TP1

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**1. Introducción al problema**

El siguiente conjunto de datos presenta información acerca de una encuesta de satisfacción a pasageros de una cierta aerolinea. Obtuvimos este dataset de Kaggle, el cual cuenta con un conjunto de train con 104000 datos, representando el 80% del data set, y un conjunto de test con 26000 datos, representando el 20% del data set. Este data set cuenta con 23 variables, como “Type of travel”, “Class”, “Flight distance”, “Departure Delay in Minutes”, “Arrival Delay in Minutes”. Principalmente, cuenta con “Satisfaction”, variable categorica que puede tomar dos opciones: “Satisfaction” o “neutral or dissatisfaction”.Con toda esta información, intentaremos predecir la satisfacción de un pasajero dado las respuesta a las variables.

* Justificar la elección del conjunto de datos para el uso de árboles de decisión.

*2. Preparación de los datos*

datos\_train <- read.csv("train.csv")  
datos\_test <- read.csv("test.csv")

datos<-rbind(datos\_train, datos\_test)

set.seed(123)  
sample\_datos <- datos[sample(nrow(datos), 50000),]  
nrow(sample\_datos)

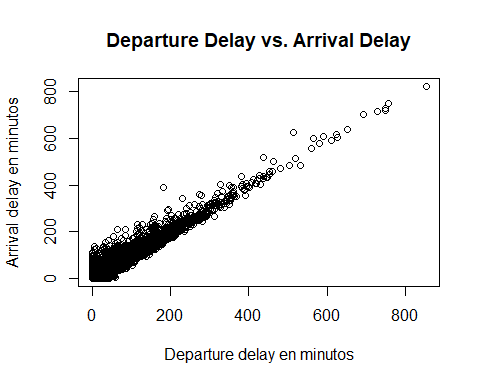
## [1] 50000

sample\_datos$satisfaction <- as.numeric(as.factor(sample\_datos$satisfaction)) - 1

summary(sample\_datos)

## X id Gender Customer.Type   
## Min. : 0 Min. : 3 Length:50000 Length:50000   
## 1st Qu.: 16126 1st Qu.: 32529 Class :character Class :character   
## Median : 38758 Median : 64899 Mode :character Mode :character   
## Mean : 44065 Mean : 64899   
## 3rd Qu.: 71427 3rd Qu.: 97113   
## Max. :103902 Max. :129880   
##   
## Age Type.of.Travel Class Flight.Distance  
## Min. : 7.00 Length:50000 Length:50000 Min. : 31   
## 1st Qu.:27.00 Class :character Class :character 1st Qu.: 414   
## Median :40.00 Mode :character Mode :character Median : 848   
## Mean :39.44 Mean :1190   
## 3rd Qu.:51.00 3rd Qu.:1744   
## Max. :85.00 Max. :4983   
##   
## Inflight.wifi.service Departure.Arrival.time.convenient Ease.of.Online.booking  
## Min. :0.000 Min. :0.000 Min. :0.000   
## 1st Qu.:2.000 1st Qu.:2.000 1st Qu.:2.000   
## Median :3.000 Median :3.000 Median :3.000   
## Mean :2.738 Mean :3.058 Mean :2.762   
## 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:4.000   
## Max. :5.000 Max. :5.000 Max. :5.000   
##   
## Gate.location Food.and.drink Online.boarding Seat.comfort   
## Min. :1.00 Min. :0.000 Min. :0.000 Min. :1.000   
## 1st Qu.:2.00 1st Qu.:2.000 1st Qu.:2.000 1st Qu.:2.000   
## Median :3.00 Median :3.000 Median :3.000 Median :4.000   
## Mean :2.98 Mean :3.213 Mean :3.254 Mean :3.447   
## 3rd Qu.:4.00 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:5.000   
## Max. :5.00 Max. :5.000 Max. :5.000 Max. :5.000   
##   
## Inflight.entertainment On.board.service Leg.room.service Baggage.handling  
## Min. :0.000 Min. :0.000 Min. :0.000 Min. :1.000   
## 1st Qu.:2.000 1st Qu.:2.000 1st Qu.:2.000 1st Qu.:3.000   
## Median :4.000 Median :4.000 Median :4.000 Median :4.000   
## Mean :3.365 Mean :3.377 Mean :3.347 Mean :3.622   
## 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:4.000 3rd Qu.:5.000   
## Max. :5.000 Max. :5.000 Max. :5.000 Max. :5.000   
##   
## Checkin.service Inflight.service Cleanliness Departure.Delay.in.Minutes  
## Min. :1.000 Min. :0.000 Min. :0.000 Min. : 0.00   
## 1st Qu.:2.000 1st Qu.:3.000 1st Qu.:2.000 1st Qu.: 0.00   
## Median :3.000 Median :4.000 Median :3.000 Median : 0.00   
## Mean :3.303 Mean :3.631 Mean :3.293 Mean : 14.67   
## 3rd Qu.:4.000 3rd Qu.:5.000 3rd Qu.:4.000 3rd Qu.: 12.00   
## Max. :5.000 Max. :5.000 Max. :5.000 Max. :853.00   
##   
## Arrival.Delay.in.Minutes satisfaction   
## Min. : 0.00 Min. :0.0000   
## 1st Qu.: 0.00 1st Qu.:0.0000   
## Median : 0.00 Median :0.0000   
## Mean : 15.08 Mean :0.4338   
## 3rd Qu.: 13.00 3rd Qu.:1.0000   
## Max. :823.00 Max. :1.0000   
## NA's :149

