Analyze\_19Nov19.R

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#############################################################################  
#### Introduction ####  
  
## Title: F1 Analysis  
## Author: Tyler Campbell  
## Date: Nov 2019  
  
## IMPORTANT:  
# If running full script (and not wanting to overwrite files), avoid 'Write files' section at bottom  
  
## Description:  
# This R script performs analysis of cleaned F1 source data  
# Sections are arranged in alphabetical order and contain section-specific notes  
  
#############################################################################  
  
  
  
  
#### Markdown ####  
  
# ignore this section for normal processing  
# load blank workspace when compiling/knitting  
# extra dots also are added to file paths for compilation purposes, remove when running script  
load("../metadata/workSpace\_Analyze.RData")  
  
  
  
  
#### Load packages ####  
  
library(dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

library(VIM)

## Loading required package: colorspace

## Loading required package: grid

## Loading required package: data.table

##   
## Attaching package: 'data.table'

## The following objects are masked from 'package:dplyr':  
##   
## between, first, last

## VIM is ready to use.   
## Since version 4.0.0 the GUI is in its own package VIMGUI.  
##   
## Please use the package to use the new (and old) GUI.

## Suggestions and bug-reports can be submitted at: https://github.com/alexkowa/VIM/issues

##   
## Attaching package: 'VIM'

## The following object is masked from 'package:datasets':  
##   
## sleep

library(ggplot2)  
library(animation)  
library(randomForest)

## randomForest 4.6-14

## Type rfNews() to see new features/changes/bug fixes.

##   
## Attaching package: 'randomForest'

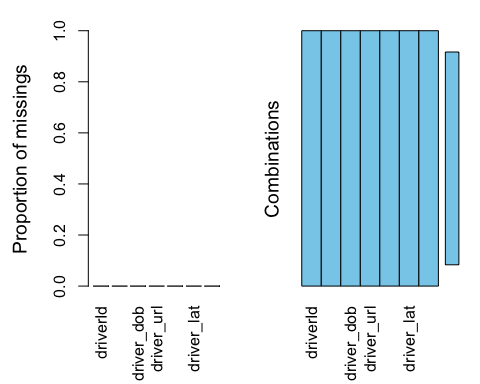
## The following object is masked from 'package:ggplot2':  
##   
## margin

## The following object is masked from 'package:dplyr':  
##   
## combine

library(e1071)  
library(corrplot)

## corrplot 0.84 loaded

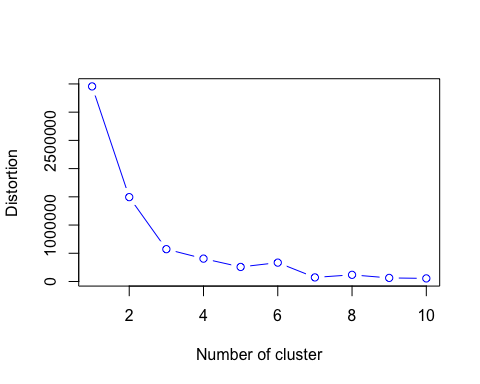
#### Load dataset ####  
resultsHistorical <- read.csv("../Analyzed Data/resultsHistorical.csv")  
  
  
  
  
#### Explore data ####  
  
# confirm no missing values  
aggr(drivers)



## K-means -----------------------------------------------------------------  
  
# incorporate lat long of driver homes to get clusters of where they come from  
# then use cluster association as new feature for prediction  
  
# partition the data  
driversLatLong <- drivers[,c(2, 6:7)]  
  
  
# convert driver name to factor  
driversLatLong$driver\_name <- as.factor(driversLatLong$driver\_name)  
  
  
# set seed for randmozing data  
set.seed(20)  
  
  
# run k-means  
clusters <- kmeans(driversLatLong[,c(2:3)], 4)  
  
  
# inspect cluters  
str(clusters)

## List of 9  
## $ cluster : int [1:848] 1 1 1 1 1 1 1 1 1 1 ...  
## $ centers : num [1:4, 1:2] 21.53 49.66 -28.85 1.42 -86.67 ...  
## ..- attr(\*, "dimnames")=List of 2  
## .. ..$ : chr [1:4] "1" "2" "3" "4"  
## .. ..$ : chr [1:2] "driver\_lat" "driver\_long"  
## $ totss : num 3456348  
## $ withinss : num [1:4] 272829 47434 586 84304  
## $ tot.withinss: num 405152  
## $ betweenss : num 3051196  
## $ size : int [1:4] 248 521 27 52  
## $ iter : int 2  
## $ ifault : int 0  
## - attr(\*, "class")= chr "kmeans"

# plot clusters (attempt multiple times if necessary)  
num\_clusters <- 4  
  
# riverClust <- kmeans.ani(driversLatLong[,c(2:3)], num\_clusters)  
# above line commented out for report compilation purposes  
  
# save the cluster number in the dataset as column 'driverHomeCluster'  
driversLatLong <- driversLatLong %>%  
 mutate(driverCluster = as.factor(clusters$cluster))  
  
  
# create a function that returns the value of totwithinss, and takes inputdataset and number of clusters  
# credit: Dr. Binh Zhang, The University of Arizona  
kmeans.totwithinss.k <- function(dataset, number\_of\_centers){  
 km <- kmeans(dataset, number\_of\_centers)  
 km$tot.withinss  
 }  
  
  
# create a function that returns a series of totwithinss values, and takes input maxk  
# vec is a vector that contains totwithinss values associated with k from 1 to maxk  
# credit: Dr. Binh Zhang, The University of Arizona  
kmeans.distortion <- function(dataset, maxk){  
 vec <- as.vector(1:maxk)  
 vec[1:maxk] <- sapply(1:maxk, kmeans.totwithinss.k, dataset = dataset)  
 return (vec)  
 }  
  
  
# plot elbow curve  
maxk <- 10  
  
dist\_vect <- kmeans.distortion(driversLatLong[,c(2:3)], maxk)  
  
plot(1:maxk, # horizontal axis  
 dist\_vect, # vertical axis  
 type= 'b', # curve  
 col = 'blue',  
 xlab = "Number of cluster",  
 ylab = "Distortion"  
 )



# reintroduce cluster results to resultsHistorical  
driversLatLong <- subset(driversLatLong, select = -c(driver\_lat, driver\_long))  
  
resultsHistorical <- resultsHistorical %>%  
 left\_join(driversLatLong, by = "driver\_name")  
  
  
  
  
#### Predict ####  
  
## Naieve Bayes ------------------------------------------------------------  
  
# review the data  
summary(resultsHistorical)

## result\_finishOrder result\_inThePoints result\_startingGridPosition  
## Min. : 1.00 Mode :logical Min. : 0.00   
## 1st Qu.: 7.00 FALSE:17744 1st Qu.: 5.00   
## Median :13.00 TRUE :7008 Median :11.00   
## Mean :13.07 Mean :11.29   
## 3rd Qu.:19.00 3rd Qu.:17.00   
## Max. :39.00 Max. :34.00   
##   
## driver\_name constructor\_name circuit\_name   
## perez : 544 ferrari : 2182 monza : 1754   
## barrichello : 326 mclaren : 1682 monaco : 1598   
## button : 309 williams : 1379 silverstone: 1318   
## michael\_schumacher: 308 sauber : 975 spa : 1160   
## alonso : 293 team\_lotus: 952 villeneuve : 995   
## raikkonen : 273 tyrrell : 881 nurburgring: 974   
## (Other) :22699 (Other) :16701 (Other) :16953   
## circuit\_city race\_month race\_year race\_round   
## Monza : 1754 Min. : 1.000 Min. :1950 Min. : 1.000   
## Monte-Carlo: 1598 1st Qu.: 5.000 1st Qu.:1975 1st Qu.: 4.000   
## Silverstone: 1318 Median : 7.000 Median :1989 Median : 8.000   
## Spa : 1160 Mean : 6.778 Mean :1988 Mean : 8.214   
## Montreal : 995 3rd Qu.: 9.000 3rd Qu.:2004 3rd Qu.:12.000   
## Nurburg : 974 Max. :12.000 Max. :2017 Max. :21.000   
## (Other) :16953   
## driverAge driver\_homeCountry driver\_lat   
## Min. :-28.00 United Kingdom:4150 Min. :-40.90   
## 1st Qu.: 26.00 Italy :3361 1st Qu.: 37.09   
## Median : 29.00 France :2762 Median : 46.23   
## Mean : 29.54 Germany :2197 Mean : 36.12   
## 3rd Qu.: 33.00 Brazil :1951 3rd Qu.: 53.41   
## Max. : 58.00 Mexico :1296 Max. : 61.92   
## (Other) :9035   
## driver\_long constructor\_homeCountry constructor\_lat   
## Min. :-106.347 United Kingdom:11778 Min. :-40.90   
## 1st Qu.: -3.749 Italy : 5467 1st Qu.: 41.87   
## Median : 2.214 France : 2117 Median : 53.41   
## Mean : -2.031 Switzerland : 983 Mean : 48.15   
## 3rd Qu.: 12.567 Germany : 794 3rd Qu.: 55.38   
## Max. : 174.886 United States : 652 Max. : 61.52   
## (Other) : 2961   
## constructor\_long result\_percentOfPreviousRaceCompleted  
## Min. :-106.347 Min. : 0.00   
## 1st Qu.: -3.436 1st Qu.: 29.00   
## Median : -3.436 Median : 94.00   
## Mean : 5.400 Mean : 67.07   
## 3rd Qu.: 12.567 3rd Qu.:100.00   
## Max. : 174.886 Max. :100.00   
##   
## result\_previousFinishDescrip status\_previousDescrip  
## Finished :13540 Finished :6228   
## Retired : 8460 +1 Lap :3514   
## FailedToFinish: 1293 Engine :1946   
## First race : 848 +2 Laps :1492   
## Withdrew : 277 Accident : 983   
## NotClassified : 183 Did not qualify: 961   
## (Other) : 151 (Other) :9628   
## driver\_preRaceTotPoints driver\_preRaceTotWins driverCluster  
## Min. : 0.00 Min. : 0.0000 1: 5476   
## 1st Qu.: 0.00 1st Qu.: 0.0000 2:17126   
## Median : 1.00 Median : 0.0000 3: 228   
## Mean : 12.25 Mean : 0.2769 4: 1922   
## 3rd Qu.: 10.00 3rd Qu.: 0.0000   
## Max. :374.00 Max. :13.0000   
##

glimpse(resultsHistorical)

## Observations: 24,752  
## Variables: 23  
## $ result\_finishOrder <int> 1, 2, 3, 4, 5, 6, 7, 8, 9,…  
## $ result\_inThePoints <lgl> TRUE, TRUE, TRUE, TRUE, TR…  
## $ result\_startingGridPosition <int> 1, 2, 4, 6, 9, 13, 15, 14,…  
## $ driver\_name <fct> farina, fagioli, reg\_parne…  
## $ constructor\_name <fct> alfa, alfa, alfa, lago, la…  
## $ circuit\_name <fct> silverstone, silverstone, …  
## $ circuit\_city <fct> Silverstone, Silverstone, …  
## $ race\_month <int> 5, 5, 5, 5, 5, 5, 5, 5, 5,…  
## $ race\_year <int> 1950, 1950, 1950, 1950, 19…  
## $ race\_round <int> 1, 1, 1, 1, 1, 1, 1, 1, 1,…  
## $ driverAge <int> 43, 51, 38, 45, 44, 36, 43…  
## $ driver\_homeCountry <fct> Italy, Italy, United Kingd…  
## $ driver\_lat <dbl> 41.87194, 41.87194, 55.378…  
## $ driver\_long <dbl> 12.567380, 12.567380, -3.4…  
## $ constructor\_homeCountry <fct> Italy, Italy, Italy, Franc…  
## $ constructor\_lat <dbl> 41.87194, 41.87194, 41.871…  
## $ constructor\_long <dbl> 12.567380, 12.567380, 12.5…  
## $ result\_percentOfPreviousRaceCompleted <int> 0, 0, 0, 0, 0, 0, 0, 0, 0,…  
## $ result\_previousFinishDescrip <fct> First race, First race, Fi…  
## $ status\_previousDescrip <fct> First race, First race, Fi…  
## $ driver\_preRaceTotPoints <int> 0, 0, 0, 0, 0, 0, 0, 0, 0,…  
## $ driver\_preRaceTotWins <int> 0, 0, 0, 0, 0, 0, 0, 0, 0,…  
## $ driverCluster <fct> 2, 2, 2, 2, 2, 2, 2, 2, 2,…

