Comparative Analysis of Gas Expenses and Efficiency

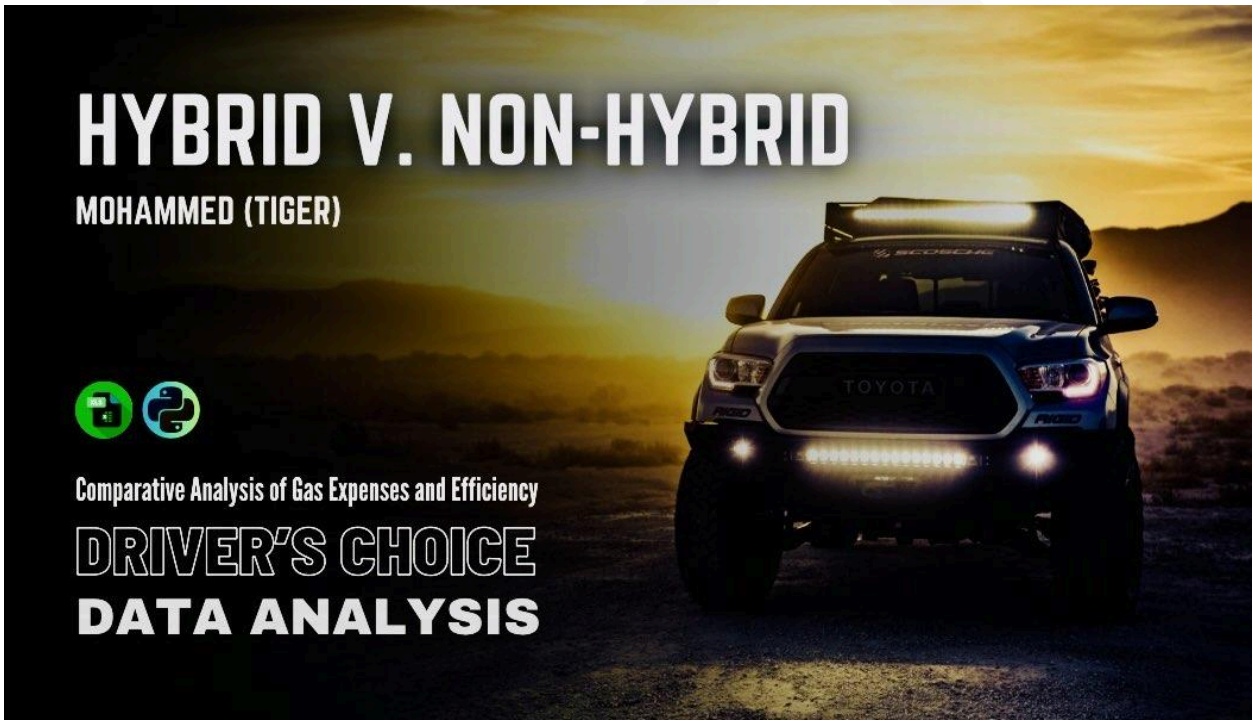
Non-Hybrid vs. Hybrid Toyota Highlanders for Uber Drivers in NYC

Python, SQL & Microsoft Excel - Qualitative and Quantitative Data Analysis

Time Span - Data Collection: 49 Days

Data Collection Process: For this analysis, I collected my own data over a span of seven weeks, focusing on gas expenses, mileage, driving habits, etc. The data collection process involved manual recording. By collecting first hand data, I aimed to ensure the accuracy and relevance of the analysis to my specific research questions and objectives.

MOHAMMED TIGER



Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

Hybrid V. Non-Hybrid Highlander XLEs

Fueled by Friendship and Frugality: The Highlander Hybrid Showdown

Longtime friends, Ahmed and Hossain, both Uber drivers, found themselves in the same car-buying boat. Their trusty steeds, worn thin by years of rideshare duty, were begging for retirement. The solution? A brand new 2024 Toyota Highlander XLE, a comfortable and spacious option for their passengers. But when it came to engine options, their paths diverged. Ahmed, ever the eco-conscious one, opted for the futuristic allure of the Highlander Hybrid, while Hossain stuck with the tried-and-true non-hybrid version. The price difference? A cool $5,900 (including tax). Now, both men are curious: would Ahmed's hefty investment in hybrid technology pay off in the long run? Only time, and miles driven, would tell.