plot(sample\_datos$Departure.Delay.in.Minutes, sample\_datos$Arrival.Delay.in.Minutes, main = "Departure Delay vs. Arrival Delay", xlab = "Departure delay en minutos", ylab = "Arrival delay en minutos")



#install.packages("GGally")  
library(GGally)

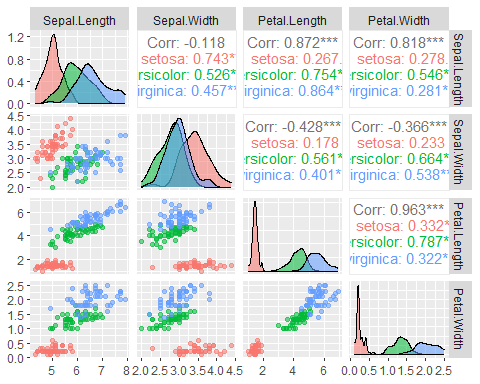
## Warning: package 'GGally' was built under R version 4.2.3

## Loading required package: ggplot2

## Warning: package 'ggplot2' was built under R version 4.2.3

## Registered S3 method overwritten by 'GGally':  
## method from   
## +.gg ggplot2

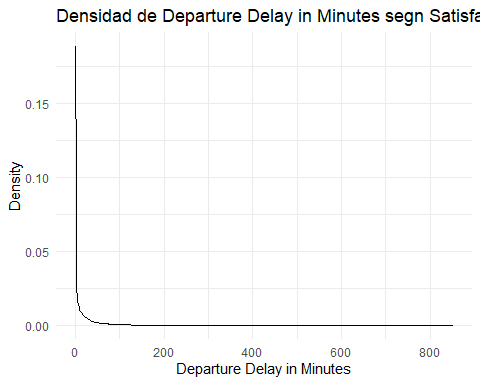
ggpairs(iris, # Data frame  
 columns = 1:4, # Columnas  
 aes(color = Species, # Color por grupo (var. categórica)  
 alpha = 0.5)) # Transparencia



#install.packages("ggplot2")  
library(ggplot2)

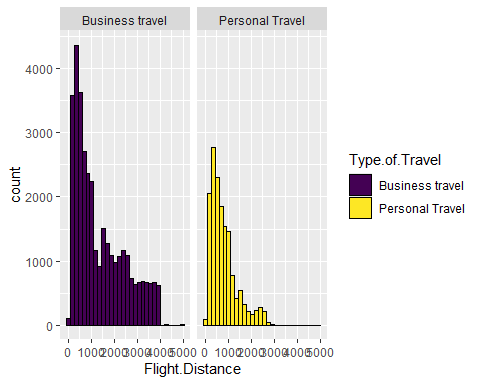
library(ggplot2)  
  