# clean dataset  
resultsNB <- subset(resultsHistorical, select = -c(  
 result\_finishOrder,driver\_lat, driver\_long, constructor\_lat, constructor\_long)  
 )  
  
  
# partition data for training and testing  
sample\_size <- floor(0.7 \* nrow(resultsNB))  
  
training\_index <- sample(nrow(resultsNB), size = sample\_size, replace = FALSE)  
train <- resultsNB[training\_index,]  
test <- resultsNB[-training\_index,]  
  
  
# check dimensions of partitions  
dim(train)

## [1] 17326 18

dim(test)

## [1] 7426 18

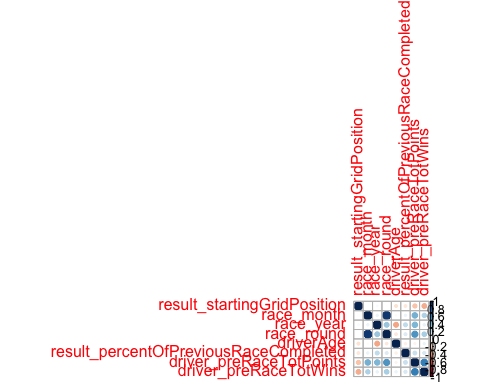
# fit model  
results.model <- naiveBayes(result\_inThePoints ~ . , data = train)  
  
