DAY 1 LAB EXPERIMENTS

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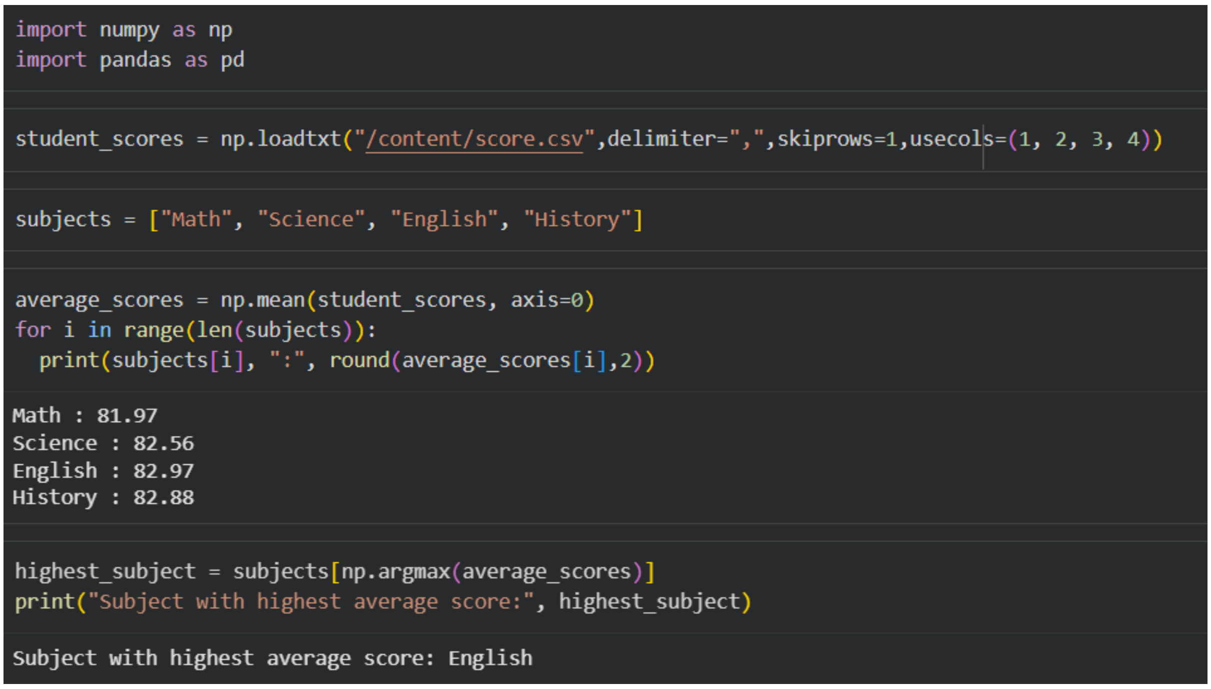
1. Scenario: You are working on a project that involves analyzing student performance data for a class of 32 students. The data is stored in a NumPy array named student_scores, where each row represents a student and each column represents a different subject. The subjects are arranged in the following order: Math, Science, English, and History. Your task is to calculate the average score for each subject and identify the subject with the highest average score.

Question: How would you use NumPy arrays to calculate the average score for each subject and determine the subject with the highest average score? Assume 4x4 matrix that stores marks of each student in given order.

Solution:

```
import numpy as np

import pandas as pd

student_scores = np.loadtxt("/content/score.csv",delimiter=",",skiprows=1,usecols=(1, 2, 3, 4))

subjects = ["Math", "Science", "English", "History"]

average_scores = np.mean(student_scores, axis=0)

for i in range(len(subjects)):

  print(subjects[i], ":", round(average_scores[i],2))

highest_subject = subjects[np.argmax(average_scores)]

print("Subject with highest average score:", highest_subject)
```



```
import numpy as np
import pandas as pd
```

```
student_scores = np.loadtxt("/content/score.csv",delimiter=",",skiprows=1,usecols=(1, 2, 3, 4))
```

```
subjects = ["Math", "Science", "English", "History"]
```

```
average_scores = np.mean(student_scores, axis=0)
for i in range(len(subjects)):
  print(subjects[i], ":", round(average_scores[i],2))
```

```
Math : 81.97
Science : 82.56
English : 82.97
History : 82.88
```

```
highest_subject = subjects[np.argmax(average_scores)]
print("Subject with highest average score:", highest_subject)
```