# Crear el gráfico de densidad superpuesto  
ggplot(sample\_datos, aes(x = Departure.Delay.in.Minutes, fill = satisfaction, color = satisfaction)) +  
 geom\_density(alpha = 0.5) +  
 scale\_fill\_manual(values = c("red", "blue")) +  
 scale\_color\_manual(values = c("red", "blue")) +  
 labs(x = "Departure Delay in Minutes",   
 y = "Density",   
 fill = "Satisfaction",  
 color = "Satisfaction",  
 title = "Densidad de Departure Delay in Minutes segn Satisfaccion") +  
 theme\_minimal()

## Warning: The following aesthetics were dropped during statistical transformation: fill  
## and colour.  
## ℹ This can happen when ggplot fails to infer the correct grouping structure in  
## the data.  
## ℹ Did you forget to specify a `group` aesthetic or to convert a numerical  
## variable into a factor?



ggplot(data = sample\_datos) +  
 geom\_histogram(mapping = aes(x = Flight.Distance, fill = Type.of.Travel),  
 colour = "black") +  
 scale\_fill\_viridis\_d() +  
 facet\_wrap(~ Type.of.Travel)

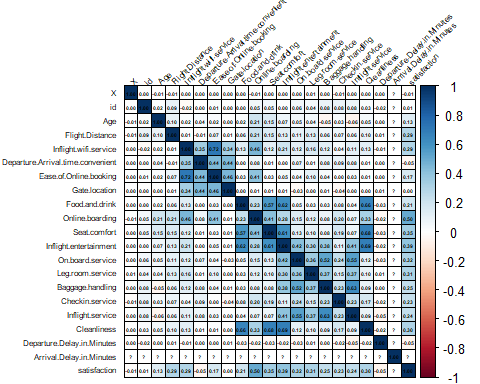
## `stat\_bin()` using `bins = 30`. Pick better value with `binwidth`.



#install.packages("corrplot")  
library(corrplot)

## corrplot 0.94 loaded

numeric\_data <- sample\_datos[, sapply(sample\_datos, is.numeric)]  
cor\_matrix <- cor(numeric\_data)  
corrplot(cor\_matrix, method = "color",   
 tl.col = "black", tl.srt = 45, tl.cex = 0.5, # Ajustes de etiquetas  
 cl.ratio = 0.2, # Ajustar el tamaño de las celdas  
 addgrid.col = "black", # Añadir color a las líneas de la cuadrícula  
 addCoef.col = "black",  
 number.cex = 0.3)



*3. Construcción de un árbol de decisión básico*

entrenamiento <- sample\_datos[1:35000,]  
validacion <- sample\_datos[35001:42500,]  
testeo <- sample\_datos[42501:50000,]  
  
nrow(entrenamiento)

## [1] 35000

nrow(validacion)

## [1] 7500

nrow(testeo)

## [1] 7500

library(rpart)

## Warning: package 'rpart' was built under R version 4.2.3

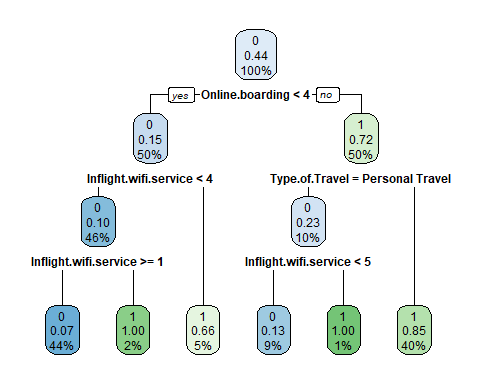
tree <- rpart(formula = satisfaction ~ .,   
 data = entrenamiento,   
 method = "class")  
tree$control