# review model  
results.model

##   
## Naive Bayes Classifier for Discrete Predictors  
##   
## Call:  
## naiveBayes.default(x = X, y = Y, laplace = laplace)  
##   
## A-priori probabilities:  
## Y  
## FALSE TRUE   
## 0.7205933 0.2794067   
##   
## Conditional probabilities:  
## result\_startingGridPosition  
## Y [,1] [,2]  
## FALSE 12.903004 7.414219  
## TRUE 7.328031 5.087480  
##   
## driver\_name  
## Y abate abecassis acheson adamich adams  
## FALSE 1.601922e-04 8.009612e-05 4.805767e-04 1.922307e-03 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00  
## driver\_name  
## Y ader adolff agabashian ahrens alan\_brown  
## FALSE 8.009612e-05 8.009612e-05 3.203845e-04 1.601922e-04 4.805767e-04  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00 2.065689e-04  
## driver\_name  
## Y albers alboreto alesi alguersuari alliot  
## FALSE 2.162595e-03 1.001201e-02 7.609131e-03 2.322787e-03 6.407689e-03  
## TRUE 2.065689e-04 6.403636e-03 1.074158e-02 1.032844e-03 1.032844e-03  
## driver\_name  
## Y allison alonso amati ambrosio amick  
## FALSE 8.009612e-04 5.526632e-03 2.402883e-04 1.201442e-03 1.601922e-04  
## TRUE 4.131378e-04 2.726709e-02 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y amon anderson andersson andre\_pilette andretti  
## FALSE 4.164998e-03 1.361634e-03 2.402883e-04 8.810573e-04 6.407689e-04  
## TRUE 3.718240e-03 8.262756e-04 0.000000e+00 2.065689e-04 4.131378e-04  
## driver\_name  
## Y andrews angelis apicella armi arnold  
## FALSE 8.009612e-05 4.164998e-03 0.000000e+00 8.009612e-05 0.000000e+00  
## TRUE 0.000000e+00 6.816773e-03 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y arnoux arundell ascari ashdown ashley  
## FALSE 6.327593e-03 7.208650e-04 7.208650e-04 8.009612e-05 7.208650e-04  
## TRUE 5.783929e-03 6.197067e-04 3.718240e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y ashmore aston attwood ayulo badoer  
## FALSE 1.601922e-04 1.601922e-04 8.009612e-04 8.009612e-05 3.283941e-03  
## TRUE 0.000000e+00 0.000000e+00 8.262756e-04 2.065689e-04 0.000000e+00  
## driver\_name  
## Y baghetti bailey baldi ball balsa  
## FALSE 1.281538e-03 8.810573e-04 2.082499e-03 8.009612e-05 8.009612e-05  
## TRUE 6.197067e-04 2.065689e-04 8.262756e-04 2.065689e-04 0.000000e+00  
## driver\_name  
## Y bandini banks barbazza barber barilla  
## FALSE 1.281538e-03 2.402883e-04 1.121346e-03 8.009612e-05 6.407689e-04  
## TRUE 2.891964e-03 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y barrichello bartels barth bassi bauer  
## FALSE 1.057269e-02 2.402883e-04 3.203845e-04 0.000000e+00 8.009612e-05  
## TRUE 1.941748e-02 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y baumgartner bayol beaufort beauman bechem  
## FALSE 1.441730e-03 4.004806e-04 1.601922e-03 8.009612e-05 8.009612e-05  
## TRUE 2.065689e-04 2.065689e-04 6.197067e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y behra bell bellof belmondo belso  
## FALSE 2.402883e-03 8.810573e-04 1.041249e-03 1.521826e-03 2.402883e-04  
## TRUE 2.685396e-03 2.065689e-04 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y beltoise beretta berg berger bernard  
## FALSE 3.123748e-03 6.407689e-04 5.606728e-04 6.247497e-03 2.563076e-03  
## TRUE 3.718240e-03 0.000000e+00 0.000000e+00 1.404668e-02 8.262756e-04  
## driver\_name  
## Y bernoldi bertaggia bettenhausen beuttler bianchi  
## FALSE 1.682018e-03 4.004806e-04 4.004806e-04 1.682018e-03 9.611534e-04  
## TRUE 0.000000e+00 0.000000e+00 4.131378e-04 0.000000e+00 4.131378e-04  
## driver\_name  
## Y bianco bill\_moss binder biondetti bira  
## FALSE 2.402883e-04 8.009612e-05 7.208650e-04 0.000000e+00 8.009612e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y birger bisch blanchard bleekemolen blignaut  
## FALSE 1.601922e-04 8.009612e-05 8.009612e-05 4.004806e-04 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y blokdyk blundell bob\_scott boesel boffa  
## FALSE 8.009612e-05 2.883460e-03 3.203845e-04 1.521826e-03 8.009612e-05  
## TRUE 0.000000e+00 2.065689e-03 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y bondurant bonetto bonnier bonomi bordeu  
## FALSE 3.203845e-04 6.407689e-04 5.046055e-03 8.009612e-05 8.009612e-05  
## TRUE 2.065689e-04 6.197067e-04 2.272258e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y borgudd botha bottas boullion bourdais  
## FALSE 7.208650e-04 8.009612e-05 2.082499e-03 4.004806e-04 1.121346e-03  
## TRUE 0.000000e+00 0.000000e+00 9.089031e-03 4.131378e-04 6.197067e-04  
## driver\_name  
## Y boutsen boyd brabham brack brambilla  
## FALSE 6.567881e-03 4.004806e-04 1.922307e-03 1.601922e-04 3.684421e-03  
## TRUE 5.783929e-03 2.065689e-04 0.000000e+00 0.000000e+00 1.445982e-03  
## driver\_name  
## Y branca brancatelli brandon branson  
## FALSE 1.601922e-04 2.402883e-04 2.402883e-04 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04  
## driver\_name  
## Y brendon\_hartley bridger brise bristow  
## FALSE 8.009612e-05 0.000000e+00 4.805767e-04 2.402883e-04  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00  
## driver\_name  
## Y broeker brooks brown brudes brundle  
## FALSE 8.009612e-05 1.441730e-03 0.000000e+00 8.009612e-05 7.288746e-03  
## TRUE 0.000000e+00 2.685396e-03 0.000000e+00 0.000000e+00 4.751084e-03  
## driver\_name  
## Y bruni bruno\_senna bryan bucci bucknum  
## FALSE 9.611534e-04 2.002403e-03 2.402883e-04 3.203845e-04 2.402883e-04  
## TRUE 0.000000e+00 1.445982e-03 4.131378e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y bueb buemi bueno burgess burti  
## FALSE 4.004806e-04 2.322787e-03 8.009612e-05 1.121346e-03 6.407689e-04  
## TRUE 0.000000e+00 2.685396e-03 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y bussinello button byrne cabantous cabianca  
## FALSE 3.203845e-04 8.169804e-03 2.402883e-04 6.407689e-04 2.402883e-04  
## TRUE 0.000000e+00 2.416856e-02 0.000000e+00 2.065689e-04 2.065689e-04  
## driver\_name  
## Y cabral cade caffi campbell-jones campos  
## FALSE 2.402883e-04 0.000000e+00 4.325190e-03 2.402883e-04 1.201442e-03  
## TRUE 0.000000e+00 0.000000e+00 6.197067e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y Cannoc cantoni cantrell capelli carini  
## FALSE 8.009612e-05 2.402883e-04 8.009612e-05 4.645575e-03 1.601922e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 1.859120e-03 0.000000e+00  
## driver\_name  
## Y castellotti cecotto cesaris cevert chaboud  
## FALSE 5.606728e-04 1.201442e-03 1.097317e-02 1.922307e-03 8.009612e-05  
## TRUE 8.262756e-04 0.000000e+00 2.065689e-03 1.859120e-03 0.000000e+00  
## driver\_name  
## Y chamberlain chandhok Changy chapman charlton  
## FALSE 1.601922e-04 5.606728e-04 8.009612e-05 8.009612e-05 8.810573e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y charrington chaves cheesbourg cheever chiesa  
## FALSE 8.009612e-05 7.208650e-04 2.402883e-04 6.968362e-03 5.606728e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 3.305102e-03 0.000000e+00  
## driver\_name  
## Y chilton chimeri chiron chitwood christie  
## FALSE 1.601922e-03 8.009612e-05 1.041249e-03 0.000000e+00 1.601922e-04  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y claes clapham clark cogan collins  
## FALSE 1.441730e-03 0.000000e+00 1.441730e-03 1.601922e-04 1.682018e-03  
## TRUE 0.000000e+00 0.000000e+00 6.610205e-03 0.000000e+00 8.262756e-04  
## driver\_name  
## Y collomb colombo comas comotti connor  
## FALSE 4.004806e-04 2.402883e-04 3.524229e-03 8.009612e-05 4.004806e-04  
## TRUE 0.000000e+00 0.000000e+00 1.032844e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y constantine cordts corrado\_fabi coulthard courage  
## FALSE 0.000000e+00 8.009612e-05 1.201442e-03 6.647978e-03 1.441730e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 1.776492e-02 8.262756e-04  
## driver\_name  
## Y craft crawford crespo creus crockett  
## FALSE 1.601922e-04 0.000000e+00 8.009612e-05 8.009612e-05 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y crook cross crossley cruz daigh  
## FALSE 8.009612e-05 1.601922e-04 8.009612e-05 0.000000e+00 3.203845e-04  
## TRUE 0.000000e+00 4.131378e-04 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y dalmas daly damon\_hill danner daponte  
## FALSE 2.723268e-03 2.963556e-03 3.924710e-03 2.402883e-03 1.601922e-04  
## TRUE 0.000000e+00 1.239413e-03 8.882462e-03 4.131378e-04 0.000000e+00  
## driver\_name  
## Y darter davidson davies davis daywalt  
## FALSE 4.805767e-04 1.201442e-03 3.203845e-04 8.009612e-05 4.004806e-04  
## TRUE 4.131378e-04 0.000000e+00 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y deletraz dempsey\_wilson dennis\_taylor depailler  
## FALSE 2.402883e-04 1.601922e-04 8.009612e-05 3.684421e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 4.751084e-03  
## driver\_name  
## Y desire\_wilson dick\_rathmann diniz dinsmore dochnal  
## FALSE 8.009612e-05 3.203845e-04 5.046055e-03 3.203845e-04 8.009612e-05  
## TRUE 0.000000e+00 2.065689e-04 1.032844e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y dolhem donnelly donohue doornbos downing  
## FALSE 1.601922e-04 8.810573e-04 8.009612e-04 4.805767e-04 1.601922e-04  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y drake driver drogo dryver duke  
## FALSE 8.009612e-05 1.601922e-04 8.009612e-05 8.009612e-05 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y dumfries duncan duncan\_hamilton dusio  
## FALSE 7.208650e-04 8.009612e-05 4.004806e-04 8.009612e-05  
## TRUE 4.131378e-04 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y eaton ecclestone edmunds edwards elford  
## FALSE 8.810573e-04 8.009612e-05 0.000000e+00 1.041249e-03 5.606728e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 4.131378e-04  
## driver\_name  
## Y elisian emerson\_fittipaldi emery enge  
## FALSE 2.402883e-04 5.126151e-03 1.601922e-04 1.601922e-04  
## TRUE 0.000000e+00 7.023342e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y england ericsson ernesto\_brambilla ertl  
## FALSE 8.009612e-05 4.164998e-03 8.009612e-05 1.762115e-03  
## TRUE 0.000000e+00 6.197067e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y estefano etancelin evans fabi fabre  
## FALSE 2.402883e-04 5.606728e-04 7.208650e-04 2.963556e-03 8.009612e-04  
## TRUE 0.000000e+00 4.131378e-04 0.000000e+00 1.239413e-03 0.000000e+00  
## driver\_name  
## Y facetti fagioli fairman fangio farina  
## FALSE 8.009612e-05 1.601922e-04 6.407689e-04 9.611534e-04 5.606728e-04  
## TRUE 0.000000e+00 8.262756e-04 2.065689e-04 7.023342e-03 3.098533e-03  
## driver\_name  
## Y faulkner filippis firman fischer fisher  
## FALSE 1.601922e-04 3.203845e-04 6.407689e-04 2.402883e-04 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 2.065689e-04 0.000000e+00  
## driver\_name  
## Y fisichella fitch fittipaldi fitzau flaherty  
## FALSE 8.970765e-03 8.009612e-05 2.082499e-03 8.009612e-05 1.601922e-04  
## TRUE 1.074158e-02 0.000000e+00 6.197067e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y flinterman flockhart fohr foitek follmer  
## FALSE 1.601922e-04 7.208650e-04 8.009612e-05 1.281538e-03 6.407689e-04  
## TRUE 0.000000e+00 2.065689e-04 0.000000e+00 0.000000e+00 2.065689e-04  
## driver\_name  
## Y fonder fontana fontes forberg force  
## FALSE 1.601922e-04 2.402883e-04 8.009612e-05 0.000000e+00 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y forini foyt francia freeland frentzen  
## FALSE 1.601922e-04 1.601922e-04 1.601922e-04 3.203845e-04 5.526632e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04 9.089031e-03  
## driver\_name  
## Y frere friesacher fry fushida gabbiani  
## FALSE 5.606728e-04 7.208650e-04 8.009612e-05 8.009612e-05 6.407689e-04  
## TRUE 2.065689e-04 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y gachot gaillard galica galli galvez  
## FALSE 4.325190e-03 2.402883e-04 1.601922e-04 1.041249e-03 0.000000e+00  
## TRUE 4.131378e-04 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04  
## driver\_name  
## Y gamble ganley garde gardner garrett  
## FALSE 8.009612e-05 2.002403e-03 1.041249e-03 2.402883e-04 1.601922e-04  
## TRUE 0.000000e+00 6.197067e-04 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y gartner gary\_brabham gasly gavin gaze  
## FALSE 5.606728e-04 1.601922e-04 3.203845e-04 3.203845e-04 3.203845e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 