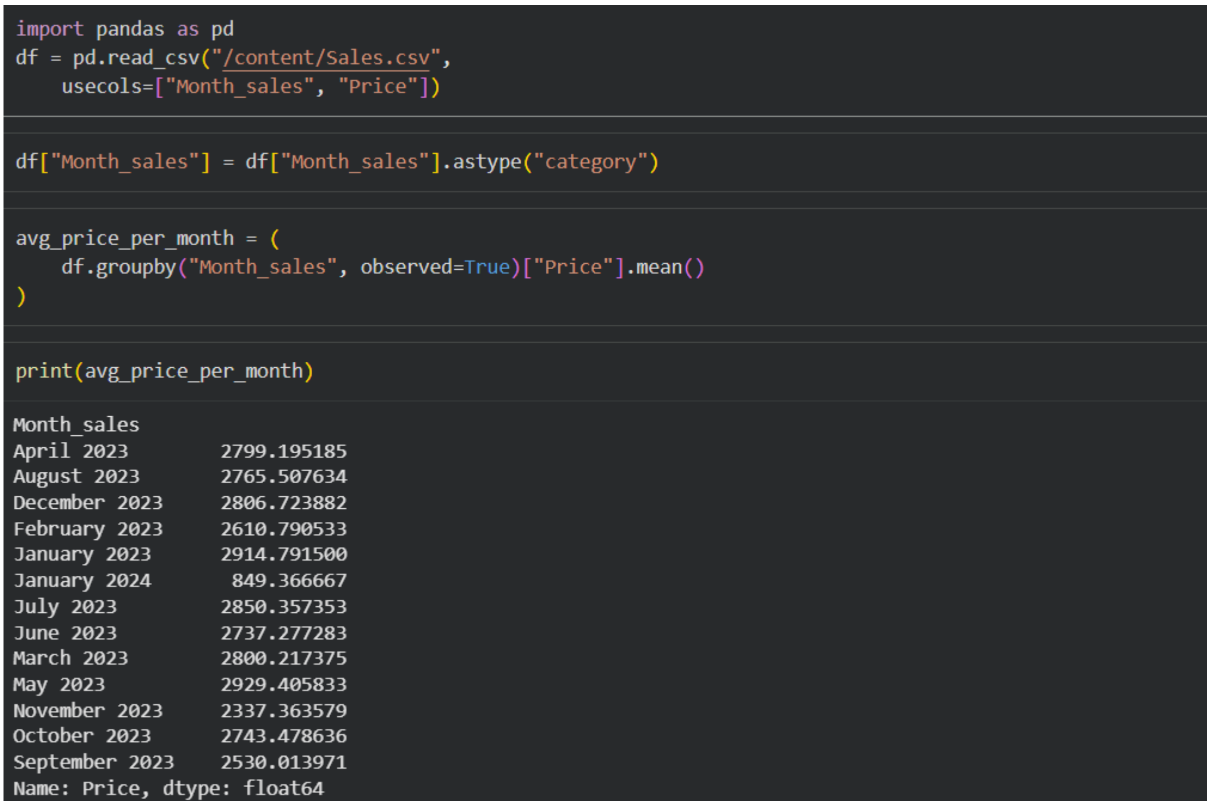
```
Subject with highest average score: English
```

2.Scenario: You are a data analyst working for a company that sells products online. You have been tasked with analyzing the sales data for the past month. The data is stored in a NumPy array.

