   
## 0.62 0.0024 1.326979 0.275   
## 0.62 0.0025 1.327032 0.275   
## 0.62 0.0026 1.326873 0.275   
## 0.62 0.0027 1.327875 0.275   
## 0.62 0.0028 1.331774 0.275   
## 0.62 0.0029 1.328356 0.275   
## 0.62 0.0030 1.324591 0.275   
## 0.63 0.0010 1.325805 0.275   
## 0.63 0.0011 1.334604 0.275   
## 0.63 0.0012 1.330625 0.275   
## 0.63 0.0013 1.330385 0.275   
## 0.63 0.0014 1.340572 0.275   
## 0.63 0.0015 1.340305 0.275   
## 0.63 0.0016 1.340919 0.275   
## 0.63 0.0017 1.340732 0.275   
## 0.63 0.0018 1.339277 0.275   
## 0.63 0.0019 1.336634 0.275   
## 0.63 0.0020 1.329397 0.275   
## 0.63 0.0021 1.323642 0.275   
## 0.63 0.0022 1.328675 0.275   
## 0.63 0.0023 1.326392 0.275   
## 0.63 0.0024 1.327273 0.275   
## 0.63 0.0025 1.326405 0.275   
## 0.63 0.0026 1.325712 0.275   
## 0.63 0.0027 1.329677 0.275   
## 0.63 0.0028 1.327355 0.275   
## 0.63 0.0029 1.328209 0.275   
## 0.63 0.0030 1.324617 0.275   
## 0.64 0.0010 1.326193 0.275   
## 0.64 0.0011 1.334604 0.275   
## 0.64 0.0012 1.330505 0.275   
## 0.64 0.0013 1.333789 0.275   
## 0.64 0.0014 1.340692 0.275   
## 0.64 0.0015 1.338970 0.275   
## 0.64 0.0016 1.341747 0.275   
## 0.64 0.0017 1.339931 0.275   
## 0.64 0.0018 1.341467 0.275   
## 0.64 0.0019 1.334230 0.275   
## 0.64 0.0020 1.327795 0.275   
## 0.64 0.0021 1.325805 0.275   
## 0.64 0.0022 1.324203 0.275   
## 0.64 0.0023 1.327220 0.275   
## 0.64 0.0024 1.327153 0.275   
## 0.64 0.0025 1.327113 0.275   
## 0.64 0.0026 1.323963 0.275   
## 0.64 0.0027 1.331627 0.275   
## 0.64 0.0028 1.327408 0.275   
## 0.64 0.0029 1.323643 0.275   
## 0.64 0.0030 1.330358 0.275   
## 0.65 0.0010 1.327555 0.275   
## 0.65 0.0011 1.333122 0.275   
## 0.65 0.0012 1.330945 0.275   
## 0.65 0.0013 1.333081 0.275   
## 0.65 0.0014 1.341640 0.275   
## 0.65 0.0015 1.338048 0.275   
## 0.65 0.0016 1.339170 0.275   
## 0.65 0.0017 1.340198 0.275   
## 0.65 0.0018 1.338770 0.275   
## 0.65 0.0019 1.328543 0.275   
## 0.65 0.0020 1.326045 0.275   
## 0.65 0.0021 1.326072 0.275   
## 0.65 0.0022 1.325417 0.275   
## 0.65 0.0023 1.327780 0.275   
## 0.65 0.0024 1.326645 0.275   
## 0.65 0.0025 1.324857 0.275   
## 0.65 0.0026 1.328168 0.275   
## 0.65 0.0027 1.327742 0.275   
## 0.65 0.0028 1.327261 0.275   
## 0.65 0.0029 1.323523 0.275   
## 0.65 0.0030 1.330359 0.275   
## 0.66 0.0010 1.329571 0.275   
## 0.66 0.0011 1.331787 0.275   
## 0.66 0.0012 1.331212 0.275   
## 0.66 0.0013 1.334176 0.275   
## 0.66 0.0014 1.341787 0.275   
## 0.66 0.0015 1.340625 0.275   
## 0.66 0.0016 1.339077 0.275   
## 0.66 0.0017 1.341026 0.275   
## 0.66 0.0018 1.337048 0.275   
## 0.66 0.0019 1.329370 0.275   
## 0.66 0.0020 1.323762 0.275   
## 0.66 0.0021 1.327995 0.275   
## 0.66 0.0022 1.325738 0.275   
## 0.66 0.0023 1.326445 0.275   
## 0.66 0.0024 1.328154 0.275   
## 0.66 0.0025 1.324229 0.275   
## 0.66 0.0026 1.328583 0.275   
## 0.66 0.0027 1.327088 0.275   
## 0.66 0.0028 1.326460 0.275   
## 0.66 0.0029 1.326540 