4.131378e-04 0.000000e+00  
## driver\_name  
## Y geki gendebien gene george george\_amick  
## FALSE 1.601922e-04 7.208650e-04 2.162595e-03 8.009612e-05 0.000000e+00  
## TRUE 0.000000e+00 1.032844e-03 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y george\_connor georges\_berger gerard gerini  
## FALSE 1.601922e-04 1.601922e-04 4.004806e-04 3.203845e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04  
## driver\_name  
## Y gethin ghinzani giacomelli gibson  
## FALSE 1.521826e-03 6.007209e-03 4.565479e-03 8.009612e-05  
## TRUE 4.131378e-04 0.000000e+00 1.032844e-03 0.000000e+00  
## driver\_name  
## Y gilles\_villeneuve gimax ginther giovinazzi  
## FALSE 2.883460e-03 8.009612e-05 1.281538e-03 1.601922e-04  
## TRUE 3.098533e-03 0.000000e+00 3.718240e-03 0.000000e+00  
## driver\_name  
## Y giunti glock godia goethals goldsmith  
## FALSE 2.402883e-04 4.405286e-03 7.208650e-04 8.009612e-05 8.009612e-05  
## TRUE 0.000000e+00 2.065689e-03 4.131378e-04 0.000000e+00 2.065689e-04  
## driver\_name  
## Y gonzalez gordini gould gounon graffenried  
## FALSE 7.208650e-04 8.009612e-05 8.810573e-04 5.606728e-04 1.121346e-03  
## TRUE 3.098533e-03 0.000000e+00 2.065689e-04 0.000000e+00 4.131378e-04  
## driver\_name  
## Y graham\_whitehead grassi green greene  
## FALSE 8.009612e-05 1.121346e-03 8.009612e-05 4.004806e-04  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00  
## driver\_name  
## Y gregory griffith grignard grim grosjean  
## FALSE 2.322787e-03 1.601922e-04 8.009612e-05 8.009612e-05 3.844614e-03  
## TRUE 6.197067e-04 0.000000e+00 0.000000e+00 0.000000e+00 6.816773e-03  
## driver\_name  
## Y grouillard gubby guelfi guerra guerrero  
## FALSE 3.764517e-03 8.009612e-05 8.009612e-05 2.402883e-04 1.601922e-03  
## TRUE 2.065689e-04 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y gugelmin gurney gutierrez guy\_mairesse hahne  
## FALSE 5.046055e-03 3.043652e-03 1.337605e-02 2.402883e-04 2.402883e-04  
## TRUE 6.197067e-04 4.337947e-03 6.197067e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y hailwood hakkinen halford hall hamilton  
## FALSE 1.762115e-03 4.485382e-03 4.004806e-04 3.203845e-04 2.402883e-03  
## TRUE 1.652551e-03 1.053501e-02 0.000000e+00 4.131378e-04 2.561454e-02  
## driver\_name  
## Y hampshire hanks hans\_stuck hansgen harris  
## FALSE 8.009612e-05 2.402883e-04 3.203845e-04 1.601922e-04 8.009612e-05  
## TRUE 0.000000e+00 4.131378e-04 0.000000e+00 2.065689e-04 0.000000e+00  
## driver\_name  
## Y harrison hart hartley haryanto hasemi  
## FALSE 8.009612e-05 8.009612e-05 5.606728e-04 7.208650e-04 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y hattori hawkins hawthorn hayje heeks  
## FALSE 0.000000e+00 2.402883e-04 1.121346e-03 4.805767e-04 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 4.957653e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y heidfeld helfrich hellings henry\_taylor henton  
## FALSE 6.167401e-03 2.402883e-04 8.009612e-05 5.606728e-04 2.002403e-03  
## TRUE 9.502169e-03 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y herbert herman herrmann hesnault heyer  
## FALSE 7.689227e-03 3.203845e-04 1.041249e-03 9.611534e-04 8.009612e-05  
## TRUE 4.337947e-03 0.000000e+00 8.262756e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y hill hirt hobbs hocking hoffmann  
## FALSE 6.968362e-03 3.203845e-04 4.805767e-04 8.009612e-05 4.004806e-04  
## TRUE 8.882462e-03 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y holland holmes homeier hoshino hoyt  
## FALSE 8.009612e-05 8.009612e-05 8.009612e-05 8.009612e-05 8.009612e-05  
## TRUE 2.065689e-04 0.000000e+00 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y hulkenberg hulme hunt hurtubise hutchison  
## FALSE 3.203845e-03 2.482980e-03 3.283941e-03 8.009612e-05 8.009612e-05  
## TRUE 1.156786e-02 8.262756e-03 5.577360e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y ian\_scheckter ian\_stewart ickx ide iglesias  
## FALSE 1.281538e-03 0.000000e+00 4.565479e-03 3.203845e-04 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 5.164222e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y inoue ireland irvine irwin jabouille  
## FALSE 9.611534e-04 2.162595e-03 5.927113e-03 4.805767e-04 2.963556e-03  
## TRUE 0.000000e+00 2.065689e-03 6.816773e-03 2.065689e-04 4.131378e-04  
## driver\_name  
## Y jack\_brabham jackson james jarier jean  
## FALSE 4.325190e-03 1.601922e-04 1.601922e-04 7.288746e-03 8.009612e-05  
## TRUE 8.056187e-03 0.000000e+00 0.000000e+00 2.065689e-03 0.000000e+00  
## driver\_name  
## Y jerry\_unser jimmy\_stewart jo\_schlesser joachim\_winkelhock  
## FALSE 8.009612e-05 8.009612e-05 1.601922e-04 4.805767e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y johansson john\_barber john\_james johnson johnstone  
## FALSE 4.325190e-03 0.000000e+00 0.000000e+00 3.203845e-04 0.000000e+00  
## TRUE 3.718240e-03 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00  
## driver\_name  
## Y jolyon\_palmer jones jover jules\_bianchi karch  
## FALSE 1.682018e-03 4.965959e-03 8.009612e-05 1.922307e-03 8.009612e-05  
## TRUE 4.131378e-04 5.577360e-03 0.000000e+00 2.065689e-04 0.000000e+00  
## driver\_name  
## Y karthikeyan katayama kavanagh keegan keizan  
## FALSE 2.643172e-03 5.286344e-03 0.000000e+00 2.242691e-03 1.601922e-04  
## TRUE 2.065689e-04 6.197067e-04 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y keke\_rosberg keller kelly ken\_miles kennedy  
## FALSE 4.965959e-03 3.203845e-04 8.009612e-05 0.000000e+00 3.203845e-04  
## TRUE 4.957653e-03 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y kessel kessler kevin\_magnussen kiesa  
## FALSE 4.004806e-04 8.009612e-05 2.322787e-03 4.004806e-04  
## TRUE 0.000000e+00 0.000000e+00 2.685396e-03 0.000000e+00  
## driver\_name  
## Y kinnunen kladis klenk klerk klien  
## FALSE 4.004806e-04 0.000000e+00 8.009612e-05 2.402883e-04 2.242691e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 1.445982e-03  
## driver\_name  
## Y kling klodwig kobayashi koinigg kovalainen  
## FALSE 2.402883e-04 1.601922e-04 2.723268e-03 1.601922e-04 4.245094e-03  
## TRUE 6.197067e-04 0.000000e+00 3.924809e-03 0.000000e+00 4.544516e-03  
## driver\_name  
## Y kozarowitzky krause kubica kuhnke kvyat  
## FALSE 8.009612e-05 1.601922e-04 1.361634e-03 1.601922e-04 2.803364e-03  
## TRUE 0.000000e+00 0.000000e+00 5.783929e-03 0.000000e+00 3.718240e-03  
## driver\_name  
## Y la\_caze laffite lagorce lammers lamy  
## FALSE 0.000000e+00 6.968362e-03 8.009612e-05 2.002403e-03 2.002403e-03  
## TRUE 0.000000e+00 8.056187e-03 0.000000e+00 0.000000e+00 2.065689e-04  
## driver\_name  
## Y landi lang langes larini larrauri  
## FALSE 3.203845e-04 8.009612e-05 8.810573e-04 3.684421e-03 1.041249e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 4.131378e-04 0.000000e+00  
## driver\_name  
## Y larreta larrousse larson lauda laurent  
## FALSE 8.009612e-05 1.601922e-04 1.601922e-04 6.007209e-03 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 9.708738e-03 0.000000e+00  
## driver\_name  
## Y lavaggi lawrence leclere lederle lees  
## FALSE 4.805767e-04 1.601922e-04 3.203845e-04 1.601922e-04 7.208650e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00  
## driver\_name  
## Y legat lehto lennep leoni leslie\_johnson  
## FALSE 1.601922e-04 3.444133e-03 4.004806e-04 4.004806e-04 0.000000e+00  
## TRUE 0.000000e+00 4.131378e-04 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y leston levegh levrett lewis lewis-evans  
## FALSE 2.402883e-04 4.004806e-04 0.000000e+00 4.805767e-04 5.606728e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04 2.065689e-04  
## driver\_name  
## Y ligier linden lippi liuzzi lof  
## FALSE 5.606728e-04 5.606728e-04 8.009612e-05 4.485382e-03 8.009612e-05  
## TRUE 2.065689e-04 4.131378e-04 0.000000e+00 1.239413e-03 0.000000e+00  
## driver\_name  
## Y lombardi londono loof lotterer louveau  
## FALSE 1.121346e-03 8.009612e-05 0.000000e+00 8.009612e-05 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y love lovely loyer lucas lucienbonnet  
## FALSE 3.203845e-04 5.606728e-04 0.000000e+00 8.009612e-05 0.000000e+00  
## TRUE 2.065689e-04 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y lunger macdowel mackay-fraser mackey macklin  
## FALSE 2.322787e-03 0.000000e+00 0.000000e+00 8.009612e-05 1.041249e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y magee maggs magill maglioli magnussen  
## FALSE 1.601922e-04 1.041249e-03 1.601922e-04 4.805767e-04 1.441730e-03  
## TRUE 0.000000e+00 1.239413e-03 0.000000e+00 4.131378e-04 2.065689e-04  
## driver\_name  
## Y mairesse maldonado manfred\_winkelhock mansell  
## FALSE 4.004806e-04 4.405286e-03 3.283941e-03 5.766920e-03  
## TRUE 4.131378e-04 1.859120e-03 0.000000e+00 1.301384e-02  
## driver\_name  
## Y mantovani mantz manzon marimon mario\_andretti  
## FALSE 4.004806e-04 0.000000e+00 1.601922e-03 5.606728e-04 5.606728e-03  
## TRUE 2.065689e-04 0.000000e+00 6.197067e-04 4.131378e-04 5.577360e-03  
## driver\_name  
## Y marko markus\_winkelhock marques marr  
## FALSE 6.407689e-04 8.009612e-05 1.361634e-03 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y marsh martin martini mass massa  
## FALSE 7.208650e-04 1.601922e-04 6.007209e-03 5.206247e-03 6.087305e-03  
## TRUE 0.000000e+00 0.000000e+00 1.652551e-03 4.957653e-03 2.437513e-02  
## driver\_name  
## Y matta max\_verstappen may mayer mazet  
## FALSE 1.361634e-03 1.041249e-03 1.601922e-04 8.009612e-05 8.009612e-05  
## TRUE 0.000000e+00 5.164222e-03 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y mazzacane mcalpine mccarthy mccoy mcdowell  
## FALSE 1.121346e-03 4.004806e-04 5.606728e-04 8.009612e-05 1.601922e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y mcgrath mcguire mclaren mcnish mcrae  
## FALSE 8.009612e-05 0.000000e+00 3.203845e-03 8.009612e-04 8.009612e-05  
## TRUE 6.197067e-04 0.000000e+00 8.056187e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y mcwithey menditeguy merhi merzario  
## FALSE 8.009612e-05 4.004806e-04 7.208650e-04 4.004806e-03  
## TRUE 0.000000e+00 2.065689e-04 0.000000e+00 1.032844e-03  
## driver\_name  
## Y michael\_schumacher mieres migault mike\_taylor  
## FALSE 4.405286e-03 8.009612e-04 5.606728e-04 1.601922e-04  
## TRUE 2.953935e-02 8.262756e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y miles milhoux miller mitter modena  
## FALSE 9.611534e-04 8.009612e-05 1.601922e-04 2.402883e-04 4.084902e-03  
## TRUE 2.065689e-04 0.000000e+00 0.000000e+00 2.065689e-04 6.197067e-04  
## driver\_name  
## Y monarch montagny monteiro montermini monteverdi  
## FALSE 8.009612e-05 5.606728e-04 1.922307e-03 1.521826e-03 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y montoya morbidelli moreno morgan moser  
## FALSE 2.002403e-03 3.203845e-03 3.684421e-03 8.009612e-05 9.611534e-04  
## TRUE 8.262756e-03 6.197067e-04 1.032844e-03 0.000000e+00 2.065689e-04  
## driver\_name  
## Y moss munaron murray musso nakajima  
## FALSE 2.402883e-03 2.402883e-04 3.203845e-04 6.407689e-04 1.682018e-03  
## TRUE 4.337947e-03 0.000000e+00 0.000000e+00 1.445982e-03 1.032844e-03  
## driver\_name  
## Y nakano nalon nannini naspetti nasr  
## FALSE 1.682018e-03 2.402883e-04 3.364037e-03 3.203845e-04 1.762115e-03  
## TRUE 2.065689e-04 0.000000e+00 2.891964e-03 0.000000e+00 8.262756e-04  
## driver\_name  
## Y natili naylor nazaruk needell nelleman  
## FALSE 1.601922e-04 5.606728e-04 0.000000e+00 1.601922e-04 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y neve nicholson niday niedermayr niemann  
## FALSE 8.009612e-04 8.009612e-05 0.000000e+00 8.009612e-05 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y nilsson noda nuckey obrien ocon  
## FALSE 1.281538e-03 2.402883e-04 1.601922e-04 8.009612e-05 5.606728e-04  
## TRUE 1.445982e-03 0.000000e+00 0.000000e+00 0.000000e+00 2.272258e-03  
## driver\_name  
## Y oliver ongais opel orey oscar\_gonzalez  
## FALSE 3.043652e-03 4.004806e-04 7.208650e-04 2.402883e-04 0.000000e+00  
## TRUE 8.262756e-04 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y owen pace pagani paletti palm  
## FALSE 8.009612e-05 3.444133e-03 0.000000e+00 6.407689e-04 1.601922e-04  
## TRUE 0.000000e+00 2.478827e-03 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y