Project Proposal, Group P 02/25/24 Title: Group Members: Group P–Sydney Bluestein, Parker Smith, Tate Eppinger, and Juan Perez

Title: Does "what's under the hood" matter when predicting sports car prices in America? *vroom vroom*

Research Question/Purpose: Who doesn't love a cool sports car? Parker's dad and Sydney's grandfather are particularly interested in car shows/collecting. Therefore, we grew up listening to our fair share of "why this car will be worth millions one day." We've always wondered, what makes these cars so much more expensive than the cars we drive daily? Does the make and model of the car matter, or is the price based on the practicality and performance of the vehicle? Is a Ferrari more expensive because of the name brand or because it can go from 0-60 faster than other car brands? In general, we would like to investigate the relationship between predictors such as car make and horsepower on race car price. We are interested in assessing our hypothesis that name brands contribute more to race car prices than practical measures such as torque. We also want to investigate the relationship between year and car price. We expect that car price would be high for "antique cars," but new cars would also have high prices. This would lead to a curvature in the data. So, would we have to transform the data to make it linear? Obviously, these are very early predictions/ideas, and I look forward to determining if the evidence supports or contrasts our initial inclinations.

Data: We pulled data from the Kaggle Data Explorer. (It appears like Kaggle is not very highly regulated, so we should proceed with caution). This dataset was created to identify market trends relating to sports car prices. The author of this dataset did not mention how they selected which cars to include in the set; therefore, we should proceed with caution.

Population: This data set contains sports cars from various manufacturers worldwide. Therefore, it would not be wise to expand this model to all cars or car manufacturers outside of those included in the data set. The IQR includes cars produced in the years 2014-2019. Thus, we should not predict the price of cars produced anywhere outside the range of this range. The data set from Kaggle is a sample from sports cars in America, so we hope to be able to use this model as a way to predict the price of sports cars in the US so that hopeful owners can get the right car for the right price.

Response Variable: Our response variable is the price of sports cars. This is a quantitative variable that is measured in US dollars. Sports car price is not normally distributed, as the data is skewed right. The median sports car price is $140,000. The IQR is 178,200 dollars.

Explanatory Variables: We have numerous explanatory variables to look into from the Kaggle data set. First, car make and car model are categorical variables, and we tallied charts to display the possible categories. The categorical variables are also represented in bar graphs; however, we have yet to figure out how to make the labels legible. Year is a quantitative variable that represents the year the car was made. 0-60 speed is a quantitative variable that represents the time in seconds it takes for the car to go from 0 miles per hour to 60 miles per hour. Torque is a quantitative variable measured in pounds/feet that measures the power of the car's drive train. Horsepower is another quantitative variable measured in foot-pounds/minute and measures the engine power. Lastly, engine size is a quantitative variable in liters that measures how much gas the car can hold. We included distributions of our explanatory variables below.

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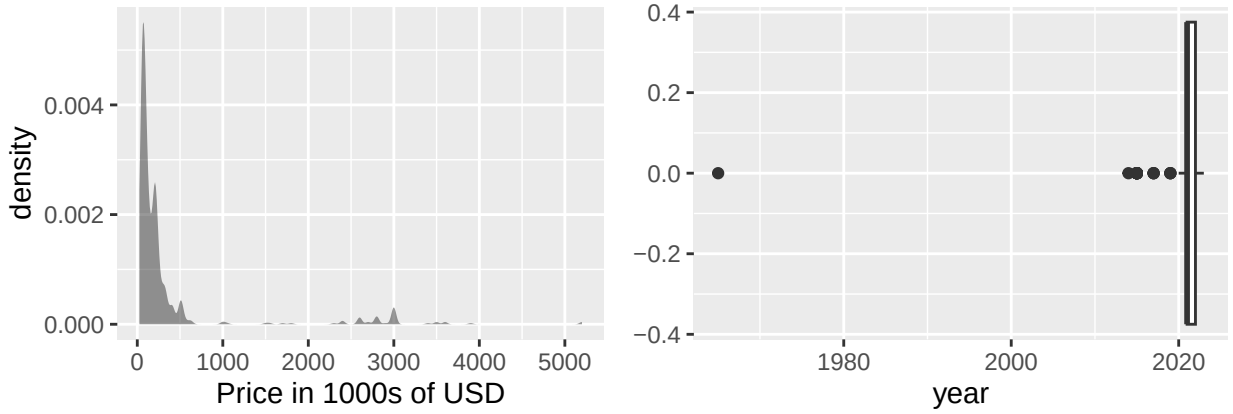
```
SportsCars <- janitor::clean_names(Sport_car_price)
SportsCars <- unique(SportsCars)
SportsCars <- SportsCars %>%
  filter(!grepl("Electric", engine_size_l)) %>%
  mutate(across(engine_size_l:x0_60_mph_time_seconds, as.numeric))
r1<-gf_density(~price_in_usd/1000, data=SportsCars, xlab="Price in 1000s of USD") #specify 1000s, respo
favstats(~price_in_usd, data=SportsCars) #IQR test 1.5, 1.5(IQR=152720)=229080, data range from $298980
```

```
##    min    Q1   median     Q3     max     mean       sd   n missing
##  25000 69900 118647.5 222620 5200000 350318.2 730469.3 680       0
```

```
r2<-gf_boxplot(~year, data=SportsCars)
favstats(~year, data=SportsCars) #IQR test 1.5, 1.5(IQR=1)=1.5, data range from 2019 to 2023
```

```
##   min   Q1 median   Q3  max     mean       sd   n missing
##  1965 2021   2021 2022 2023 2021.138 2.389535 680       0
```

```
grid.arrange(r1, r2, ncol=2, heights=c(2, 2))
```




```
m1<-gf_dens(~ horsepower, data = SportsCars, color = "blue")
m2<-gf_dens(~ torque_lb_ft, data = SportsCars, color = "deepskyblue")
m3<-gf_dens(~ engine_size_l, data = SportsCars, color = "pink4")
m4<-gf_dens(~ x0_60_mph_time_seconds, data = SportsCars,  xlab="0 to 60mph time in seconds", color = "pu
```

```
m5<-gf_bar (~car_make, data= SportsCars)
m6<-gf_bar (~car_model, data= SportsCars)
grid.arrange(m1, m2, m3, m4, m5, m6, ncol=3, heights=c(2, 2))
```