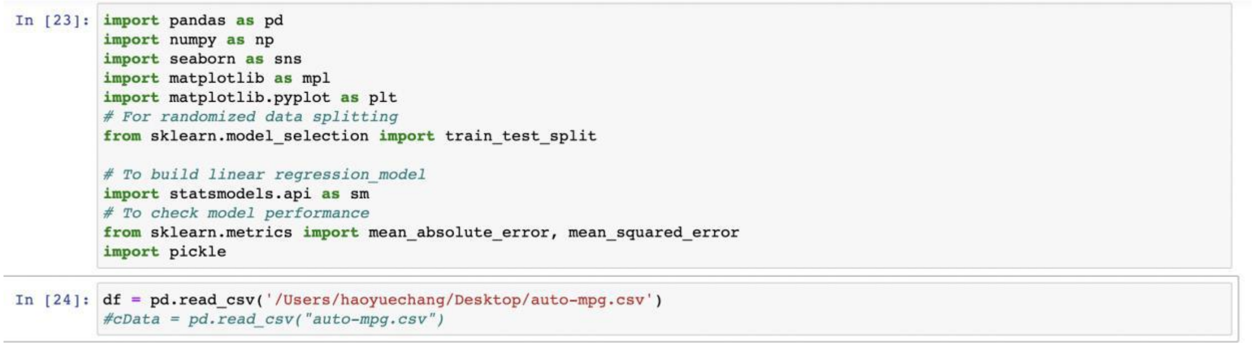
Haoyue Chang

Batch code< LISUM22>

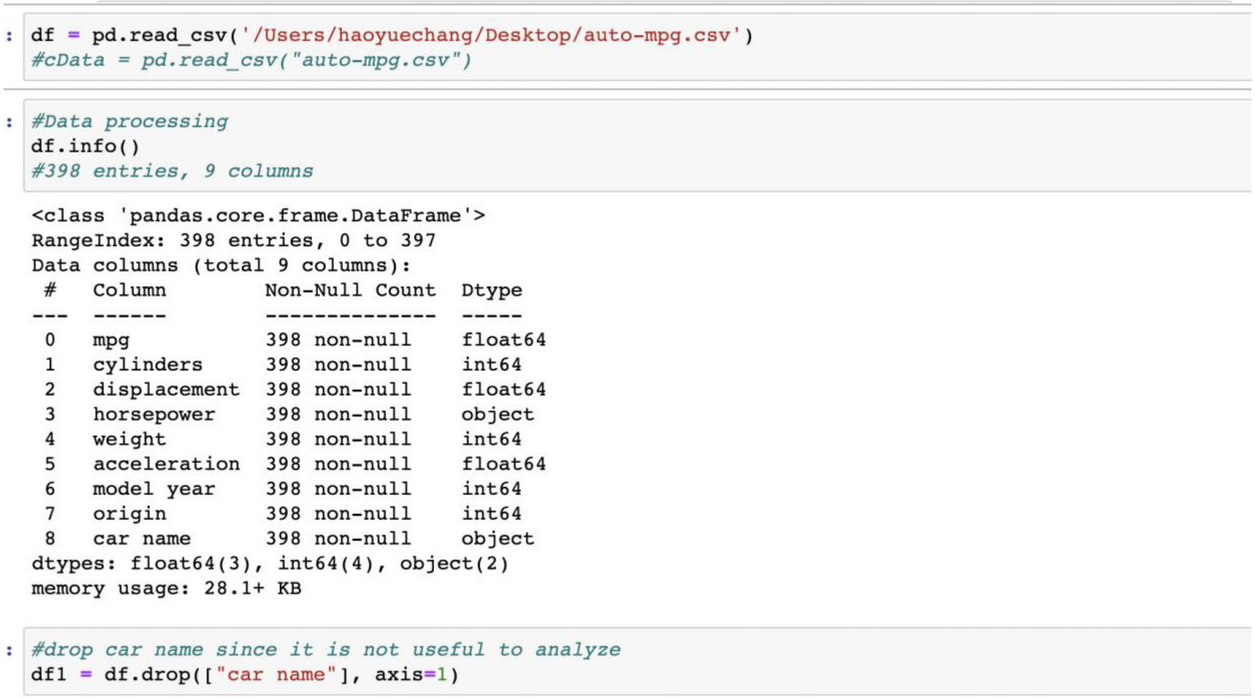
Submission date: July 3rd, 2023

Submitted to Deployment on Flask for Data Glacier Internship



```
In [23]: import pandas as pd
         import numpy as np
         import seaborn as sns
         import matplotlib as mpl
         import matplotlib.pyplot as plt
         # For randomized data splitting
         from sklearn.model_selection import train_test_split

         # To build linear regression_model
         import statsmodels.api as sm
         # To check model performance
         from sklearn.metrics import mean_absolute_error, mean_squared_error
         import pickle
```

```
In [24]: df = pd.read_csv('/Users/haoyuechang/Desktop/auto-mpg.csv')
         #cData = pd.read_csv("auto-mpg.csv")
```