palmer panis pantano papis parker  
## FALSE 4.645575e-03 6.647978e-03 8.009612e-04 1.601922e-04 0.000000e+00  
## TRUE 1.239413e-03 4.131378e-03 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y parkes parnell parsons patrese paul\_russo  
## FALSE 1.601922e-04 3.203845e-04 4.805767e-04 1.081298e-02 3.203845e-04  
## TRUE 4.131378e-04 0.000000e+00 4.131378e-04 1.032844e-02 8.262756e-04  
## driver\_name  
## Y pease penske perdisa perez perkins  
## FALSE 1.601922e-04 1.601922e-04 4.004806e-04 1.297557e-02 8.009612e-04  
## TRUE 0.000000e+00 0.000000e+00 6.197067e-04 4.606486e-02 0.000000e+00  
## driver\_name  
## Y pescarolo pesenti\_rossi peter\_walker peters peterson  
## FALSE 3.203845e-03 3.203845e-04 2.402883e-04 8.009612e-05 4.805767e-03  
## TRUE 6.197067e-04 0.000000e+00 0.000000e+00 0.000000e+00 6.403636e-03  
## driver\_name  
## Y petrov phil\_hill pian pic picard  
## FALSE 2.402883e-03 1.762115e-03 0.000000e+00 2.082499e-03 0.000000e+00  
## TRUE 1.859120e-03 3.098533e-03 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y pieterse pietsch pilette piotti piper  
## FALSE 1.601922e-04 1.601922e-04 2.402883e-04 4.004806e-04 1.601922e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y piquet piquet\_jr pirocchi pironi pirro  
## FALSE 5.686824e-03 1.361634e-03 8.009612e-05 2.643172e-03 2.162595e-03  
## TRUE 1.404668e-02 6.197067e-04 0.000000e+00 4.131378e-03 4.131378e-04  
## driver\_name  
## Y pizzonia poele pollet pon poore  
## FALSE 8.009612e-04 1.521826e-03 2.402883e-04 0.000000e+00 8.009612e-05  
## TRUE 6.197067e-04 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04  
## driver\_name  
## Y portago posey pozzi pretorius prinoth  
## FALSE 1.601922e-04 8.009612e-05 8.009612e-05 1.601922e-04 8.009612e-05  
## TRUE 4.131378e-04 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y prophet prost pryce purley puzey  
## FALSE 8.009612e-05 4.405286e-03 1.922307e-03 6.407689e-04 8.009612e-05  
## TRUE 0.000000e+00 1.921091e-02 1.445982e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y quester raby rahal raikkonen  
## FALSE 8.009612e-05 4.004806e-04 1.601922e-04 4.485382e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 2.602768e-02  
## driver\_name  
## Y ralf\_schumacher ramos raphanel rathmann  
## FALSE 4.965959e-03 4.805767e-04 1.281538e-03 4.805767e-04  
## TRUE 1.218756e-02 2.065689e-04 0.000000e+00 8.262756e-04  
## driver\_name  
## Y ratzenberger ray\_crawford rebaque redman reece  
## FALSE 1.601922e-04 1.601922e-04 1.297557e-02 6.407689e-04 4.805767e-04  
## TRUE 0.000000e+00 0.000000e+00 2.891964e-03 4.131378e-04 0.000000e+00  
## driver\_name  
## Y reed rees reg\_parnell regazzoni resta  
## FALSE 8.009612e-05 8.009612e-05 1.601922e-04 4.885863e-03 1.922307e-03  
## TRUE 0.000000e+00 0.000000e+00 6.197067e-04 7.229911e-03 3.924809e-03  
## driver\_name  
## Y reutemann reventlow revson rhodes ribeiro  
## FALSE 4.405286e-03 3.203845e-04 1.121346e-03 8.009612e-05 1.361634e-03  
## TRUE 8.675893e-03 0.000000e+00 1.859120e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y ricardo\_rodriguez ricciardo richardson riess  
## FALSE 9.611534e-04 2.883460e-03 8.009612e-05 0.000000e+00  
## TRUE 1.239413e-03 1.136129e-02 0.000000e+00 0.000000e+00  
## driver\_name  
## Y rigsby rindt riseley\_prichard riu  
## FALSE 0.000000e+00 2.242691e-03 8.009612e-05 8.009612e-05  
## TRUE 0.000000e+00 2.685396e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y robarts rodriguez roig rol rollinson  
## FALSE 1.601922e-04 6.407689e-03 4.004806e-04 4.004806e-04 8.009612e-05  
## TRUE 0.000000e+00 1.177443e-02 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y rolt roos rooyen rosa rosberg  
## FALSE 1.601922e-04 0.000000e+00 8.009612e-05 5.446536e-03 4.565479e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 1.652551e-03 1.755836e-02  
## driver\_name  
## Y rose rosier rosset rossi rothengatter  
## FALSE 8.009612e-05 1.842211e-03 1.601922e-03 2.402883e-04 1.441730e-03  
## TRUE 2.065689e-04 8.262756e-04 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y ruby russo ruttman ryan sachs  
## FALSE 1.601922e-04 1.601922e-04 4.004806e-04 8.009612e-05 2.402883e-04  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y said sainz sala salazar salo  
## FALSE 8.009612e-05 2.162595e-03 1.682018e-03 1.842211e-03 5.286344e-03  
## TRUE 0.000000e+00 4.131378e-03 0.000000e+00 2.065689e-04 1.652551e-03  
## driver\_name  
## Y salvadori sanesi sarrazin sato  
## FALSE 2.402883e-03 3.203845e-04 8.009612e-05 4.164998e-03  
## TRUE 1.445982e-03 2.065689e-04 0.000000e+00 2.065689e-03  
## driver\_name  
## Y satoru\_nakajima scarborough scarfiotti scarlatti  
## FALSE 3.844614e-03 1.601922e-04 5.606728e-04 7.208650e-04  
## TRUE 2.065689e-03 0.000000e+00 4.131378e-04 0.000000e+00  
## driver\_name  
## Y scheckter schell schenken scherrer schiattarella  
## FALSE 2.883460e-03 2.803364e-03 1.762115e-03 8.009612e-05 4.805767e-04  
## TRUE 7.023342e-03 2.065689e-03 6.197067e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y schiller schindler schlesser schneider schoeller  
## FALSE 1.601922e-04 2.402883e-04 8.009612e-05 1.762115e-03 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y schroeder schuppan scott\_Brown scotti seidel  
## FALSE 8.009612e-05 7.208650e-04 8.009612e-05 8.009612e-05 8.009612e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y seiffert senna serafini serra serrurier  
## FALSE 1.601922e-04 3.604325e-03 0.000000e+00 1.601922e-03 1.601922e-04  
## TRUE 0.000000e+00 1.363355e-02 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y settember sharp shawe\_taylor shelby shelly  
## FALSE 6.407689e-04 3.203845e-04 1.601922e-04 4.004806e-04 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y siffert simon slotemaker solana sommer  
## FALSE 3.684421e-03 4.004806e-04 8.009612e-05 1.682018e-03 1.601922e-04  
## TRUE 2.685396e-03 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y sospiri south sparken speed spence  
## FALSE 0.000000e+00 0.000000e+00 0.000000e+00 1.682018e-03 1.281538e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 1.032844e-03  
## driver\_name  
## Y stacey starrabba stevens stevenson stewart  
## FALSE 2.402883e-04 1.601922e-04 8.009612e-04 4.805767e-04 2.643172e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 7.229911e-03  
## driver\_name  
## Y stohr stommelen streiff stroll stuck  
## FALSE 4.004806e-04 3.283941e-03 2.563076e-03 8.009612e-04 3.684421e-03  
## TRUE 0.000000e+00 1.032844e-03 6.197067e-04 1.032844e-03 1.652551e-03  
## driver\_name  
## Y stuppacher sullivan surer surtees sutcliffe  
## FALSE 2.402883e-04 5.606728e-04 4.325190e-03 4.084902e-03 8.009612e-05  
## TRUE 0.000000e+00 2.065689e-04 1.652551e-03 7.023342e-03 0.000000e+00  
## driver\_name  
## Y sutil sutton suzuki swaters sweikert  
## FALSE 5.286344e-03 1.601922e-04 5.206247e-03 4.004806e-04 2.402883e-04  
## TRUE 3.718240e-03 0.000000e+00 6.197067e-04 0.000000e+00 2.065689e-04  
## driver\_name  
## Y takagi takahara takahashi tambay taramazzo  
## FALSE 1.682018e-03 1.601922e-04 8.009612e-05 4.645575e-03 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 4.131378e-03 0.000000e+00  
## driver\_name  
## Y tarquini taruffi taylor teague templeman  
## FALSE 4.645575e-03 5.606728e-04 2.402883e-04 2.402883e-04 1.601922e-04  
## TRUE 0.000000e+00 1.445982e-03 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y terra testut thackwell thiele thompson  
## FALSE 1.601922e-04 8.009612e-05 2.402883e-04 1.601922e-04 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y thomson thorne tingelstad tingle titterington  
## FALSE 3.203845e-04 8.009612e-05 8.009612e-05 3.203845e-04 8.009612e-05  
## TRUE 4.131378e-04 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y tolan tom\_jones tomaso tornaco toshio\_suzuki  
## FALSE 2.402883e-04 0.000000e+00 1.601922e-04 1.601922e-04 1.601922e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y trevor\_taylor trimmer trintignant trips trulli  
## FALSE 1.682018e-03 2.402883e-04 3.684421e-03 8.009612e-04 9.771726e-03  
## TRUE 4.131378e-04 0.000000e+00 2.891964e-03 1.859120e-03 1.074158e-02  
## driver\_name  
## Y tuero tunmer turner ulmen unser  
## FALSE 7.208650e-04 8.009612e-05 1.601922e-04 8.009612e-05 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y uria vaccarella vandoorne veith vergne  
## FALSE 8.009612e-05 4.004806e-04 1.041249e-03 2.402883e-04 2.803364e-03  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00 2.065689e-03  
## driver\_name  
## Y verstappen vettel vic\_wilson villeneuve villeneuve\_sr  
## FALSE 5.686824e-03 2.723268e-03 8.009612e-05 6.007209e-03 1.601922e-04  
## TRUE 8.262756e-04 2.189630e-02 0.000000e+00 7.849618e-03 0.000000e+00  
## driver\_name  
## Y villoresi villota volonterio vonlanthen vos  
## FALSE 1.361634e-03 5.606728e-04 8.009612e-05 0.000000e+00 0.000000e+00  
## TRUE 2.272258e-03 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y vukovich vyver wacker walker wallard  
## FALSE 8.009612e-05 8.009612e-05 8.009612e-05 7.208650e-04 8.009612e-05  
## TRUE 6.197067e-04 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y walt\_brown walter ward warwick watson  
## FALSE 8.009612e-05 8.009612e-05 6.407689e-04 7.529035e-03 6.407689e-03  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 4.957653e-03 6.403636e-03  
## driver\_name  
## Y webb webber wehrlein weidler weiler  
## FALSE 3.203845e-04 5.686824e-03 2.402883e-03 2.402883e-04 0.000000e+00  
## TRUE 0.000000e+00 1.611237e-02 2.065689e-04 0.000000e+00 0.000000e+00  
## driver\_name  
## Y wendlinger westbury weyant wharton whiteaway  
## FALSE 2.162595e-03 8.009612e-05 1.601922e-04 1.201442e-03 8.009612e-05  
## TRUE 1.032844e-03 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00  
## driver\_name  
## Y whitehead whitehouse widdows wietzes wilds  
## FALSE 8.810573e-04 8.009612e-05 0.000000e+00 8.009612e-05 4.805767e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## driver\_name  
## Y williams williamson wilson wilson\_fittipaldi  
## FALSE 8.009612e-05 8.009612e-05 6.407689e-04 2.162595e-03  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 4.131378e-04  
## driver\_name  
## Y wisell wunderink wurz yamamoto yoong  
## FALSE 9.611534e-04 3.203845e-04 3.604325e-03 1.361634e-03 8.810573e-04  
## TRUE 6.197067e-04 0.000000e+00 2.065689e-03 0.000000e+00 0.000000e+00  
## driver\_name  
## Y zanardi zapico zonta zorzi zunino  
## FALSE 2.643172e-03 0.000000e+00 2.162595e-03 1.601922e-04 5.606728e-04  
## TRUE 0.000000e+00 0.000000e+00 4.131378e-04 0.000000e+00 0.000000e+00  
##   
## constructor\_name  
## Y adams afm ags alfa alta  
## FALSE 8.009612e-05 4.004806e-04 6.968362e-03 1.153384e-02 3.203845e-04  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 6.816773e-03 0.000000e+00  
## constructor\_name  
## Y amon apollon arrows arzani-volpini aston\_martin  
## FALSE 3.203845e-04 8.009612e-05 2.931518e-02 0.000000e+00 7.208650e-04  
## TRUE 0.000000e+00 0.000000e+00 1.053501e-02 0.000000e+00 0.000000e+00  
## constructor\_name  
## Y ats bar behra-porsche bellasi benetton  
## FALSE 8.970765e-03 9.211053e-03 1.601922e-04 4.004806e-04 1.690028e-02  
## TRUE 2.065689e-04 9.915307e-03 0.000000e+00 0.000000e+00 3.057220e-02  
## constructor\_name  
## Y bmw bmw\_sauber boro brabham  
## FALSE 4.805767e-04 3.283941e-03 4.004806e-04 3.227873e-02  
## TRUE 0.000000e+00 9.295600e-03 0.000000e+00 2.375542e-02  
## constructor\_name  
## Y brabham-alfa\_romeo brabham-brm brabham-climax brabham-ford  
## FALSE 3.123748e-03 1.762115e-03 3.764517e-03 2.563076e-03  
## TRUE 1.239413e-03 1.239413e-03 3.098533e-03 2.065689e-03  
## constructor\_name  
## Y brabham-repco brawn brm brm-ford bromme  
## FALSE 2.563076e-03 1.601922e-04 2.803364e-02 8.009612e-05 3.203845e-04  
## TRUE 5.577360e-03 4.751084e-03 2.396199e-02 0.000000e+00 0.000000e+00  
## constructor\_name  
## Y brp bugatti butterworth caterham cisitalia  
## FALSE 6.407689e-04 8.009612e-05 2.402883e-04 6.007209e-03 8.009612e-05  
## TRUE 8.262756e-04 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## constructor\_name  
## Y coloni connaught connew cooper  
## FALSE 4.565479e-03 2.883460e-03 8.009612e-05 5.206247e-03  
## TRUE 0.000000e+00 4.131378e-04 