0.275   
## 0.66 0.0030 1.331280 0.275   
## 0.67 0.0010 1.329036 0.275   
## 0.67 0.0011 1.332494 0.275   
## 0.67 0.0012 1.329316 0.275   
## 0.67 0.0013 1.336099 0.275   
## 0.67 0.0014 1.340425 0.275   
## 0.67 0.0015 1.340238 0.275   
## 0.67 0.0016 1.341827 0.275   
## 0.67 0.0017 1.343336 0.275   
## 0.67 0.0018 1.333403 0.275   
## 0.67 0.0019 1.328449 0.275   
## 0.67 0.0020 1.324029 0.275   
## 0.67 0.0021 1.326219 0.275   
## 0.67 0.0022 1.328581 0.275   
## 0.67 0.0023 1.327153 0.275   
## 0.67 0.0024 1.326699 0.275   
## 0.67 0.0025 1.324910 0.275   
## 0.67 0.0026 1.330652 0.275   
## 0.67 0.0027 1.327381 0.275   
## 0.67 0.0028 1.325806 0.275   
## 0.67 0.0029 1.329264 0.275   
## 0.67 0.0030 1.329972 0.275   
## 0.68 0.0010 1.330959 0.275   
## 0.68 0.0011 1.332227 0.275   
## 0.68 0.0012 1.329584 0.275   
## 0.68 0.0013 1.338262 0.275   
## 0.68 0.0014 1.339771 0.275   
## 0.68 0.0015 1.342962 0.275   
## 0.68 0.0016 1.340198 0.275   
## 0.68 0.0017 1.342949 0.275   
## 0.68 0.0018 1.332602 0.275   
## 0.68 0.0019 1.325752 0.275   
## 0.68 0.0020 1.325805 0.275   
## 0.68 0.0021 1.323642 0.275   
## 0.68 0.0022 1.330624 0.275   
## 0.68 0.0023 1.327740 0.275   
## 0.68 0.0024 1.323789 0.275   
## 0.68 0.0025 1.325859 0.275   
## 0.68 0.0026 1.325819 0.275   
## 0.68 0.0027 1.327261 0.275   
## 0.68 0.0028 1.323669 0.275   
## 0.68 0.0029 1.332615 0.275   
## 0.68 0.0030 1.326327 0.275   
## 0.69 0.0010 1.332588 0.275   
## 0.69 0.0011 1.331693 0.275   
## 0.69 0.0012 1.330411 0.275   
## 0.69 0.0013 1.339330 0.275   
## 0.69 0.0014 1.336393 0.275   
## 0.69 0.0015 1.342014 0.275   
## 0.69 0.0016 1.340465 0.275   
## 0.69 0.0017 1.339037 0.275   
## 0.69 0.0018 1.331921 0.275   
## 0.69 0.0019 1.325631 0.275   
## 0.69 0.0020 1.326753 0.275   
## 0.69 0.0021 1.324763 0.275   
## 0.69 0.0022 1.325764 0.275   
## 0.69 0.0023 1.329903 0.275   
## 0.69 0.0024 1.325030 0.275   
## 0.69 0.0025 1.329797 0.275   
## 0.69 0.0026 1.326407 0.275   
## 0.69 0.0027 1.325926 0.275   
## 0.69 0.0028 1.329624 0.275   
## 0.69 0.0029 1.331307 0.275   
## 0.69 0.0030 1.320960 0.275   
## 0.70 0.0010 1.334070 0.275   
## 0.70 0.0011 1.332253 0.275   
## 0.70 0.0012 1.329850 0.275   
## 0.70 0.0013 1.339744 0.275   
## 0.70 0.0014 1.336687 0.275   
## 0.70 0.0015 1.342041 0.275   
## 0.70 0.0016 1.341413 0.275   
## 0.70 0.0017 1.336073 0.275   
## 0.70 0.0018 1.327741 0.275   
## 0.70 0.0019 1.323322 0.275   
## 0.70 0.0020 1.327167 0.275   
## 0.70 0.0021 1.328168 0.275   
## 0.70 0.0022 1.325791 0.275   
## 0.70 0.0023 1.327647 0.275   
## 0.70 0.0024 1.323549 0.275   
## 0.70 0.0025 1.328369 0.275   
## 0.70 0.0026 1.325192 0.275   
## 0.70 0.0027 1.323229 0.275   
## 0.70 0.0028 1.329771 0.275   
## 0.70 0.0029 1.328610 0.275   
## 0.70 0.0030 1.322829 0.275   
##   
## utility was used to select the optimal model using the largest value.  
## The final values used for the model were alpha = 0.61 and lambda = 0.0015.