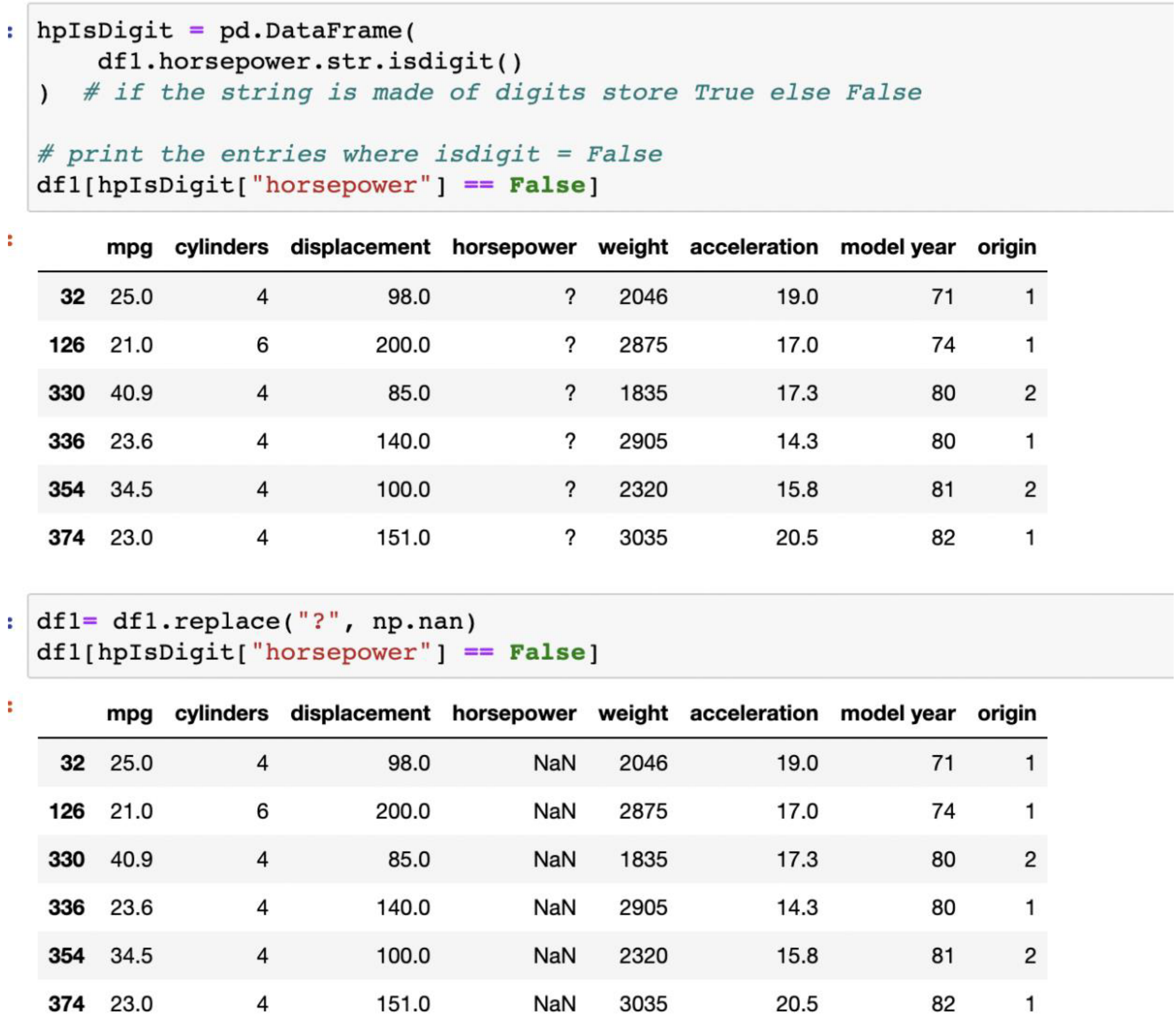


```
: df = pd.read_csv('/Users/haoyuechang/Desktop/auto-mpg.csv')
  #cData = pd.read_csv("auto-mpg.csv")
```

```
: #Data processing
  df.info()
  #398 entries, 9 columns
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 398 entries, 0 to 397
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   mpg           398 non-null    float64
 1   cylinders     398 non-null    int64  
 2   displacement  398 non-null    float64
 3   horsepower    398 non-null    object 
 4   weight        398 non-null    int64  
 5   acceleration  398 non-null    float64
 6   model year    398 non-null    int64  
 7   origin        398 non-null    int64  
 8   car name      398 non-null    object 
dtypes: float64(3), int64(4), object(2)
memory usage: 28.1+ KB
```

```
: #drop car name since it is not useful to analyze
  df1 = df.drop(["car name"], axis=1)
```