0.000000e+00 2.272258e-03  
## constructor\_name  
## Y cooper-alfa\_romeo cooper-ats cooper-borgward cooper-brm  
## FALSE 8.009612e-05 0.000000e+00 1.601922e-04 7.208650e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 6.197067e-04  
## constructor\_name  
## Y cooper-castellotti cooper-climax cooper-ferrari cooper-ford  
## FALSE 3.203845e-04 1.097317e-02 1.601922e-04 1.601922e-04  
## TRUE 2.065689e-04 1.322041e-02 0.000000e+00 0.000000e+00  
## constructor\_name  
## Y cooper-maserati cooper-osca dallara de\_tomaso-alfa\_romeo  
## FALSE 6.567881e-03 8.009612e-05 7.529035e-03 2.402883e-04  
## TRUE 5.783929e-03 0.000000e+00 1.445982e-03 0.000000e+00  
## constructor\_name  
## Y de\_tomaso-ferrari de\_tomaso-osca deidt del\_roy  
## FALSE 0.000000e+00 1.601922e-04 2.402883e-04 0.000000e+00  
## TRUE 0.000000e+00 0.000000e+00 4.131378e-04 0.000000e+00  
## constructor\_name  
## Y derrington dunn eagle-climax eagle-weslake elder  
## FALSE 0.000000e+00 1.601922e-04 7.208650e-04 1.041249e-03 8.009612e-05  
## TRUE 0.000000e+00 0.000000e+00 4.131378e-04 2.065689e-04 0.000000e+00  
## constructor\_name  
## Y emeryson emw enb ensign epperly  
## FALSE 6.407689e-04 0.000000e+00 8.009612e-05 8.329996e-03 3.203845e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 1.652551e-03 6.197067e-04  
## constructor\_name  
## Y era eurobrun ewing ferguson ferrari  
## FALSE 6.407689e-04 4.245094e-03 2.402883e-04 0.000000e+00 5.230276e-02  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 1.755836e-01  
## constructor\_name  
## Y fittipaldi fondmetal footwork force\_india forti  
## FALSE 7.368843e-03 2.723268e-03 1.025230e-02 1.481778e-02 2.643172e-03  
## TRUE 2.272258e-03 0.000000e+00 2.065689e-03 5.102252e-02 0.000000e+00  
## constructor\_name  
## Y frazer\_nash fry gilby gordini haas  
## FALSE 1.601922e-04 0.000000e+00 3.203845e-04 5.446536e-03 7.368843e-03  
## TRUE 2.065689e-04 0.000000e+00 0.000000e+00 1.652551e-03 3.305102e-03  
## constructor\_name  
## Y hall hesketh hill honda hrt  
## FALSE 8.009612e-05 6.728074e-03 8.810573e-04 5.686824e-03 6.808170e-03  
## TRUE 0.000000e+00 1.445982e-03 4.131378e-04 6.197067e-03 0.000000e+00  
## constructor\_name  
## Y hwm iso\_marlboro jaguar jbw jordan  
## FALSE 3.283941e-03 2.883460e-03 7.448939e-03 4.004806e-04 2.170605e-02  
## TRUE 2.065689e-04 8.262756e-04 3.511671e-03 0.000000e+00 1.631894e-02  
## constructor\_name  
## Y kauhsen klenk kojima kurtis\_kraft kuzma  
## FALSE 1.601922e-04 8.009612e-05 1.601922e-04 1.041249e-02 2.162595e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 6.403636e-03 4.131378e-04  
## constructor\_name  
## Y lago lambo lancia langley larrousse  
## FALSE 4.325190e-03 1.441730e-03 4.805767e-04 8.009612e-05 1.297557e-02  
## TRUE 1.445982e-03 0.000000e+00 4.131378e-04 0.000000e+00 2.478827e-03  
## constructor\_name  
## Y lds lds-alfa\_romeo lds-climax lec lesovsky  
## FALSE 2.402883e-04 8.009612e-05 1.601922e-04 2.402883e-04 7.208650e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04  
## constructor\_name  
## Y leyton life ligier lola lotus\_f1  
## FALSE 3.524229e-03 7.208650e-04 2.787345e-02 9.371245e-03 3.764517e-03  
## TRUE 6.197067e-04 0.000000e+00 1.549267e-02 1.652551e-03 9.502169e-03  
## constructor\_name  
## Y lotus\_racing lotus-borgward lotus-brm lotus-climax lotus-ford  
## FALSE 3.524229e-03 1.601922e-04 5.366440e-03 1.145374e-02 4.645575e-03  
## TRUE 0.000000e+00 0.000000e+00 1.859120e-03 8.056187e-03 6.197067e-03  
## constructor\_name  
## Y lotus-maserati lotus-pw lyncar maki manor  
## FALSE 1.601922e-04 2.402883e-04 8.009612e-05 3.203845e-04 4.164998e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 2.065689e-04  
## constructor\_name  
## Y march march-alfa\_romeo march-ford marchese  
## FALSE 2.707249e-02 6.407689e-04 1.601922e-03 1.601922e-04  
## TRUE 7.229911e-03 0.000000e+00 1.239413e-03 0.000000e+00  
## constructor\_name  
## Y martini marussia maserati matra matra-ford  
## FALSE 3.203845e-04 5.927113e-03 1.930316e-02 2.402883e-03 7.208650e-04  
## TRUE 0.000000e+00 2.065689e-04 1.218756e-02 3.098533e-03 2.685396e-03  
## constructor\_name  
## Y mbm mcguire mclaren mclaren-alfa\_romeo  
## FALSE 8.009612e-05 0.000000e+00 4.557469e-02 7.208650e-04  
## TRUE 0.000000e+00 0.000000e+00 1.268333e-01 0.000000e+00  
## constructor\_name  
## Y mclaren-brm mclaren-ford mclaren-seren mercedes merzario  
## FALSE 5.606728e-04 3.123748e-03 0.000000e+00 4.725671e-03 1.601922e-03  
## TRUE 4.131378e-04 4.957653e-03 2.065689e-04 4.007436e-02 0.000000e+00  
## constructor\_name  
## Y meskowski mf1 milano minardi moda  
## FALSE 8.009612e-05 1.361634e-03 8.009612e-05 3.580296e-02 1.041249e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 2.478827e-03 0.000000e+00  
## constructor\_name  
## Y moore nichels olson onyx osca  
## FALSE 2.402883e-04 3.203845e-04 0.000000e+00 2.723268e-03 5.606728e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 4.131378e-04 0.000000e+00  
## constructor\_name  
## Y osella pacific pankratz parnelli pawl  
## FALSE 1.369644e-02 3.524229e-03 1.601922e-04 9.611534e-04 1.601922e-04  
## TRUE 2.065689e-04 0.000000e+00 0.000000e+00 6.197067e-04 0.000000e+00  
## constructor\_name  
## Y penske phillips politoys porsche prost  
## FALSE 2.322787e-03 3.203845e-04 8.009612e-05 4.004806e-03 8.249900e-03  
## TRUE 1.032844e-03 4.131378e-04 0.000000e+00 2.891964e-03 2.685396e-03  
## constructor\_name  
## Y protos rae ram re rebaque  
## FALSE 1.601922e-04 8.009612e-05 3.684421e-03 8.009612e-05 1.201442e-03  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## constructor\_name  
## Y red\_bull renault rial sauber scarab  
## FALSE 1.025230e-02 2.186624e-02 2.482980e-03 4.437325e-02 4.805767e-04  
## TRUE 4.503202e-02 3.594299e-02 2.065689e-04 2.953935e-02 0.000000e+00  
## constructor\_name  
## Y schroeder scirocco shadow shadow-ford shadow-matra  
## FALSE 4.004806e-04 9.611534e-04 1.065278e-02 1.201442e-03 0.000000e+00  
## TRUE 2.065689e-04 0.000000e+00 2.685396e-03 8.262756e-04 0.000000e+00  
## constructor\_name  
## Y shannon sherman simca simtek snowberger  
## FALSE 0.000000e+00 8.009612e-05 1.762115e-03 2.563076e-03 8.009612e-05  
## TRUE 0.000000e+00 2.065689e-04 2.065689e-04 0.000000e+00 0.000000e+00  
## constructor\_name  
## Y spirit spyker spyker\_mf1 stebro stevens  
## FALSE 1.601922e-03 1.762115e-03 4.805767e-04 8.009612e-05 4.004806e-04  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## constructor\_name  
## Y stewart super\_aguri surtees sutton team\_lotus  
## FALSE 4.805767e-03 4.645575e-03 1.321586e-02 8.009612e-05 4.052863e-02  
## TRUE 2.065689e-03 2.065689e-04 3.511671e-03 0.000000e+00 3.635612e-02  
## constructor\_name  
## Y tec-mec tecno theodore token toleman  
## FALSE 8.009612e-05 7.208650e-04 3.283941e-03 2.402883e-04 6.808170e-03  
## TRUE 0.000000e+00 2.065689e-04 2.065689e-04 0.000000e+00 1.859120e-03  
## constructor\_name  
## Y tomaso toro\_rosso toyota trevis trojan  
## FALSE 8.810573e-04 1.994393e-02 1.033240e-02 3.203845e-04 6.407689e-04  
## TRUE 0.000000e+00 1.611237e-02 1.094815e-02 2.065689e-04 0.000000e+00  
## constructor\_name  
## Y turner tyrrell vanwall veritas vhristensen  
## FALSE 0.000000e+00 3.900681e-02 2.723268e-03 1.121346e-03 8.009612e-05  
## TRUE 0.000000e+00 2.582111e-02 3.098533e-03 0.000000e+00 0.000000e+00  
## constructor\_name  
## Y virgin watson wetteroth williams wolf  
## FALSE 4.164998e-03 1.041249e-03 8.009612e-05 4.189027e-02 3.123748e-03  
## TRUE 0.000000e+00 6.197067e-04 0.000000e+00 9.047717e-02 2.272258e-03  
## constructor\_name  
## Y zakspeed  
## FALSE 7.048458e-03  
## TRUE 0.000000e+00  
##   
## circuit\_name  
## Y adelaide ain-diab aintree albert\_park americas  
## FALSE 0.0140168202 0.0010412495 0.0063275931 0.0167400881 0.0050460553  
## TRUE 0.0084693245 0.0008262756 0.0051642223 0.0274736625 0.0097087379  
## circuit\_name  
## Y anderstorp avus bahrain BAK boavista  
## FALSE 0.0073688426 0.0006407689 0.0104925911 0.0012815378 0.0010412495  
## TRUE 0.0047510845 0.0010328445 0.0190043379 0.0022722578 0.0016525511  
## circuit\_name  
## Y brands\_hatch bremgarten buddh catalunya charade  
## FALSE 0.0169002803 0.0045654786 0.0025630757 0.0242691229 0.0035242291  
## TRUE 0.0132204090 0.0030985334 0.0055773600 0.0320181781 0.0037182400  
## circuit\_name  
## Y dallas detroit dijon donington essarts  
## FALSE 0.0012014417 0.0081698038 0.0073688426 0.0009611534 0.0037645174  
## TRUE 0.0008262756 0.0059904978 0.0041313778 0.0008262756 0.0043379467  
## circuit\_name  
## Y estoril fuji galvez george hockenheimring  
## FALSE 0.0169002803 0.0035242291 0.0189827793 0.0033640368 0.0374849820  
## TRUE 0.0105350134 0.0043379467 0.0167320801 0.0030985334 0.0336707292  
## circuit\_name  
## Y hungaroring imola indianapolis interlagos istanbul  
## FALSE 0.0305967161 0.0285943132 0.0253103724 0.0340408490 0.0052062475  
## TRUE 0.0349101425 0.0235488535 0.0185912002 0.0375955381 0.0068167734  
## circuit\_name  
## Y jacarepagua jarama jerez kyalami las\_vegas  
## FALSE 0.0132959551 0.0119343212 0.0091309571 0.0221866239 0.0028033640  
## TRUE 0.0088824623 0.0072299112 0.0061970667 0.0177649246 0.0014459822  
## circuit\_name  
## Y lemans long\_beach magny\_cours marina\_bay monaco  
## FALSE 0.0004805767 0.0104925911 0.0168201842 0.0069683620 0.0661593913  
## TRUE 0.0014459822 0.0068167734 0.0181780624 0.0156992357 0.0623838050  
## circuit\_name  
## Y monsanto montjuic monza mosport nivelles  
## FALSE 0.0005606728 0.0034441330 0.0737685222 0.0094513416 0.0022426912  
## TRUE 0.0004131378 0.0028919645 0.0665151828 0.0080561867 0.0020656889  
## circuit\_name  
## Y nurburgring okayama osterreichring pedralbes pescara  
## FALSE 0.0389267121 0.0023227873 0.0289146976 0.0020024029 0.0005606728  
## TRUE 0.0367692625 0.0016525511 0.0212765957 0.0014459822 0.0006197067  
## circuit\_name  
## Y phoenix red\_bull\_ring reims ricard riverside  
## FALSE 0.0052863436 0.0026431718 0.0114537445 0.0187424910 0.0009611534  
## TRUE 0.0022722578 0.0055773600 0.0101218756 0.0117744268 0.0010328445  
## circuit\_name  
## Y rodriguez sebring sepang shanghai silverstone  
## FALSE 0.0193832599 0.0007208650 0.0149779736 0.0110532639 0.0542250701  
## TRUE 0.0200371824 0.0004131378 0.0241685602 0.0185912002 0.0518487916  
## circuit\_name  
## Y sochi spa suzuka tremblant valencia  
## FALSE 0.0026431718 0.0446936324 0.0273127753 0.0011213456 0.0037645174  
## TRUE 0.0092956001 0.0520553605 0.0347035736 0.0022722578 0.0070233423  
## circuit\_name  
## Y villeneuve watkins\_glen yas\_marina yeongam zandvoort  
## FALSE 0.0402883460 0.0211453744 0.0070484581 0.0035242291 0.0307569083  
## TRUE 0.0411072093 0.0179714935 0.0154926668 0.0066102045 0.0276802314  
## circuit\_name  
## Y zeltweg zolder  
## FALSE 0.0009611534 0.0135362435  
## TRUE 0.0012394133 0.0070233423  
##   
## circuit\_city  
## Y Abu Dhabi Adelaide Anderstorp Austin Baku  
## FALSE 0.0070484581 0.0140168202 0.0073688426 0.0050460553 0.0012815378  
## TRUE 0.0154926668 0.0084693245 0.0047510845 0.0097087379 0.0022722578  
## circuit\_city  
## Y Barcelona Berlin Bern Brussels Budapest  
## FALSE 0.0054465358 0.0006407689 0.0045654786 0.0022426912 0.0305967161  
## TRUE 0.0043379467 0.0010328445 0.0030985334 0.0020656889 0.0349101425  
## circuit\_city  
## Y Buenos Aires California Casablanca Castle Donington  
## FALSE 0.0189827793 0.0114537445 0.0010412495 0.0009611534  
## TRUE 0.0167320801 0.0078496178 0.0008262756 0.0008262756  
## circuit\_city  
## Y Clermont-Ferrand Dallas Detroit Dijon  
## FALSE 0.0035242291 0.0012014417 0.0081698038 0.0073688426  
## TRUE 0.0037182400 0.0008262756 0.0059904978 0.0041313778  
## circuit\_city  
## Y Eastern Cape Province Estoril Florida Heusden-Zolder  
## FALSE 0.0033640368 0.0169002803 0.0007208650 0.0135362435  
## TRUE 0.0030985334 0.0105350134 0.0004131378 0.0070233423  
## circuit\_city  
## Y Hockenheim Imola Indianapolis Istanbul  
## FALSE 0.0374849820 0.0285943132 0.0253103724 0.0052062475  
## TRUE 0.0336707292 0.0235488535 0.0185912002 0.0068167734  
## circuit\_city  
## Y Jerez de la Frontera Kent Kuala Lumpur Le Castellet  
## FALSE 0.0091309571 0.0169002803 0.0149779736 