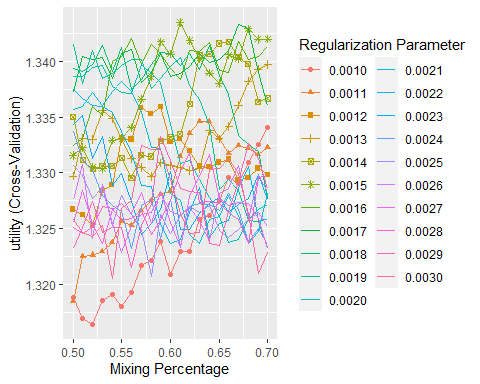
plot(df.glm)



ggplot(df.glm)

## Warning: The shape palette can deal with a maximum of 6 discrete values because  
## more than 6 becomes difficult to discriminate; you have 21. Consider  
## specifying shapes manually if you must have them.

## Warning: Removed 315 rows containing missing values (geom\_point).



df.glm.model <- df.glm$finalModel  
  
df.glm.model.coef <- predict(df.glm.model,   
 s = df.glm.model$lambdaOpt,   
 type = 'coefficients')  
   
print(df.glm.model.coef)

## 84 x 1 sparse Matrix of class "dgCMatrix"  
## 1  
## (Intercept) -0.8568083380  
## MonthlyRevenue 0.0003677516  
## MonthlyMinutes -0.0002015464  
## TotalRecurringCharge -0.0017228824  
## DirectorAssistedCalls -0.0025049965  
## OverageMinutes 0.0012345219  
## RoamingCalls 0.0039449735  
## PercChangeMinutes -0.0005670419  
## PercChangeRevenues 0.0029029786  
## DroppedCalls 0.0050746019  
## BlockedCalls .   
## UnansweredCalls 0.0004590031  
## CustomerCareCalls -0.0052477416  
## ThreewayCalls -0.0354026220  
## ReceivedCalls .   
## OutboundCalls .   
## InboundCalls -0.0003481358  
## PeakCallsInOut -0.0004531587  
## OffPeakCallsInOut .   
## DroppedBlockedCalls 0.0018080976  
## CallForwardingCalls .   
## CallWaitingCalls -0.0020166128  
## MonthsInService -0.0180837157  
## UniqueSubs 0.1360346731  
## ActiveSubs -0.1246357866  
## Handsets 0.0337336181  
## HandsetModels .   
## CurrentEquipmentDays 0.0012811594  
## AgeHH1 -0.0034060800  
## AgeHH2 -0.0010507415  
## ChildrenInHHYes 0.1448433828  
## HandsetRefurbishedYes 0.2754691951  
## HandsetWebCapableYes -0.1594131675  
## TruckOwnerYes .   
## RVOwnerYes .   
## HomeownershipUnknown .   
## BuysViaMailOrderYes .   
## RespondsToMailOffersYes -0.1157284693  
## OptOutMailingsYes .   
## NonUSTravelYes .   
## OwnsComputerYes .   
## HasCreditCardYes 0.0846013899  
## RetentionCalls 0.1466228189  
## RetentionOffersAccepted -0.0705977023  
## NewCellphoneUserYes -0.0053146546  
## NotNewCellphoneUserYes 0.0456339986  
## ReferralsMadeBySubscriber -0.0186540696  
## IncomeGroup -0.0022030098  
## OwnsMotorcycleYes 0.0938445445  
## AdjustmentsToCreditRating -0.0552169545  
## HandsetPrice100 0.0094746118  
## HandsetPrice130 .   