Question: How would you find the average price of all the products sold in the past month? Assume 3x3 matrix with each row representing the sales for a different product

Solution:

```
import pandas as pd

df = pd.read_csv("/content/Sales.csv",

   usecols=["Month_sales", "Price"])

df["Month_sales"] = df["Month_sales"].astype("category")

avg_price_per_month = (

   df.groupby("Month_sales", observed=True)["Price"].mean()

)

print(avg_price_per_month)
```



```
import pandas as pd
df = pd.read_csv("/content/Sales.csv",
    usecols=["Month_sales", "Price"])
```

```
df["Month_sales"] = df["Month_sales"].astype("category")
```

```
avg_price_per_month = (
    df.groupby("Month_sales", observed=True)["Price"].mean()
)
```

```
print(avg_price_per_month)
```

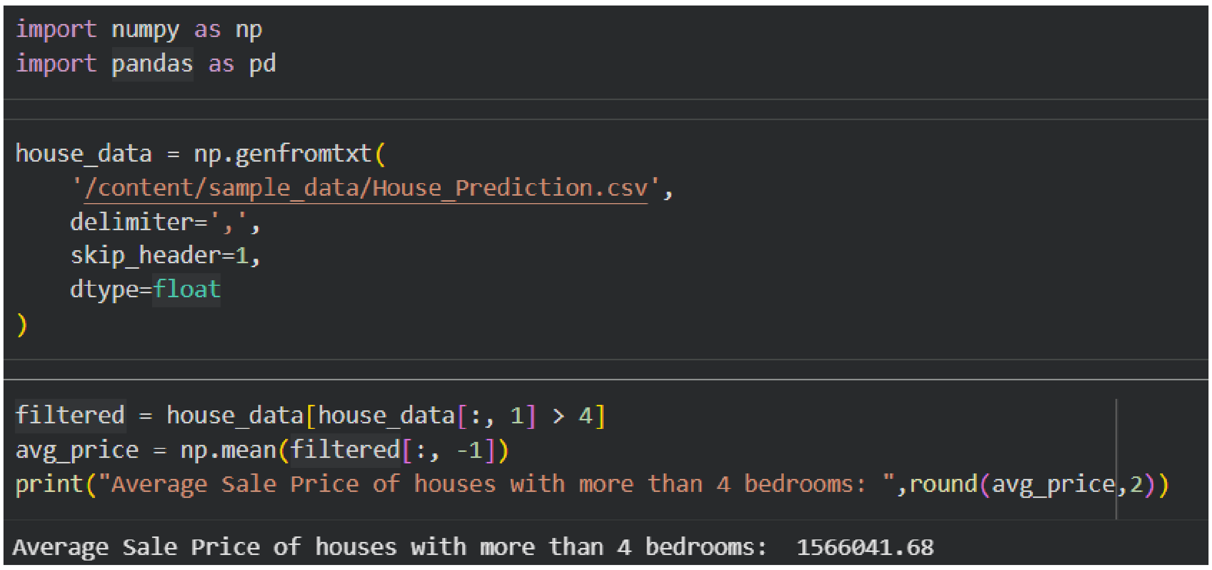
```
Month_sales
April 2023        2799.195185
August 2023       2765.507634
December 2023     2806.723882
February 2023     2610.790533
January 2023      2914.791500
January 2024       849.366667
July 2023         2850.357353
June 2023         2737.277283
March 2023        2800.217375
May 2023          2929.405833
November 2023     2337.363579
October 2023      2743.478636
September 2023    2530.013971
Name: Price, dtype: float64
```

3. **Scenario**: You are working on a project that involves analyzing a dataset containing information about houses in a neighborhood. The dataset is stored in a CSV file, and you have imported it into a NumPy array named house_data. Each row of the array represents a house, and the columns contain various features such as the number of bedrooms, square footage, and sale price.

Question: Using NumPy arrays and operations, how would you find the average sale price of houses with more than four bedrooms in the neighborhood?

Solution:

```
import numpy as np

import pandas as pd

house_data = np.genfromtxt(

   '/content/sample_data/House_Prediction.csv',

   delimiter=',',

   skip_header=1,

   dtype=float

)

filtered = house_data[house_data[:, 1] > 4]

avg_price = np.mean(filtered[:, -1])

print("Average Sale Price of houses with more than 4 bedrooms: ",round(avg_price,2))
```



```
import numpy as np
import pandas as pd
```

```
house_data = np.genfromtxt(
    '/content/sample_data/House_Prediction.csv',
    delimiter=',',
    skip_header=1,
    dtype=float
)
```

```
filtered = house_data[house_data[:, 1] > 4]
avg_price = np.mean(filtered[:, -1])
print("Average Sale Price of houses with more than 4 bedrooms: ",round(avg_price,2))

Average Sale Price of houses with more than 4 bedrooms:  1566041.68
```