0.0187424910  
## TRUE 0.0061970667 0.0132204090 0.0241685602 0.0117744268  
## circuit\_city  
## Y Le Mans Lisbon Liverpool Madrid Magny Cours  
## FALSE 0.0004805767 0.0005606728 0.0063275931 0.0119343212 0.0168201842  
## TRUE 0.0014459822 0.0004131378 0.0051642223 0.0072299112 0.0181780624  
## circuit\_city  
## Y Marina Bay Melbourne Mexico City Midrand Monte-Carlo  
## FALSE 0.0069683620 0.0167400881 0.0193832599 0.0221866239 0.0661593913  
## TRUE 0.0156992357 0.0274736625 0.0200371824 0.0177649246 0.0623838050  
## circuit\_city  
## Y Montmelo Montreal Monza Nevada New York State  
## FALSE 0.0242691229 0.0402883460 0.0737685222 0.0028033640 0.0211453744  
## TRUE 0.0320181781 0.0411072093 0.0665151828 0.0014459822 0.0179714935  
## circuit\_city  
## Y Nurburg Okayama Ontario Oporto Oyama  
## FALSE 0.0389267121 0.0023227873 0.0094513416 0.0010412495 0.0035242291  
## TRUE 0.0367692625 0.0016525511 0.0080561867 0.0016525511 0.0043379467  
## circuit\_city  
## Y Pescara Phoenix Quebec Reims Rio de Janeiro  
## FALSE 0.0005606728 0.0052863436 0.0011213456 0.0114537445 0.0132959551  
## TRUE 0.0006197067 0.0022722578 0.0022722578 0.0101218756 0.0088824623  
## circuit\_city  
## Y Rouen Sakhir Sao Paulo Shanghai Silverstone  
## FALSE 0.0037645174 0.0104925911 0.0340408490 0.0110532639 0.0542250701  
## TRUE 0.0043379467 0.0190043379 0.0375955381 0.0185912002 0.0518487916  
## circuit\_city  
## Y Sochi Spa Spielburg Styria Suzuka  
## FALSE 0.0026431718 0.0446936324 0.0315578694 0.0009611534 0.0273127753  
## TRUE 0.0092956001 0.0520553605 0.0268539558 0.0012394133 0.0347035736  
## circuit\_city  
## Y Uttar Pradesh Valencia Yeongam County Zandvoort  
## FALSE 0.0025630757 0.0037645174 0.0035242291 0.0307569083  
## TRUE 0.0055773600 0.0070233423 0.0066102045 0.0276802314  
##   
## race\_month  
## Y [,1] [,2]  
## FALSE 6.762435 2.361807  
## TRUE 6.842181 2.424029  
##   
## race\_year  
## Y [,1] [,2]  
## FALSE 1986.396 17.56993  
## TRUE 1991.994 19.25039  
##   
## race\_round  
## Y [,1] [,2]  
## FALSE 8.109411 4.734530  
## TRUE 8.512084 5.030353  
##   
## driverAge  
## Y [,1] [,2]  
## FALSE 29.46824 5.343313  
## TRUE 29.72650 5.068536  
##   
## driver\_homeCountry  
## Y Argentina Australia Austria Belgium Brazil  
## FALSE 0.0130556668 0.0248297958 0.0275530637 0.0261914297 0.0746495795  
## TRUE 0.0204503202 0.0417269159 0.0309853336 0.0138401157 0.0888246230  
## driver\_homeCountry  
## Y Canada Chile Colombia Czech Republic Denmark  
## FALSE 0.0120144173 0.0018422107 0.0036844213 0.0001601922 0.0044853825  
## TRUE 0.0119809957 0.0002065689 0.0082627556 0.0000000000 0.0028919645  
## driver\_homeCountry  
## Y Finland France Germany Hungary India  
## FALSE 0.0294753704 0.1183019624 0.0716860232 0.0014417301 0.0032038446  
## TRUE 0.0572195827 0.0941954142 0.1291055567 0.0002065689 0.0002065689  
## driver\_homeCountry  
## Y Indonesia Ireland Italy Japan Liechtenstein  
## FALSE 0.0007208650 0.0042450941 0.1568281938 0.0297156588 0.0007208650  
## TRUE 0.0000000000 0.0014459822 0.0832472630 0.0105350134 0.0000000000  
## driver\_homeCountry  
## Y Malaysia Mexico Monaco Netherlands New Zealand  
## FALSE 0.0008810573 0.0483780537 0.0017621145 0.0173808570 0.0124148979  
## TRUE 0.0000000000 0.0625903739 0.0002065689 0.0070233423 0.0206568891  
## driver\_homeCountry  
## Y Poland Portugal Rhodesia Russia South Africa  
## FALSE 0.0013616340 0.0048858630 0.0008009612 0.0052062475 0.0080096115  
## TRUE 0.0057839289 0.0004131378 0.0002065689 0.0055773600 0.0084693245  
## driver\_homeCountry  
## Y Spain Sweden Switzerland Thailand United Kingdom  
## FALSE 0.0232278734 0.0217060473 0.0214657589 0.0008009612 0.1633960753  
## TRUE 0.0349101425 0.0150795290 0.0150795290 0.0000000000 0.1906630861  
## driver\_homeCountry  
## Y United States Uruguay Venezuela  
## FALSE 0.0574289147 0.0004004806 0.0056868242  
## TRUE 0.0361495559 0.0000000000 0.0018591200  
##   
## constructor\_homeCountry  
## Y Australia Austria Belgium Brazil Canada  
## FALSE 0.000000e+00 1.025230e-02 8.009612e-05 7.368843e-03 3.203845e-03  
## TRUE 0.000000e+00 4.503202e-02 0.000000e+00 2.272258e-03 2.272258e-03  
## constructor\_homeCountry  
## Y France Germany Hong Kong India Ireland  
## FALSE 9.299159e-02 2.378855e-02 3.283941e-03 1.481778e-02 2.170605e-02  
## TRUE 6.589548e-02 5.246850e-02 2.065689e-04 5.102252e-02 1.631894e-02  
## constructor\_homeCountry  
## Y Italy Japan Malaysia Mexico Netherlands  
## FALSE 2.084101e-01 2.114537e-02 9.531438e-03 1.201442e-03 2.643172e-03  
## TRUE 2.462301e-01 1.735179e-02 0.000000e+00 0.000000e+00 0.000000e+00  
## constructor\_homeCountry  
## Y New Zealand Rhodesia Russia South Africa Spain  
## FALSE 3.203845e-04 8.009612e-05 7.288746e-03 4.805767e-04 6.808170e-03  
## TRUE 0.000000e+00 0.000000e+00 2.065689e-04 0.000000e+00 0.000000e+00  
## constructor\_homeCountry  
## Y Switzerland United Kingdom United States  
## FALSE 4.493392e-02 4.877853e-01 3.187825e-02  
## TRUE 2.953935e-02 4.558975e-01 1.528610e-02  
##   
## result\_percentOfPreviousRaceCompleted  
## Y [,1] [,2]  
## FALSE 62.17789 40.08410  
## TRUE 80.12250 32.62545  
##   
## result\_previousFinishDescrip  
## Y Disqualified Excluded FailedToFinish Finished First race  
## FALSE 0.0065678815 0.0004805767 0.0713656388 0.4880256308 0.0431718062  
## TRUE 0.0043379467 0.0000000000 0.0039248089 0.7015079529 0.0095021690  
## result\_previousFinishDescrip  
## Y NotClassified Retired Withdrew  
## FALSE 0.0096115338 0.3682819383 0.0124949940  
## TRUE 0.0022722578 0.2718446602 0.0066102045  
##   
## status\_previousDescrip  
## Y +1 Lap +10 Laps +11 Laps +12 Laps +13 Laps  
## FALSE 1.458550e-01 1.521826e-03 4.805767e-04 4.805767e-04 5.606728e-04  
## TRUE 1.297253e-01 0.000000e+00 6.197067e-04 2.065689e-04 2.065689e-04  
## status\_previousDescrip  
## Y +14 Laps +15 Laps +16 Laps +17 Laps +18 Laps  
## FALSE 3.203845e-04 4.004806e-04 1.601922e-04 4.004806e-04 1.601922e-04  
## TRUE 4.131378e-04 2.065689e-04 2.065689e-04 0.000000e+00 0.000000e+00  
## status\_previousDescrip  
## Y +19 Laps +2 Laps +20 Laps +21 Laps +22 Laps  
## FALSE 2.402883e-04 7.160593e-02 0.000000e+00 0.000000e+00 8.009612e-05  
## TRUE 2.065689e-04 3.036563e-02 0.000000e+00 0.000000e+00 2.065689e-04  
## status\_previousDescrip  
## Y +23 Laps +24 Laps +25 Laps +26 Laps +29 Laps  
## FALSE 8.009612e-05 8.009612e-05 8.009612e-05 0.000000e+00 0.000000e+00  
## TRUE 0.000000e+00 2.065689e-04 0.000000e+00 2.065689e-04 0.000000e+00  
## status\_previousDescrip  
## Y +3 Laps +30 Laps +4 Laps +42 Laps +44 Laps  
## FALSE 3.500200e-02 0.000000e+00 1.970364e-02 0.000000e+00 0.000000e+00  
## TRUE 1.136129e-02 2.065689e-04 7.643049e-03 0.000000e+00 2.065689e-04  
## status\_previousDescrip  
## Y +46 Laps +5 Laps +6 Laps +7 Laps +8 Laps  
## FALSE 8.009612e-05 9.851822e-03 7.208650e-03 4.725671e-03 2.322787e-03  
## TRUE 0.000000e+00 3.511671e-03 1.239413e-03 1.652551e-03 1.032844e-03  
## status\_previousDescrip  
## Y +9 Laps 107% Rule Accident Alternator Axle  
## FALSE 1.521826e-03 6.407689e-04 4.092911e-02 1.201442e-03 1.201442e-03  
## TRUE 4.131378e-04 0.000000e+00 3.181161e-02 2.065689e-03 2.065689e-04  
## status\_previousDescrip  
## Y Battery Brake duct Brakes Broken wing Chassis  
## FALSE 6.407689e-04 0.000000e+00 9.771726e-03 3.203845e-04 1.521826e-03  
## TRUE 4.131378e-04 0.000000e+00 7.643049e-03 6.197067e-04 6.197067e-04  
## status\_previousDescrip  
## Y Clutch Collision Collision damage Crankshaft  
## FALSE 9.451342e-03 3.147777e-02 7.208650e-04 8.009612e-05  
## TRUE 5.990498e-03 2.974592e-02 8.262756e-04 0.000000e+00  
## status\_previousDescrip  
## Y CV joint Did not prequalify Did not qualify Differential  
## FALSE 0.000000e+00 1.770124e-02 5.286344e-02 2.883460e-03  
## TRUE 2.065689e-04 6.197067e-04 3.305102e-03 2.065689e-03  
## status\_previousDescrip  
## Y Disqualified Distributor Driver Seat Driver unwell Driveshaft  
## FALSE 6.407689e-03 7.208650e-04 0.000000e+00 5.606728e-04 1.201442e-03  
## TRUE 4.131378e-03 6.197067e-04 2.065689e-04 0.000000e+00 8.262756e-04  
## status\_previousDescrip  
## Y Drivetrain Electrical Electronics Engine Engine fire  
## FALSE 8.009612e-05 1.353624e-02 2.402883e-04 8.738486e-02 8.009612e-05  
## TRUE 0.000000e+00 1.074158e-02 4.131378e-04 5.598017e-02 0.000000e+00  
## status\_previousDescrip  
## Y Engine misfire ERS Excluded Exhaust Finished  
## FALSE 8.009612e-05 2.402883e-04 4.004806e-04 1.201442e-03 1.605927e-01  
## TRUE 0.000000e+00 0.000000e+00 0.000000e+00 6.197067e-04 4.866763e-01  
## status\_previousDescrip  
## Y Fire First race Front wing Fuel Fuel leak  
## FALSE 8.009612e-05 4.317181e-02 0.000000e+00 8.009612e-05 1.762115e-03  
## TRUE 0.000000e+00 9.502169e-03 0.000000e+00 6.197067e-04 2.065689e-03  
## status\_previousDescrip  
## Y Fuel pipe Fuel pressure Fuel pump Fuel rig Fuel system  
## FALSE 0.000000e+00 1.361634e-03 2.322787e-03 8.009612e-05 7.048458e-03  
## TRUE 6.197067e-04 1.032844e-03 2.685396e-03 2.065689e-04 2.891964e-03  
## status\_previousDescrip  
## Y Gearbox Halfshaft Handling Heat shield fire  
## FALSE 3.716460e-02 3.924710e-03 2.563076e-03 8.810573e-04  
## TRUE 2.334228e-02 1.859120e-03 2.272258e-03 6.197067e-04  
## status\_previousDescrip  
## Y Hydraulics Ignition Injection Injured Injury  
## FALSE 4.725671e-03 5.286344e-03 1.041249e-03 1.601922e-04 8.009612e-04  
## TRUE 4.957653e-03 5.990498e-03 1.652551e-03 0.000000e+00 2.065689e-04  
## status\_previousDescrip  
## Y Launch control Magneto Mechanical Not classified  
## FALSE 8.009612e-05 6.407689e-04 8.810573e-04 8.970765e-03  
## TRUE 0.000000e+00 1.032844e-03 2.065689e-04 1.859120e-03  
## status\_previousDescrip  
## Y Not restarted Oil leak Oil line Oil pipe Oil pressure  
## FALSE 8.009612e-05 4.405286e-03 8.009612e-05 5.606728e-04 3.283941e-03  
## TRUE 0.000000e+00 4.337947e-03 2.065689e-04 2.065689e-04 3.098533e-03  
## status\_previousDescrip  
## Y Oil pump Out of fuel Overheating Physical Pneumatics  
## FALSE 7.208650e-04 4.084902e-03 6.647978e-03 1.361634e-03 8.009612e-05  
## TRUE 4.131378e-04 2.478827e-03 2.891964e-03 4.131378e-04 2.065689e-04  
## status\_previousDescrip  
## Y Power loss Power Unit Puncture Radiator Rear wing  
## FALSE 3.203845e-04 8.009612e-04 1.521826e-03 1.682018e-03 2.402883e-04  
## TRUE 4.131378e-04 1.445982e-03 1.652551e-03 1.652551e-03 4.131378e-04  
## status\_previousDescrip  
## Y Refuelling Retired Safety Safety belt  
## FALSE 8.009612e-05 4.405286e-03 8.009612e-05 8.009612e-05  
## TRUE 0.000000e+00 2.065689e-03 0.000000e+00 0.000000e+00  
## status\_previousDescrip  
## Y Safety concerns Seat Spark plugs Spun off  
## FALSE 0.000000e+00 0.000000e+00 0.000000e+00 3.396075e-02  
## TRUE 0.000000e+00 2.065689e-04 2.065689e-04 2.788680e-02  
## status\_previousDescrip  
## Y Stalled Steering Supercharger Suspension Technical  
## FALSE 0.000000e+00 2.563076e-03 2.402883e-04 1.802163e-02 8.009612e-05  
## TRUE 2.065689e-04 8.262756e-04 0.000000e+00 1.673208e-02 6.197067e-04  
## status\_previousDescrip  
## Y Throttle Track rod Transmission Turbo Tyre  
## FALSE 5.446536e-03 0.000000e+00 1.393672e-02 5.927113e-03 2.242691e-03  
## TRUE 2.685396e-03 0.000000e+00 9.295600e-03 3.924809e-03 2.891964e-03  
## status\_previousDescrip  
## Y Underweight Vibrations Water leak Water pipe Water pressure  
## FALSE 8.009612e-05 3.203845e-04 1.601922e-03 8.009612e-05 1.601922e-04  
## TRUE 0.000000e+00 2.065689e-04 2.065689e-04 0.000000e+00 0.000000e+00  
## status\_previousDescrip  
## Y Water pump Wheel Wheel bearing Wheel nut Wheel rim  
## FALSE 1.601922e-04 2.402883e-03 1.842211e-03 8.009612e-04 8.009612e-05  
## TRUE 2.065689e-04 4.751084e-03 1.032844e-03 6.197067e-04 0.000000e+00  
## status\_previousDescrip  
## Y Withdrew  
## FALSE 9.451342e-03  
## TRUE 5.577360e-03  
##   
## driver\_preRaceTotPoints  
## Y [,1] [,2]  
## FALSE 5.838927 16.32475  
## TRUE 28.365834 45.71819  
##   
## driver\_preRaceTotWins  
## Y [,1] [,2]  
## FALSE 0.1177413 0.5730043  
## TRUE 0.6651518 1.4562640  
##   
## driverCluster  
## Y 1 2 3 4  
## FALSE 0.217140569 0.696275531 0.008810573 0.077773328  
## TRUE 0.230324313 0.682297046 0.008675893 0.078702747