## $minsplit  
## [1] 20  
##   
## $minbucket  
## [1] 7  
##   
## $cp  
## [1] 0.01  
##   
## $maxcompete  
## [1] 4  
##   
## $maxsurrogate  
## [1] 5  
##   
## $usesurrogate  
## [1] 2  
##   
## $surrogatestyle  
## [1] 0  
##   
## $maxdepth  
## [1] 30  
##   
## $xval  
## [1] 10

library(rpart.plot)

## Warning: package 'rpart.plot' was built under R version 4.2.3

rpart.plot(tree)



*4. Evaluación del árbol de decisión básico*

predictions <- predict(tree, newdata = testeo, type = "class")  
predictions

## 88098 101291 44096 67153 54411 26558 86070 87654 92716 6120 97278   
## 0 0 0 0 0 1 0 0 1 0 1   
## 45785 106910 129596 105128 37489 61142 101706 68140 121317 99596 94314   
## 0 1 0 1 1 0 0 0 0 0 1   
## 91195 98455 122162 50649 49544 22250 78937 1406 77767 55730 114461   
## 0 0 0 0 0 0 0 1 0 0 1   
## 40033 65727 71371 15916 57624 39343 15677 93778 52614 119411 116445   
## 1 1 0 1 1 1 0 0 1 1 0   
## 2345 2572 83760 11196 79900 116503 110823 53865 125982 22334 43458   
## 1 0 0 1 0 0 1 0 0 0 0   
## 89739 42942 81335 43560 95682 16373 50044 45394 88147 46707 81719   
## 1 0 0 0 1 1 1 0 1 1 1   
## 80578 111872 63908 42148 78839 91943 86105 88179 21779 64688 94955   
## 0 0 0 0 0 1 0 0 1 0 0   
## 49672 63235 29291 100786 126570 97962 52995 115291 53821 102278 55681   
## 0 0 0 0 0 1 1 0 0 0 1   
## 15789 22346 115562 37436 98882 97708 18379 88333 116911 38312 16355   
## 0 1 1 1 1 0 0 1 1 0 1   
## 42551 83195 74321 94737 129868 8971 84085 63956 9848 125612 104134   
## 0 1 1 0 0 1 1 1 0 1 1   
## 116058 104891 42824 116209 83460 115259 52607 60874 86531 37396 69415   
## 0 0 0 1 0 0 1 1 1 0 0   
## 9715 1244 90642 121214 421 92298 67521 66419 88475 78810 56347   
## 1 1 0 1 1 1 0 0 0 1 0   
## 13252 82393 48302 14315 121133 47002 105906 29787 54781 10659 96927   
## 1 1 0 0 0 1 0 1 1 1 1   
## 46298 9062 96807 5835 84336 81816 87723 87799 110190 105442 74153   
## 0 1 1 0 0 0 1 0 0 1 1   
## 87512 54333 116375 95810 61781 114185 120502 15235 92949 18266 63410   
## 1 0 1 0 0 0 1 0 1 0 0   
## 48258 1338 88484 29845 93813 128483 126815 30490 12848 50961 81136   
## 0 1 1 0 1 0 0 1 1 1 1   
## 111877 51712 39585 83438 39498 115065 96692 45101 107192 94088 47844   
## 0 0 0 0 0 0 0 1 1 0 0   
## 115814 43721 38176 108730 30182 96218 69368 66170 30862 95279 49125   
## 0 1 1 1 1 0 0 0 0 0 1   
## 24672 82277 74428 93915 77877 95647 26403 2653 76541 126215 27052   
## 1 1 1 0 0 0 1 0 0 1 1   
## 54630 6940 118441 69978 53086 74394 23513 79276 123795 95079 38376   
## 0 0 1 0 1 1 1 0 0 1 0   
## 30259 41368 9790 69075 13426 81431 93903 71650 81859 57972 88548   
## 1 0 1 0 1 0 0 1 0 1 0   
## 54161 94702 55207 89309 