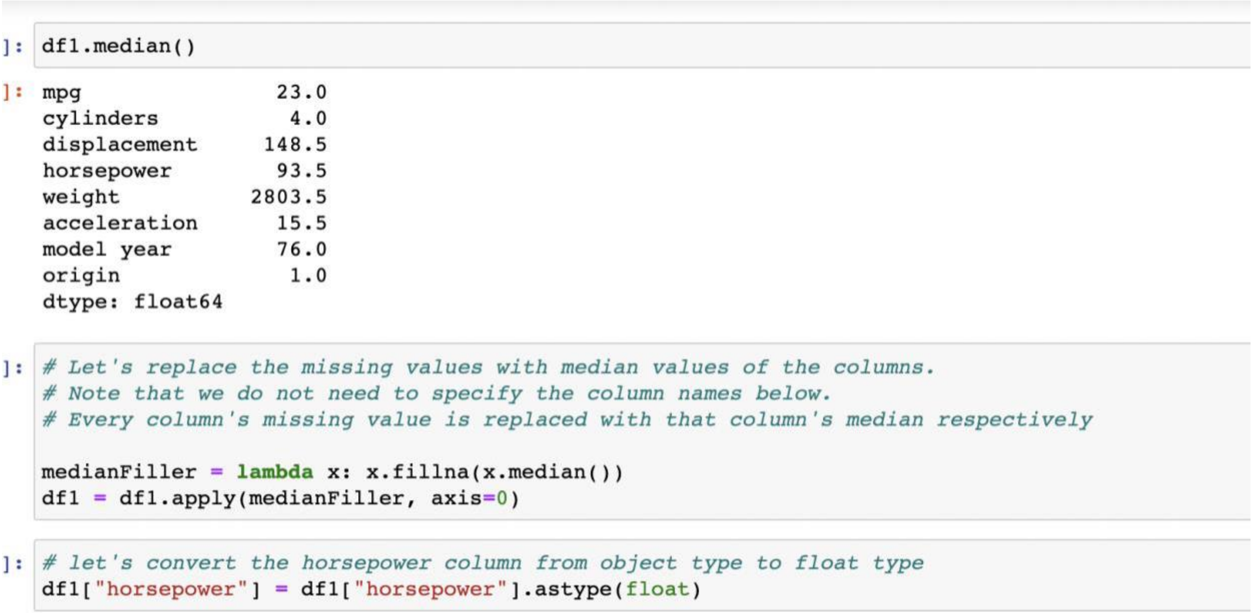


```
hpIsDigit = pd.DataFrame(
    df1.horsepower.str.isdigit()
)  # if the string is made of digits store True else False

# print the entries where isdigit = False
df1[hpIsDigit["horsepower"] == False]
```

| | mpg | cylinders | displacement | horsepower | weight | acceleration | model year | origin |
|---|---|---|---|---|---|---|---|---|
| **32** | 25.0 | 4 | 98.0 | ? | 2046 | 19.0 | 71 | 1 |
| **126** | 21.0 | 6 | 200.0 | ? | 2875 | 17.0 | 74 | 1 |
| **330** | 40.9 | 4 | 85.0 | ? | 1835 | 17.3 | 80 | 2 |
| **336** | 23.6 | 4 | 140.0 | ? | 2905 | 14.3 | 80 | 1 |
| **354** | 34.5 | 4 | 100.0 | ? | 2320 | 15.8 | 81 | 2 |
| **374** | 23.0 | 4 | 151.0 | ? | 3035 | 20.5 | 82 | 1 |

```
df1= df1.replace("?", np.nan)
df1[hpIsDigit["horsepower"] == False]
```

| | mpg | cylinders | displacement | horsepower | weight | acceleration | model year | origin |
|---|---|---|---|---|---|---|---|---|
| **32** | 25.0 | 4 | 98.0 | NaN | 2046 | 19.0 | 71 | 1 |
| **126** | 21.0 | 6 | 200.0 | NaN | 2875 | 17.0 | 74 | 1 |
| **330** | 40.9 | 4 | 85.0 | NaN | 1835 | 17.3 | 80 | 2 |
| **336** | 23.6 | 4 | 140.0 | NaN | 2905 | 14.3 | 80 | 1 |
| **354** | 34.5 | 4 | 100.0 | NaN | 2320 | 15.8 | 81 | 2 |
| **374** | 23.0 | 4 | 151.0 | NaN | 3035 | 20.5 | 82 | 1 |