# test model  
results.predict <- predict(results.model, test, type = 'class')  
  
  
# test model against recent Brazil Grand Prix results  
testBrazil <- read.csv("../Processed Data/brazil2019.csv")  
  
testBrazil$driverCluster <- as.factor(testBrazil$driverCluster)  
  
results.predict2 <- predict(results.model, testBrazil, type = 'class')  
  
resultsNB\_output2 <- data.frame(actual = testBrazil[,'result\_inThePoints'], predicted = results.predict2)  
  
table(resultsNB\_output2)

## predicted  
## actual FALSE TRUE  
## FALSE 4 6  
## TRUE 2 8

# accuracy = .65  
# conditional accuracy = .5  
  
  
  
#### Analyze results ####  
  
# inspect correlation of variables, which could impact model (i.e. assumed independence)  
train %>%  
 filter(result\_inThePoints == TRUE) %>%  
 select\_if(is.numeric) %>%  
 cor() %>%  
 corrplot::corrplot()



# create confusion matrix  
resultsNB\_output <- data.frame(actual = test[,'result\_inThePoints'], predicted = results.predict)  
  
table(resultsNB\_output)

## predicted  
## actual FALSE TRUE  
## FALSE 4583 676  
## TRUE 973 1194

# assign 'True Positive', 'False Positive', 'True Negative', 'False Negative'  
TP <- 1161  
FP <- 715  
TN <- 4629  
FN <- 921  
  
  
# calculate evaluation metrics  
errorRate <- (FP + FN) / (TP + FP + TN + FN)  
accuracy <- (TP + TN) / (TP + FP + TN + FN)  
sensitivity <- TP / (TP + FN)  
specificity <- TN / (TN + FP)  
precision <- TP / (TP + FP)  
falsePositiveRate <- FP / (TN + FP)  
  
  
## Results -----------------------------------------------------------------  
  
# error rate = .2203  
# model accuracy = .7797  
 # conditional accuracy = .7169  
 # accuracy improvement = .0628  
# sensitivity (true positive) = .5576  
# specificity (true negative) = .8662  
# precision = .6189  
# false positive rate = .1338  
  
  
  
  
#### Write File ####  
  
# define output path  
path\_out2 <- "../Analyzed Data"  
  
# write to csv  
write.csv(resultsNB, file.path(path\_out2, "resultsNB.csv"), row.names = F)