114102 59109 57000 24553 63558 125131 18149   
## 0 0 0 1 0 1 0 0 0 0 1   
## 94318 32618 81917 62358 31047 112564 61101 3331 17460 16512 85158   
## 0 0 0 1 1 1 0 0 0 1 0   
## 113695 66674 39547 118058 91987 122819 128492 109471 50581 92606 49646   
## 0 1 0 0 0 0 1 1 0 0 0   
## 42277 78475 61196 88992 53271 11584 21699 96393 24174 16458 27887   
## 1 0 0 1 1 0 1 1 1 1 1   
## 66310 67904 40290 112491 15149 49417 36046 105773 36693 74395 123790   
## 0 0 0 0 0 1 0 1 1 1 1   
## 88175 89839 15090 108659 7099 61464 111528 51761 93780 109494 100340   
## 1 1 1 0 0 1 1 1 0 1 1   
## 70265 82180 74653 38795 91872 50173 90129 59315 106466 66597 56579   
## 1 0 0 0 1 0 1 0 0 1 0   
## 92876 29795 20118 73145 103730 27793 98893 34572 7584 99747 18764   
## 1 0 1 0 0 1 0 0 1 0 0   
## 34809 35682 50085 100109 76143 46232 73516 43533 108972 28423 111801   
## 0 1 1 0 0 0 1 1 0 1 1   
## 64570 22933 30404 95132 12412 119106 114487 94515 14634 46643 107931   
## 0 0 0 1 0 0 1 1 1 1 1   
## 125986 54752 23253 123173 96570 71780 111852 16903 123384 32996 117282   
## 0 0 0 0 1 0 0 1 0 0 1   
## 76831 7061 53209 46786 48376 2127 58947 79240 124784 124513 57499   
## 0 0 0 1 0 0 0 1 0 0 0   
## 77050 70707 116248 88125 103242 4635 12703 78059 116212 93263 113635   
## 1 0 1 0 1 0 1 0 1 0 1   
## 125086 102840 3095 34959 121858 15487 87061 70373 43870 18736 32418   
## 0 1 0 1 0 0 0 0 1 1 0   
## 69970 71916 35737 107915 17838 67925 125150 20656 37854 103697 65933   
## 1 0 1 1 0 1 0 0 1 0 0   
## 103356 117853 89964 124550 97482 88374 1181 58996 83718 108747 70156   
## 0 0 0 0 0 1 1 1 1 0 1   
## 15436 111776 83179 100288 114573 28038 83248 40574 28851 93460 73953   
## 1 1 0 0 0 1 1 1 0 0 1   
## 67045 118555 30583 9217 17398 71660 107972 88193 36275 94619 39809   
## 1 0 0 0 0 1 0 0 1 0 0   
## 116088 119103 52137 127499 69056 7256 21570 6400 96104 93794 118690   
## 1 1 0 1 0 0 0 0 1 1 0   
## 1335 20175 71816 122623 3654 32216 129439 50536 79606 18925 63759   
## 0 0 0 0 1 0 0 0 1 1 0   
## 67057 96970 108984 81971 46860 102801 105129 97598 59487 11764 126887   
## 0 0 0 1 0 1 0 1 0 1 1   
## 84433 35827 62330 113268 65354 71151 66257 87039 22332 90408 111837   
## 0 1 1 0 1 1 0 0 1 1 1   
## 64958 50777 28950 42943 2168 5704 111970 46512 101751 46306 57465   
## 1 1 0 1 1 1 1 0 0 0 0   
## 1999 15730 79708 80793 105739 105285 9981 81374 85696 51102 116159   
## 1 1 1 0 1 0 1 0 0 1 1   
## 76293 34406 12958 48040 122479 37953 25281 50055 57267 100071 63256   
## 0 1 1 0 1 1 0 0 1 0 0   
## 97071 98498 47500 118500 40962 111523 1177 50739 107366 30364 89102   
## 1 0 0 1 0 0 1 0 0 0 0   
## 50806 111908 12943 29167 114144 62719 46706 120234 29003 