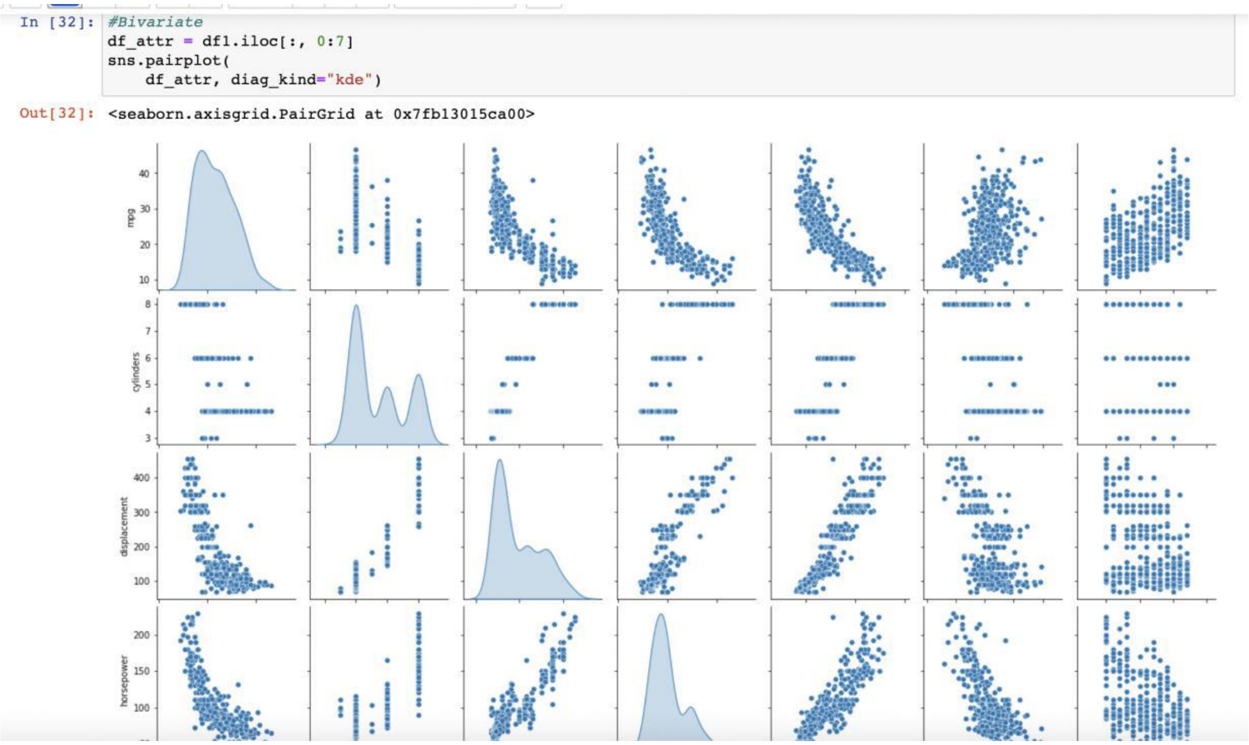


```
]: df1.median()
```

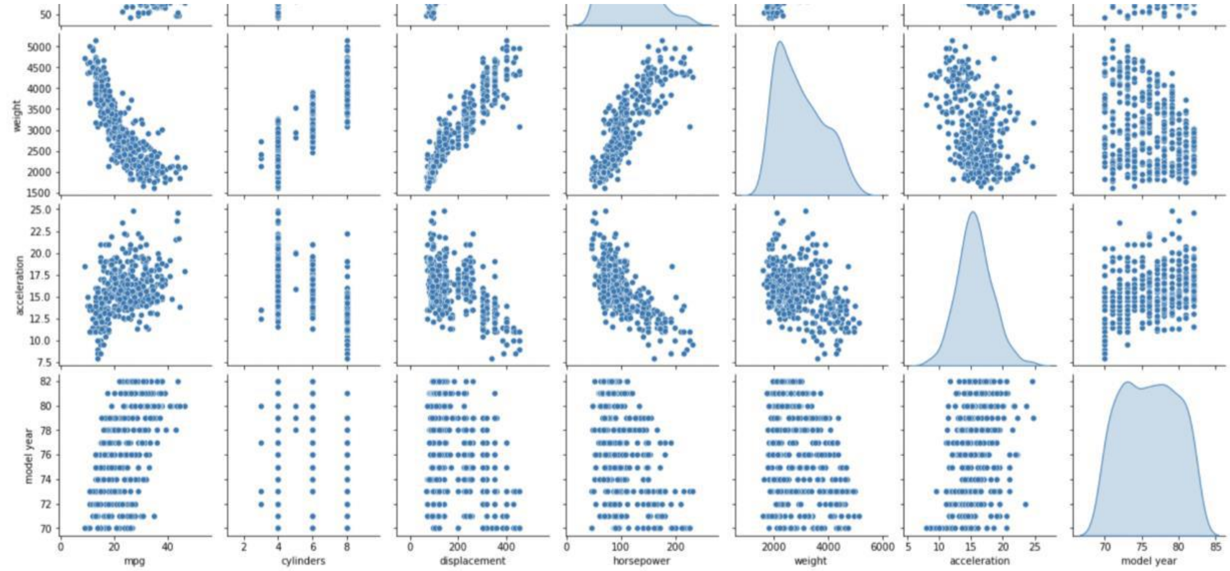
```
]: mpg               23.0
   cylinders          4.0
   displacement     148.5
   horsepower        93.5
   weight          2803.5
   acceleration      15.5
   model year        76.0
   origin             1.0
   dtype: float64
```

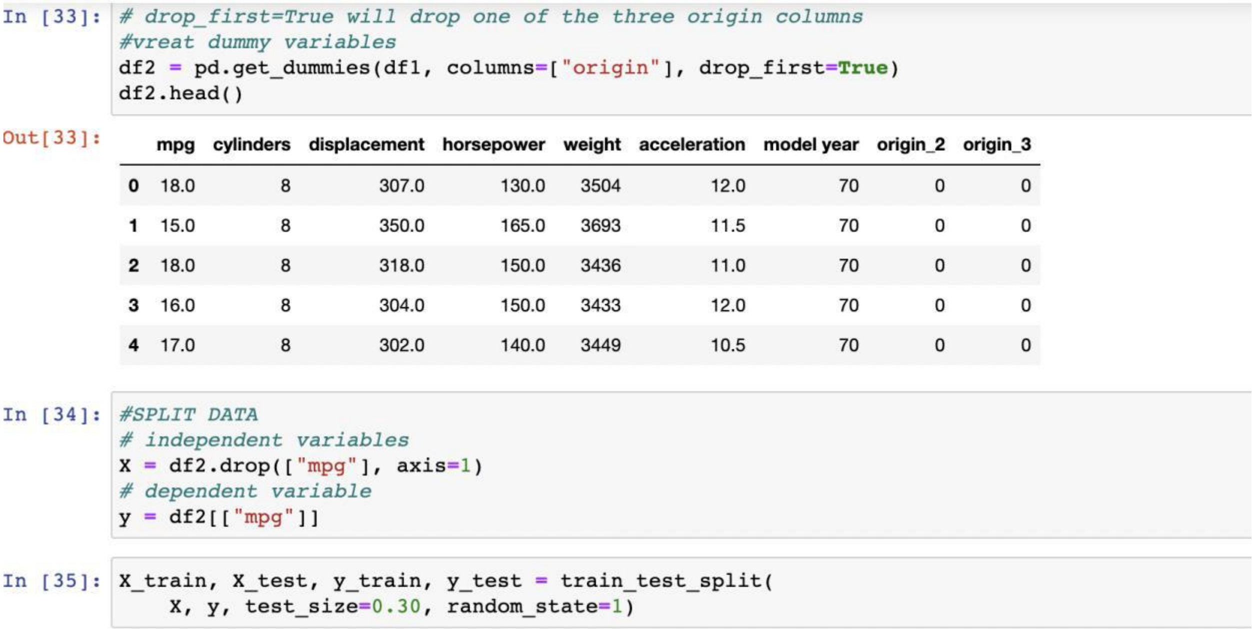
```
]: # Let's replace the missing values with median values of the columns.
   # Note that we do not need to specify the column names below.
   # Every column's missing value is replaced with that column's median respectively

   medianFiller = lambda x: x.fillna(x.median())
   df1 = df1.apply(medianFiller, axis=0)
```

```
]: # let's convert the horsepower column from object type to float type
   df1["horsepower"] = df1["horsepower"].astype(float)
```



```
In [32]: #Bivariate
         df_attr = df1.iloc[:, 0:7]
         sns.pairplot(
             df_attr, diag_kind="kde")

Out[32]: <seaborn.axisgrid.PairGrid at 0x7fb13015ca00>
```