## HandsetPrice150 0.0305987816  
## HandsetPrice180 .   
## HandsetPrice200 0.0653294468  
## HandsetPrice240 -0.0001480753  
## HandsetPrice250 0.6849211829  
## HandsetPrice30 0.0012060432  
## HandsetPrice300 -0.2326287212  
## HandsetPrice40 0.0614787271  
## HandsetPrice400 -0.0246688070  
## HandsetPrice500 -0.0003836134  
## HandsetPrice60 0.0485494913  
## HandsetPrice80 .   
## HandsetPriceUnknown -0.1254386687  
## MadeCallToRetentionTeamYes 0.5645269192  
## CreditRating2-High 0.0588145959  
## CreditRating3-Good 0.0387847701  
## CreditRating4-Medium -0.1296754772  
## CreditRating5-Low -0.3657460644  
## CreditRating6-VeryLow -0.1580971546  
## CreditRating7-Lowest -0.0495332571  
## PrizmCodeRural 0.1195409561  
## PrizmCodeSuburban -0.0385831745  
## PrizmCodeTown 0.0243874339  
## OccupationCrafts 0.0011087050  
## OccupationHomemaker 0.0747337735  
## OccupationOther .   
## OccupationProfessional -0.0232479003  
## OccupationRetired -0.1102131983  
## OccupationSelf .   
## OccupationStudent 0.2037073075  
## MaritalStatusUnknown 0.1132725675  
## MaritalStatusYes 0.0300453747

df.glm.results <- fn\_results(df.glm)  
  
print('Umbral')

## [1] "Umbral"

print(df.glm.results$prob\_thr)

## [1] 0.275

print('Utilidad en train')

## [1] "Utilidad en train"

print(df.glm.results$utility)

## [1] 1.343536

print('Utilidad en dev')

## [1] "Utilidad en dev"

df.glm.dev.prob <- predict(df.glm, newdata = df.part$dev, type = 'prob')  
df.glm.dev.pred <- fn\_pred(df.glm.dev.prob, thr = df.glm.results$prob\_thr)  
  
df.glm.dev.utility <- fn\_utility(df.glm.dev.pred, df.part$dev$Churn)  
  
print(df.glm.dev.utility)

## [1] 1.308161

print('Utilidad en train')

## [1] "Utilidad en train"

df.glm.train.prob <- predict(df.glm, newdata = df.part$train, type = 'prob')  
df.glm.train.pred <- fn\_pred(df.glm.train.prob, thr = df.glm.results$prob\_thr)  
  
df.glm.train.utility <- fn\_utility(df.glm.train.pred, df.part$train$Churn)  
  
print(df.glm.train.utility)