25841 121586   
## 0 0 0 1 1 0 0 0 1 1 0   
## 2939 87451 56475 121859 83246 32675 118003 38595 22319 117971 40247   
## 0 1 0 0 1 0 0 0 1 0 1   
## 75809 21756 127196 42486 15662 70086 70924 78734 5646 76335 102504   
## 1 1 1 1 1 1 1 0 1 0 1   
## 69021 21183 119840 41405 87712 61013 71173 45231 129568 70164 39386   
## 0 0 0 1 1 0 1 0 1 1 1   
## 109176 52178 75530 11858 112805 87097 23887 101995 89848 110778 18296   
## 0 1 0 0 0 0 0 0 0 0 0   
## 91659 112448 26178 117747 3621 71000 65473 84929 112653 84031 59637   
## 0 0 1 1 1 0 0 0 0 1 1   
## 129229 108554 82079 19842 63081 51755 51924 91614 31574 103375 62996   
## 0 0 1 1 1 1 1 0 0 0 0   
## 56485 59213 3532 118107 106980 6710 114491 41412 87480 124828 103848   
## 1 1 0 0 0 1 0 1 0 0 1   
## 117942 85955 118986 61750 75790 74995 46577 52736 54310 87647 55750   
## 1 1 0 0 1 0 1 0 1 0 0   
## 97736 115561 108975 53733 88741 99015 64054 59705 78426 93140 116511   
## 0 0 1 0 0 0 0 0 0 1 0   
## 125857 119515 71339 16164 73852 127729 116280 84418 122753 50177 47428   
## 0 1 1 0 1 0 0 0 1 0 0   
## 54710 70569 112293 29862 17502 6036 83855 117019 21137 126988 121493   
## 1 1 0 1 1 0 0 1 1 0 0   
## 21939 27674 95888 71321 99540 114915 91934 107794 77905 42783 82646   
## 1 1 1 1 1 0 1 1 0 0 0   
## 66410 81968 23990 27072 92186 121174 48992 56284 3462 80129 58430   
## 0 0 0 1 1 0 1 1 1 0 0   
## 92920 23283 62169 1529 111718 31989 15500 3990 87363 123326 44977   
## 1 1 1 0 1 1 0 1 1 0 0   
## 124330 120240 7092 105153 105936 12824 43032 22293 13804 68955 90026   
## 0 0 0 1 1 1 0 1 1 0 0   
## 24121 15877 121458 111797 45531 123613 12344 59880 69914 2536 111350   
## 0 1 1 0 0 0 1 0 0 0 1   
## 28227 43102 690 32253 14871 126819 55010 2832 88154 42515 64800   
## 1 0 1 1 0 1 0 0 1 0 1   
## 54611 40003 41580 2701 57109 26627 87554 72904 52542 30453 26677   
## 0 0 1 1 0 0 0 1 1 1 1   
## 55683 74855 82034 80257 75477 113216 81571 124500 11392 54867 105152   
## 1 1 1 1 0 0 0 1 0 0 1   
## 64115 56701 113971 57192 119562 636 16745 40829 62104 124063 51989   
## 0 0 0 1 0 1 0 1 0 0 1   
## 58125 23813 17807 20566 54384 8112 40021 110261 22043 59276 98030   
## 0 1 0 1 1 1 1 0 0 1 0   
## 38789 96095 88848 20380 776 42123 55938 68755 47831 76598 77907   
## 1 0 1 1 1 0 0 1 0 0 0   
## 50595 13078 89189 88095 79700 44664 56566 110911 33767 12552 5458   
## 1 0 0 1 1 1 1 0 0 1 0   
## 70913 84462 965 44750 118347 64897 42999 116518 9804 9526 123170   
## 0 1 1 1 1 0 1 1 0 1 0   
## 11641 17679 53139 99927 6811 79515 33270 92740 12981 107880 112755   
## 1 0 1 1 0 0 1 1 1 0 0   
## 95354 6154 116869 119430 46357 55887 84940 78400 24902 71783 55588   
## 0 0 0 0 0 1 0 1 0 1 0   
## 