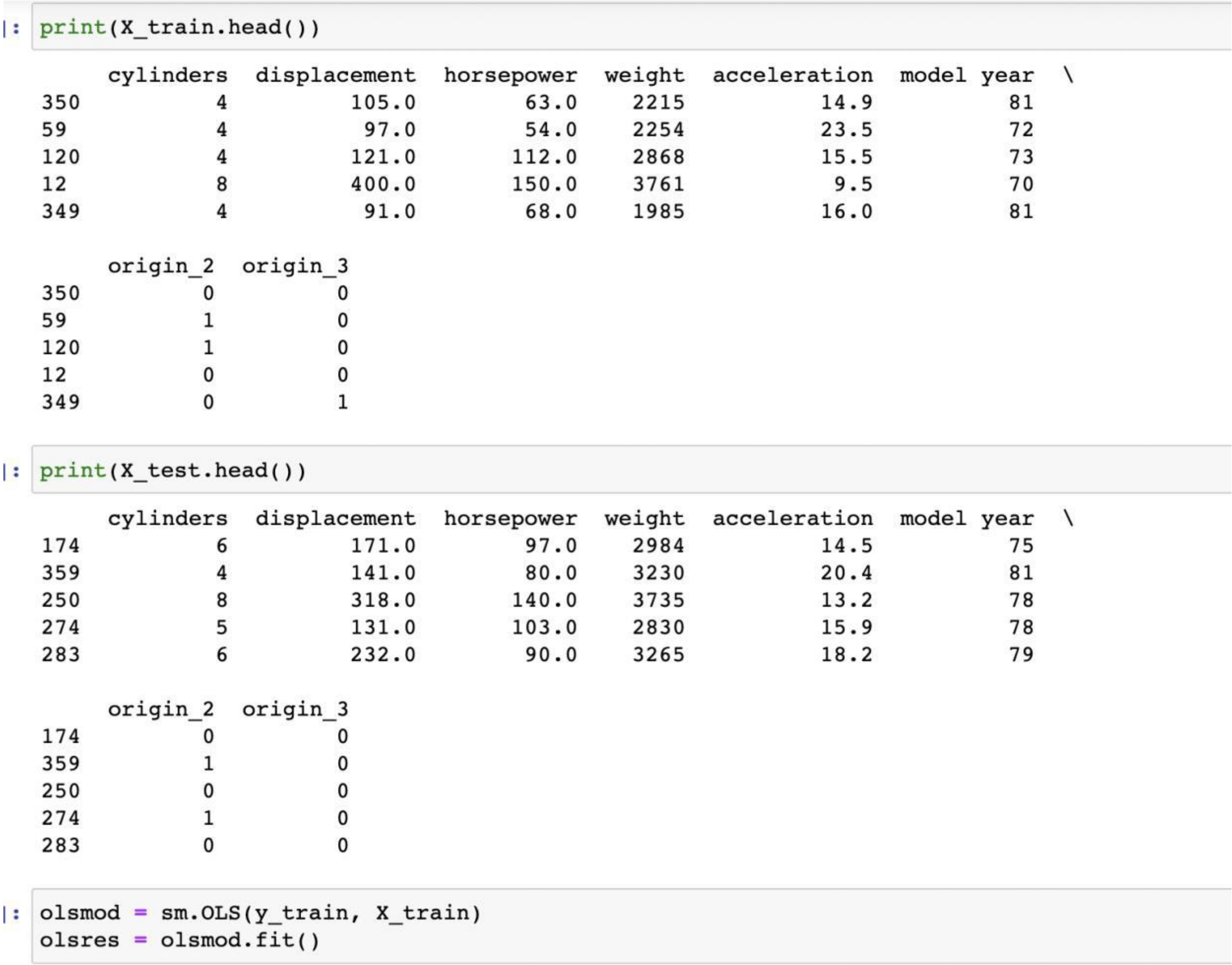
```
In [33]: # drop_first=True will drop one of the three origin columns
         #vreat dummy variables
         df2 = pd.get_dummies(df1, columns=["origin"], drop_first=True)
         df2.head()
```