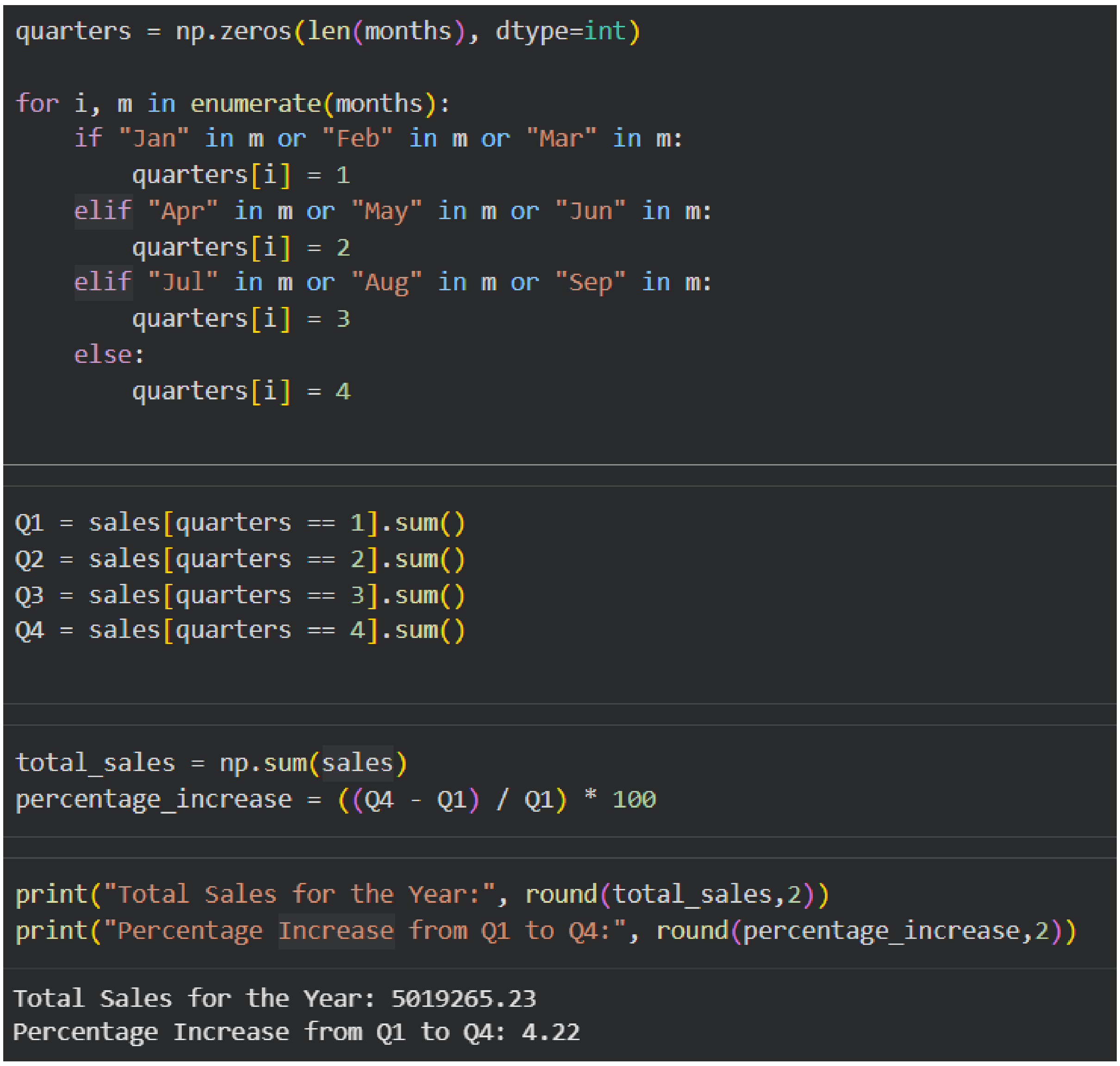
4. **Scenario**: You are working on a project that involves analyzing the sales performance of a company over the past four quarters. The quarterly sales data is stored in a NumPy array named sales_data, where each element represents the sales amount for a specific quarter. Your task is to calculate the total sales for the year and determine the percentage increase in sales from the first quarter to the fourth quarter.