43718 671 126953 43691 94528 35436 113584 95357 85507 60279 44864   
## 1 1 1 1 0 0 1 1 0 1 0   
## 90758 83609 95514 69855 37700 109338 75048 78826 91695 28720 107195   
## 1 1 1 1 0 0 0 0 0 0 0   
## 148 73889 49154 6326 88914 74290 69395 66224 69374 26606 73802   
## 1 0 1 1 0 0 1 0 1 0 1   
## 34218 52711 124158 13360 91733 78183 87690 101066 79207 68254 36917   
## 0 1 0 1 1 0 0 1 1 1 1   
## 25063 119141 44294 203 65883 2339 46037 119418 111781 81350 41702   
## 1 0 0 0 0 1 0 0 0 1 0   
## 78667 48787 42076 96522 105250 125533 40577 124089 69536 22524 33074   
## 1 0 0 1 1 1 0 0 0 1 0   
## 29974 120301 84608 96770 4019 46340 42661 116542 91280 92541 113107   
## 1 0 1 1 0 0 0 0 0 0 1   
## 104086 125299 101479 3629 129261 116402 34120 97375 57003 29627 96846   
## 0 1 1 1 0 0 1 1 0 1 0   
## 12445 122396 32409 5015 59848 9565 27178 25998 8178 8970 27317   
## 1 1 0 1 1 1 1 1 1 1 0   
## 267 97147 46084 57207 97871 103294 69621 51617 34934 74991 70980   
## 1 0 1 0 0 1 1 1 1 1 1   
## 100728 84920 72301 11221 41131 29938 102710 117400 92324 102836 2064   
## 0 0 1 0 1 0 0 1 1 1 1   
## 27631 52332 56090 129762 66796 50114 28295 5804 42457 34054 10586   
## 1 1 1 1 0 0 1 0 0 0 1   
## 11158 25338 37741 76499 83150 72814 96455 31888 33968 56628 80385   
## 0 0 1 0 1 1 0 0 1 1 1   
## 61534 110366 120126 52460 67394 35203 108542 84312 128136 23351 7527   
## 1 0 0 0 1 0 0 0 0 1 0   
## 13486 39583 125034 100899 114564 28347 100831 45751 30507 60675 25979   
## 1 0 0 0 1 1 0 0 1 0 0   
## 86292 29000 82807 123265 5949 74279 101583 32462 6038 111441 28507   
## 1 0 0 1 1 1 1 1 1 0 1   
## 83386 57656 19796 80153 66005 94622 37591 76257 110993 101872 117024   
## 1 0 1 1 0 0 1 1 0 1 0   
## 654 68713 11100 4196 57804 108060 86286 11068 17087 126778 4347   
## 1 1 0 1 0 1 0 0 0 0 1   
## 98188 31343 56722 71069 123374 72737 111339 68282 60560 63794 7449   
## 1 1 0 1 1 0 0 1 1 0 0   
## 21371 74492 40937 87609 127032 46101 105414 19364 91850 82230 1849   
## 1 0 0 1 1 1 0 1 0 1 0   
## 9679 84009 111864 84628 120757 124215 115099 107325 113620 6620 104087   
## 1 1 0 0 0 0 1 0 0 0 1   
## 89938 86009 47672 35100 61934 4102 102999 124945 9178 124230 103220   
## 1 0 0 0 0 0 1 1 0 0 0   
## 34680 46148 15438 119806 104565 116429 68561 55275 57228 69958 107347   
## 0 1 0 0 1 1 0 1 1 0 0   
## 84486 50147 22474 111302 69077 12668 48573 84242 17414 56179 125852   
## 0 1 1 1 0 0 1 0 0 0 0   
## 114664 42948 59215 104468 23149 120532 51859 21025 92691 113709 125142   
## 0 0 0 0 1 0 0 0 1 0 0   
## 124540 94948 30614 88271 43708 36447 102037 901 76691 9286 63241   
## 1 1 0 1 1 1 1 1 1 0 1   
## 75143 5545 88282 96506 56967 54461 94858 51729 