Out[33]:

|   | mpg | cylinders | displacement | horsepower | weight | acceleration | model year | origin_2 | origin_3 |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 18.0 | 8 | 307.0 | 130.0 | 3504 | 12.0 | 70 | 0 | 0 |
| **1** | 15.0 | 8 | 350.0 | 165.0 | 3693 | 11.5 | 70 | 0 | 0 |
| **2** | 18.0 | 8 | 318.0 | 150.0 | 3436 | 11.0 | 70 | 0 | 0 |
| **3** | 16.0 | 8 | 304.0 | 150.0 | 3433 | 12.0 | 70 | 0 | 0 |
| **4** | 17.0 | 8 | 302.0 | 140.0 | 3449 | 10.5 | 70 | 0 | 0 |

```
In [34]: #SPLIT DATA
         # independent variables
         X = df2.drop(["mpg"], axis=1)
         # dependent variable
         y = df2[["mpg"]]
```

```
In [35]: X_train, X_test, y_train, y_test = train_test_split(
             X, y, test_size=0.30, random_state=1)
```



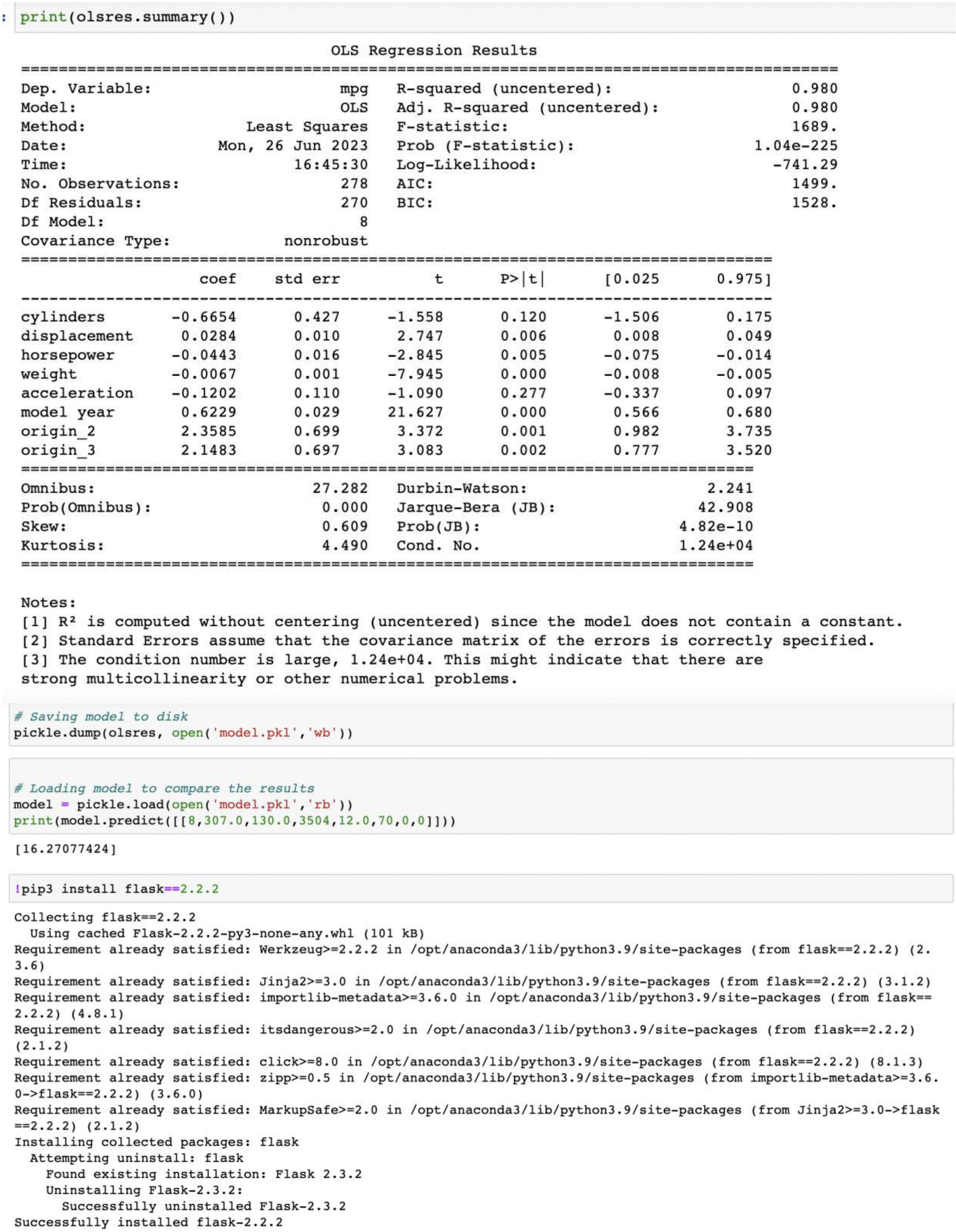
```
]: print(X_train.head())
```

```
     cylinders  displacement  horsepower  weight  acceleration  model year  \
350          4         105.0        63.0    2215          14.9          81   
59           4          97.0        54.0    2254          23.5          72   
120          4         121.0       112.0    2868          15.5          73   
12           8         400.0       150.0    3761           9.5          70   
349          4          91.0        68.0    1985          16.0          81   

     origin_2  origin_3  
350         0         0  
59          1         0  
120         1         0  
12          0         0  
349         0         1  
```

```
]: print(X_test.head())
```

```
     cylinders  displacement  horsepower  weight  acceleration  model year  \
174          6         171.0        97.0    2984          14.5          75   
359          4         141.0        80.0    3230          20.4          81   
250          8         318.0       140.0    3735          13.2          78   
274          5         131.0       103.0    2830          15.9          78   
283          6         232.0        90.0    3265          18.2          79   

     origin_2  origin_3  
174         0         0  
359         1         0  
250         0         0  
274         1         0  
283         0         0  
```

```
]: olsmod = sm.OLS(y_train, X_train)
   olsres = olsmod.fit()
```



```
: print(olsres.summary())
```

```
                                 OLS Regression Results                                
=======================================================================================
Dep. Variable:                    mpg   R-squared (uncentered):                   0.980
Model:                            OLS   Adj. R-squared (uncentered):              0.980
Method:                 Least Squares   F-statistic:                              1689.
Date:                Mon, 26 Jun 2023   Prob (F-statistic):                   1.04e-225
Time:                        16:45:30   Log-Likelihood:                         -741.29
No. Observations:                 278   AIC:                                      1499.
Df Residuals:                     270   BIC:                                      1528.
Df Model:                           8                                                  
Covariance Type:            nonrobust                                                  
================================================================================
                   coef    std err          t      P>|t|      [0.025      0.975]
--------------------------------------------------------------------------------
cylinders       -0.6654      0.427     -1.558      0.120      -1.506       0.175
displacement     0.0284      0.010      2.747      0.006       0.008       0.049
horsepower      -0.0443      0.016     -2.845      0.005      -0.075      -0.014
weight          -0.0067      0.001     -7.945      0.000      -0.008      -0.005
acceleration    -0.1202      0.110     -1.090      0.277      -0.337       0.097
model year       0.6229      0.029     21.627      0.000       0.566       0.680
origin_2         2.3585      0.699      3.372      0.001       0.982       3.735
origin_3         2.1483      0.697      3.083      0.002       0.777       3.520
==============================================================================
Omnibus:                       27.282   Durbin-Watson:                   2.241
Prob(Omnibus):                  0.000   Jarque-Bera (JB):               42.908
Skew:                           0.609   Prob(JB):                     4.82e-10
Kurtosis:                       4.490   Cond. No.                     1.24e+04
==============================================================================

Notes:
[1] R² is computed without centering (uncentered) since the model does not contain a constant.
[2] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[3] The condition number is large, 1.24e+04. This might indicate that there are
strong multicollinearity or other numerical problems.
```