Question: Using NumPy arrays and arithmetic operations calculate the total sales for the year and determine the percentage increase in sales from the first quarter to the fourth quarter?

Solution:

```
import numpy as np
import pandas as pd
data = np.genfromtxt(
   "/content/Sales.csv",
   delimiter=",",
   dtype=str,
   skip_header=1
)

months = data[:, 1]
sales = data[:, 4].astype(float)
quarters = np.zeros(len(months), dtype=int)

for i, m in enumerate(months):
   if "Jan" in m or "Feb" in m or "Mar" in m:
      quarters[i] = 1
   elif "Apr" in m or "May" in m or "Jun" in m:
      quarters[i] = 2
   elif "Jul" in m or "Aug" in m or "Sep" in m:
      quarters[i] = 3
   else:
      quarters[i] = 4
```

```
Q1 = sales[quarters == 1].sum()
Q2 = sales[quarters == 2].sum()
Q3 = sales[quarters == 3].sum()
Q4 = sales[quarters == 4].sum()


total_sales = np.sum(sales)
percentage_increase = ((Q4 - Q1) / Q1) * 100
print("Total Sales for the Year:", round(total_sales,2))
print("Percentage Increase from Q1 to Q4:", round(percentage_increase,2))
```



```
quarters = np.zeros(len(months), dtype=int)

for i, m in enumerate(months):
    if "Jan" in m or "Feb" in m or "Mar" in m:
        quarters[i] = 1
    elif "Apr" in m or "May" in m or "Jun" in m:
        quarters[i] = 2
    elif "Jul" in m or "Aug" in m or "Sep" in m:
        quarters[i] = 3
    else:
        quarters[i] = 4
```

```
Q1 = sales[quarters == 1].sum()
Q2 = sales[quarters == 2].sum()
Q3 = sales[quarters == 3].sum()
Q4 = sales[quarters == 4].sum()
```

```
total_sales = np.sum(sales)
percentage_increase = ((Q4 - Q1) / Q1) * 100
```

```
print("Total Sales for the Year:", round(total_sales,2))
print("Percentage Increase from Q1 to Q4:", round(percentage_increase,2))
```