99579 81111 5616   
## 1 0 1 1 0 1 1 0 1 0 1   
## 3659 41286 108006 10940 92695 34074 85913 36627 11813 109529 21638   
## 0 1 1 1 1 0 0 0 0 1 1   
## 52177 66912 63651 11403 6051 48281 32144 108161 11345 16562 62493   
## 1 0 0 1 1 0 1 0 0 1 0   
## 14762 31821 80397 90131 52198 63462 123548 47629 1458 92908 111615   
## 0 0 1 1 1 1 0 0 0 0 0   
## 66797 74036 29688 44319 16254 54545 23581 83893 8190 1744 79351   
## 0 1 0 0 1 0 0 0 0 1 0   
## 81400 118393 114371 117091 34241 41337 57728 71355 115135 70132 7715   
## 1 0 1 0 0 0 0 1 1 1 1   
## 105306 14599 40625 70997 122516 129601 128368 120205 14266 44030 64309   
## 0 1 1 0 0 1 1 0 1 0 1   
## 64834 89909 20405 27827 81170 33408 48345 47013 1122 8922 79670   
## 0 1 1 1 1 0 1 1 1 0 0   
## 9305 15825 82630 36570 82614 37885 4845 18254 80894 15483 37043   
## 1 1 0 1 1 1 1 0 0 0 0   
## 4037 108063 52291 89176 43948 81582 83161 109168 30474 19022 66580   
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## 59040 62729 27946 97758 109778 61732 6582 108025 4419 109853 21417   
## 0 0 0 0 1 1 0 0 1 0 1   
## 22320 69225 68199 87705 42115 84059 73550 54087 37831 42125 120382   
## 0 1 0 0 1 0 1 0 0 0 0   
## 1960 71847 101536 3270 54829 53064 127265 89266 60346 72014 81006   
## 0 0 1 1 1 1 0 1 0 0 1   
## 106992 27361 7816 1474 112751 125048 80778 45369 119153 69833 21987   
## 1 0 0 1 1 1 0 0 1 0 1   
## 76461 1442 118896 5952 84759 73032 9902 5619 4773 89569 79808   
## 1 0 0 1 0 0 0 1 1 1 0   
## 80465 124336 61923 32181 110933 17969 17084 38275 3181 43997 78508   
## 0 1 0 1 0 1 1 1 0 0 0   
## 43307 126488 126971 42023 118459 275 67175 48535 49132 84565 122346   
## 0 0 0 0 1 0 1 0 1 0 0   
## 42295 3056 24619 33608 595 121835 81699 62099 9249 51968 125922   
## 0 1 1 0 1 1 0 0 1 0 1   
## 112876 34388 73821 93795 113436 120669 3743 51541 103980 73576 50261   
## 0 1 0 0 1 0 0 1 0 1 1   
## 121527 95094 58582 102680 12572 73088 8115 8264 414 123727 38759   
## 1 1 0 1 1 0 0 1 0 0 1   
## 74773 97035 1771 110085 64597 103485 44890 100508 24089 11460 86569   
## 0 1 1 0 1 1 1 1 0 1 0   
## 104580 83993 120637 39825 117608 2273 17653 101232 129348 86634 121816   
## 1 0 1 0 1 1 1 0 1 0 0   
## 88578 87982 51017 27096 95390 50146 5086 125785 44547 34544 50430   
## 1 0 1 1 0 0 0 1 0 1 0   
## 122059 41665 51610 103564 38149 123674 27299 78611 59530 78086 118598   
## 1 1 1 1 0 0 1 1 1 1 1   
## 56144 78588 113335 33337 57196 86515 40527 66740 100650   
## 0 1 1 1 1 0 0 0 1   
## Levels: 0 1

#install.packages("stats")  
#install.packages("utils")  
#install.packages("ROCR")  
#library(stats)  
#library(utils)  
#library(ROCR)  
#ConfusionMatrix(predictions, testeo$satisfaction)