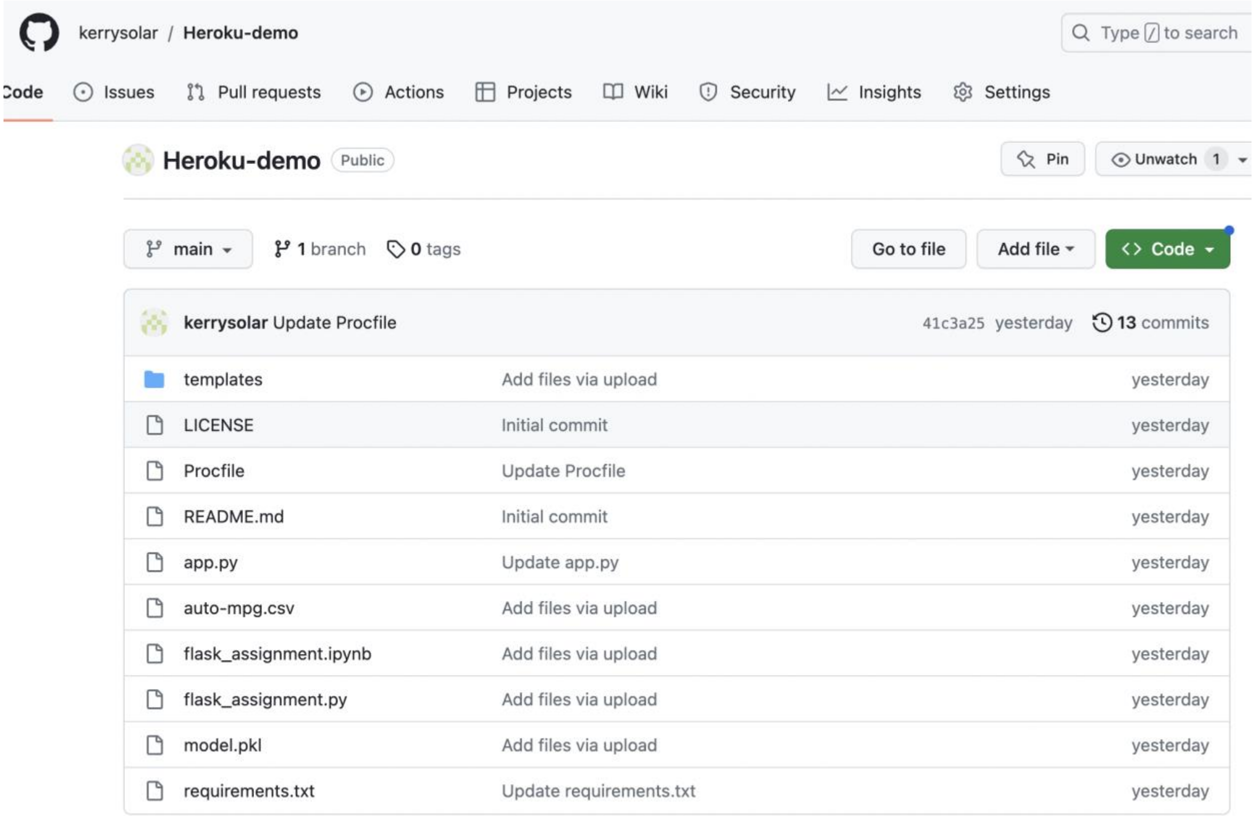
```
# Saving model to disk
pickle.dump(olsres, open('model.pkl','wb'))
```

```
# Loading model to compare the results
model = pickle.load(open('model.pkl','rb'))
print(model.predict([[8,307.0,130.0,3504,12.0,70,0,0]]))
```

```
[16.27077424]
```