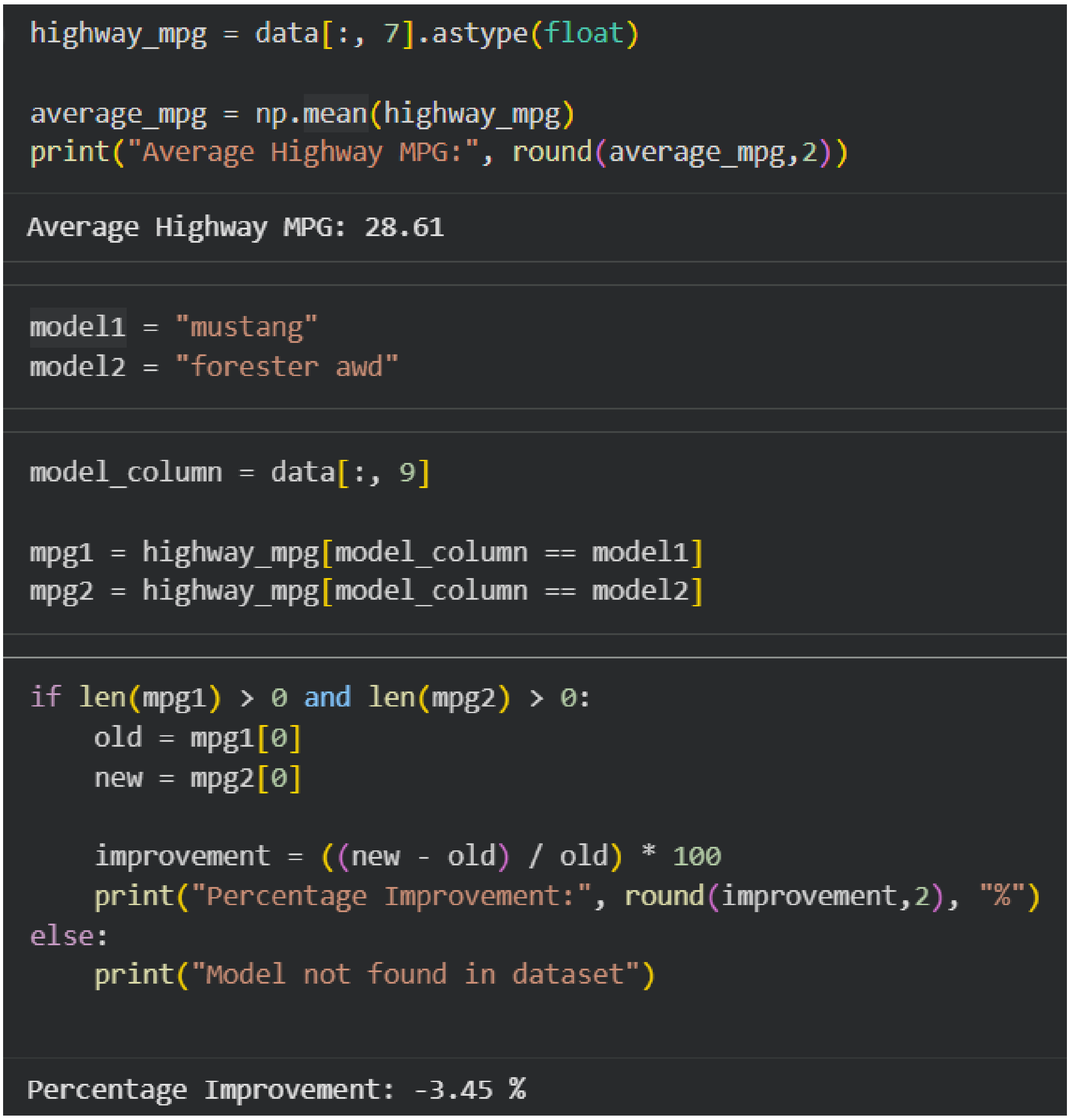
```
Total Sales for the Year: 5019265.23
Percentage Increase from Q1 to Q4: 4.22
```

5. **Scenario**: You are a data analyst working for a car manufacturing company. As part of your analysis, you have a dataset containing information about the fuel efficiency of different car models. The dataset is stored in a NumPy array named fuel_efficiency, where each element represents the fuel efficiency (in miles per gallon) of a specific car model. Your task is to calculate the average fuel efficiency and determine the percentage improvement in fuel efficiency between two car models.

Question: How would you use NumPy arrays and arithmetic operations to calculate the average fuel efficiency and determine the percentage improvement in fuel efficiency between two car models?

Solution:

```
import numpy as np
import pandas as pd
import numpy as np

data = np.genfromtxt(
    '/content/fuel.csv',
    delimiter=',',
    dtype=str,
    skip_header=1
)
highway_mpg = data[:, 7].astype(float)
average_mpg = np.mean(highway_mpg)
model1 = "mustang"
model2 = "forester awd"
model_column = data[:, 9]
mpg1 = highway_mpg[model_column == model1]
mpg2 = highway_mpg[model_column == model2]
print("Average Highway MPG:", round(average_mpg,2))
if len(mpg1) > 0 and len(mpg2) > 0:
    old = mpg1[0]
    new = mpg2[0]
    improvement = ((new - old) / old) * 100
    print("Percentage Improvement:", round(improvement,2), "%")
else:
    print("Model not found in dataset")
```



```
highway_mpg = data[:, 7].astype(float)

average_mpg = np.mean(highway_mpg)
print("Average Highway MPG:", round(average_mpg,2))
```

```
Average Highway MPG: 28.61
```

```
model1 = "mustang"
model2 = "forester awd"
```

```
model_column = data[:, 9]

mpg1 = highway_mpg[model_column == model1]
mpg2 = highway_mpg[model_column == model2]
```

```
if len(mpg1) > 0 and len(mpg2) > 0:
    old = mpg1[0]
    new = mpg2[0]

    improvement = ((new - old) / old) * 100
    print("Percentage Improvement:", round(improvement,2), "%")
else:
    print("Model not found in dataset")
```

```
Percentage Improvement: -3.45 %
```