## [1] 1.376699

#################  
# ploteo de las utilidades de CV y train vs el umbral  
  
df.glm.train.prob <- predict(df.glm, newdata = df.part$train, type = 'prob')  
  
df.glm.dev.utility\_vec <- fn\_utility\_thr(y\_prob = df.glm.dev.prob,   
 y = df.part$dev$Churn,   
 thr\_vec = df.thr\_vec)  
  
  
df.glm.train.utility\_vec <- fn\_utility\_thr(y\_prob = df.glm.train.prob,   
 y = df.part$train$Churn,   
 thr\_vec = df.thr\_vec)  
  
print('Utilidad por umbral')

## [1] "Utilidad por umbral"

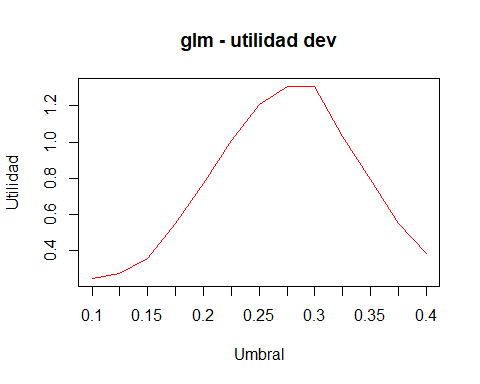
print(df.glm.dev.utility\_vec)

## utility1 utility2 utility3 utility4 utility5 utility6 utility7 utility8   
## 0.2474899 0.2738197 0.3599124 0.5484939 0.7692801 1.0069964 1.2105319 1.3081606   
## utility9 utility10 utility11 utility12 utility13   
## 1.3051698 1.0287866 0.7913373 0.5523392 0.3837321

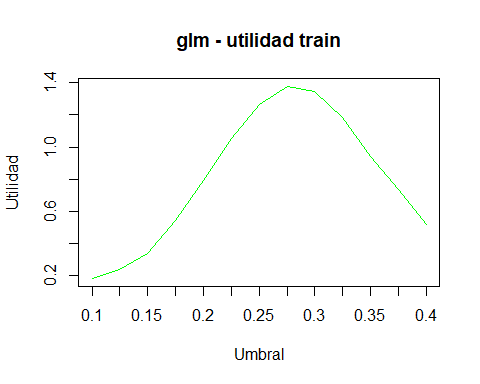
print(df.glm.train.utility\_vec)

## utility1 utility2 utility3 utility4 utility5 utility6 utility7 utility8   
## 0.1839435 0.2396326 0.3401826 0.5459692 0.7902748 1.0508692 1.2625971 1.3766990   
## utility9 utility10 utility11 utility12 utility13   
## 1.3436540 1.1833293 0.9391172 0.7339181 0.5179043

#par(mfrow=c(1,1))  
plot\_thr\_utility(df.glm.dev.utility\_vec, df.thr\_vec, 'glm - utilidad dev')



#abline(v = df.glm.results$prob\_thr, col="blue")  
#par(new=TRUE)  
  
plot\_thr\_utility\_train(df.glm.train.utility\_vec, df.thr\_vec, 'glm - utilidad train')



#abline(v = df.glm.results$prob\_thr, col="blue")  
#########################################  
  
print('Matriz de confusion en dev')

## [1] "Matriz de confusion en dev"

df.glm.dev.cm <- conf\_matrix(df.glm.dev.pred, df.part$dev$Churn)  
  
print(df.glm.dev.cm)

## Reference  
## Prediction No Yes  
## No 3414 946  
## Yes 3248 1754

print('\*\* Generacion de la prediccion sobre test sample')

## [1] "\*\* Generacion de la prediccion sobre test sample"

test\_sample <- read.csv('../data/test\_sample.csv')  
rownames(test\_sample) <- test\_sample$CustomerID  
test\_sample$CustomerID <- NULL  
test\_sample$ServiceArea <- NULL  
  
file\_id <- paste0(c(script.name, script.date), collapse = ' ')  
  
gen\_prediction(df.glm, test\_sample, prob\_thr = df.glm.results$prob\_thr, id = file\_id)  
  
print('Done')

## [1] "Done"

script.done <- Sys.time()  
  
print(script.done - script.start)

## Time difference of 11.03539 mins