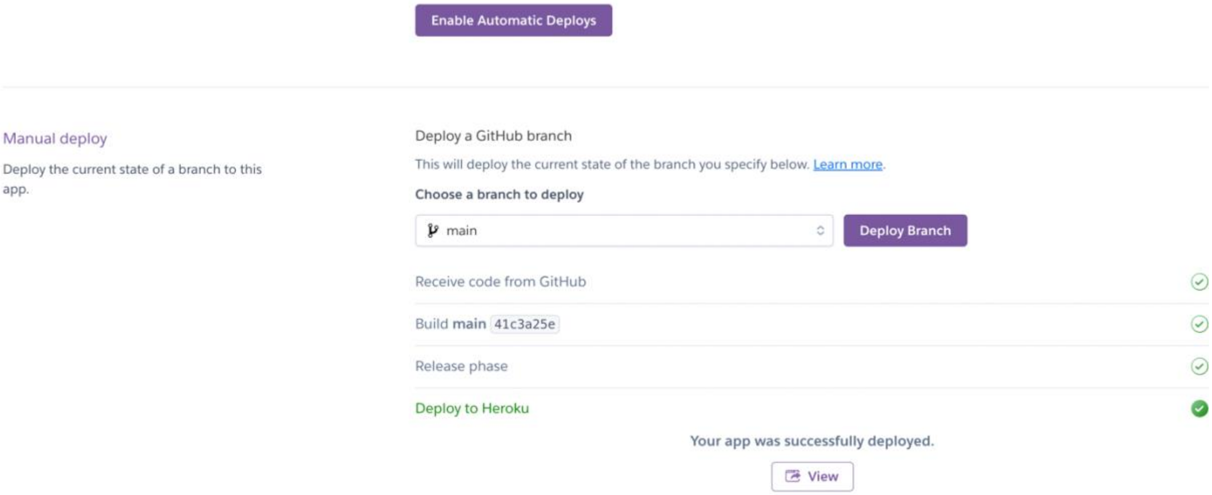
```
!pip3 install flask==2.2.2
```

```
Collecting flask==2.2.2
  Using cached Flask-2.2.2-py3-none-any.whl (101 kB)
Requirement already satisfied: Werkzeug>=2.2.2 in /opt/anaconda3/lib/python3.9/site-packages (from flask==2.2.2) (2.
3.6)
Requirement already satisfied: Jinja2>=3.0 in /opt/anaconda3/lib/python3.9/site-packages (from flask==2.2.2) (3.1.2)
Requirement already satisfied: importlib-metadata>=3.6.0 in /opt/anaconda3/lib/python3.9/site-packages (from flask==
2.2.2) (4.8.1)
Requirement already satisfied: itsdangerous>=2.0 in /opt/anaconda3/lib/python3.9/site-packages (from flask==2.2.2)
(2.1.2)
Requirement already satisfied: click>=8.0 in /opt/anaconda3/lib/python3.9/site-packages (from flask==2.2.2) (8.1.3)
Requirement already satisfied: zipp>=0.5 in /opt/anaconda3/lib/python3.9/site-packages (from importlib-metadata>=3.6.
0->flask==2.2.2) (3.6.0)
Requirement already satisfied: MarkupSafe>=2.0 in /opt/anaconda3/lib/python3.9/site-packages (from Jinja2>=3.0->flask
==2.2.2) (2.1.2)
Installing collected packages: flask
  Attempting uninstall: flask
    Found existing installation: Flask 2.3.2
    Uninstalling Flask-2.3.2:
      Successfully uninstalled Flask-2.3.2
Successfully installed flask-2.2.2
```



kerrysolar Update Procfile 41c3a25 yesterday 13 commits

| | | |
|---|---|---|
| templates | Add files via upload | yesterday |
| LICENSE | Initial commit | yesterday |
| Procfile | Update Procfile | yesterday |
| README.md | Initial commit | yesterday |
| app.py | Update app.py | yesterday |
| auto-mpg.csv | Add files via upload | yesterday |
| flask_assignment.ipynb | Add files via upload | yesterday |
| flask_assignment.py | Add files via upload | yesterday |
| model.pkl | Add files via upload | yesterday |
| requirements.txt | Update requirements.txt | yesterday |



Manual deploy

Deploy the current state of a branch to this app.

Deploy a GitHub branch

This will deploy the current state of the branch you specify below. Learn more.

Choose a branch to deploy

Receive code from GitHub ✓

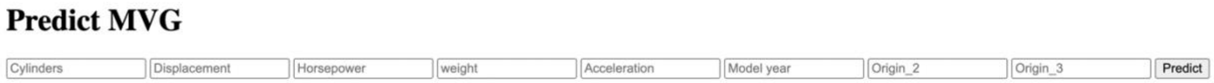
Build main 41c3a25e ✓

Release phase ✓

Deploy to Heroku ✓

Your app was successfully deployed.

`



# Predict MVG