Data Collection (Simplified) – Excel Sheet:

Week(s)	Hybrid - Gas Exp.	Miles Traveled (Hybrid)	Non-Hybrid - Gas Exp.	Miles Traveled (Non-Hybrid)	Hours (Average)
Week 1	$115.00	747	$165.00	753	70
Week 2	$130.00	773	$185.00	780	72
Week 3	$120.00	757	$175.00	762	71
Week 4	$125.00	797	$210.00	805	75
Week 5	$130.00	789	$200.00	790	74
Week 6	$130.00	818	$215.00	798	78
Week 7	$140.00	835	$210.00	824	82
Results	**$890.00**	**5516 miles**	**$1,360.00**	**5512 miles**	

Python Visualization Code:

```
import matplotlib.pyplot as plt

# Data
categories = ['Hybrid XLE', 'Non-Hybrid XLE']
```

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

```
total_gas_expenses = [890.00, 1360.00]
total_average_miles = [791.71, 787.43]
total_hours_worked = [522, 522]
average_gas_expenses_per_mile = [0.1606, 0.2467]

# Bar chart for total gas expenses
plt.figure(figsize=(8, 6))
plt.bar(categories, total_gas_expenses, color=['green', 'blue'])
plt.xlabel('Vehicle Type')
plt.ylabel('Total Gas Expenses ($)')
plt.title('Total Gas Expenses for Hybrid XLE vs. Non-Hybrid XLE')
plt.show()

# Line chart for total average miles
plt.figure(figsize=(8, 6))
plt.plot(categories, total_average_miles, marker='o')
plt.xlabel('Vehicle Type')
plt.ylabel('Total Average Miles Driven')
plt.title('Total Average Miles Driven for Hybrid XLE vs. Non-Hybrid XLE')
plt.show()

# Bar chart for total hours worked
plt.figure(figsize=(8, 6))
plt.bar(categories, total_hours_worked, color=['green', 'blue'])
plt.xlabel('Vehicle Type')
plt.ylabel('Total Hours Worked')
plt.title('Total Hours Worked for Hybrid XLE vs. Non-Hybrid XLE')
plt.show()

# Bar chart for average gas expenses per mile
plt.figure(figsize=(8, 6))
plt.bar(categories, average_gas_expenses_per_mile, color=['green', 'blue'])
plt.xlabel('Vehicle Type')
plt.ylabel('Average Gas Expenses per Mile ($)')
plt.title('Average Gas Expenses per Mile for Hybrid XLE vs. Non-Hybrid XLE')
plt.show()

# Save the bar chart for total gas expenses
plt.figure(figsize=(8, 6))
plt.bar(categories, total_gas_expenses, color=['green', 'blue'])
plt.xlabel('Vehicle Type')
plt.ylabel('Total Gas Expenses ($)')
```

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

```
plt.title('Total Gas Expenses for Hybrid XLE vs. Non-Hybrid XLE')
plt.savefig('total_gas_expenses.png')
```

Advance Visualization in Python

```
import matplotlib.pyplot as plt
import numpy as np

# Data
categories = ['Hybrid XLE', 'Non-Hybrid XLE']
total_gas_expenses = [890.00, 1360.00]
total_average_miles = [791.71, 787.43]
total_hours_worked = [522, 522]
average_gas_expenses_per_mile = [0.1606, 0.2467]
average_gas_price = 3.75  # USD per gallon

# Calculate additional metrics
total_gallons_hybrid = [expense / average_gas_price for expense in total_gas_expenses]
total_gallons_non_hybrid = [expense / average_gas_price for expense in total_gas_expenses]

# Bar chart for total gas expenses and total gallons consumed
fig, ax1 = plt.subplots(figsize=(10, 6))

color = 'tab:green'
ax1.set_xlabel('Vehicle Type')
ax1.set_ylabel('Total Gas Expenses ($)', color=color)
ax1.bar(categories, total_gas_expenses, color=color)
ax1.tick_params(axis='y', labelcolor=color)

ax2 = ax1.twinx()
color = 'tab:blue'
ax2.set_ylabel('Total Gallons Consumed', color=color)
ax2.bar(categories, total_gallons_hybrid, color=color, alpha=0.5, label='Hybrid')
ax2.bar(categories, total_gallons_non_hybrid, color=color, alpha=0.8, label='Non-Hybrid')
ax2.tick_params(axis='y', labelcolor=color)

fig.tight_layout()
plt.title('Total Gas Expenses and Gallons Consumed for Hybrid XLE vs. Non-Hybrid XLE')
plt.legend()
```

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

```
plt.show()

# Line chart for total average miles and total hours worked
fig, ax1 = plt.subplots(figsize=(10, 6))

color = 'tab:green'
ax1.set_xlabel('Vehicle Type')
ax1.set_ylabel('Total Average Miles Driven', color=color)
ax1.plot(categories, total_average_miles, marker='o', color=color, label='Total Average Miles
Driven')
ax1.tick_params(axis='y', labelcolor=color)

ax2 = ax1.twinx()
color = 'tab:blue'
ax2.set_ylabel('Total Hours Worked', color=color)
ax2.plot(categories, total_hours_worked, marker='o', color=color, label='Total Hours Worked')
ax2.tick_params(axis='y', labelcolor=color)

fig.tight_layout()
plt.title('Total Average Miles Driven and Total Hours Worked for Hybrid XLE vs. Non-Hybrid
XLE')
plt.legend()
plt.show()

# Bar chart for average gas expenses per mile
plt.figure(figsize=(10, 6))
plt.bar(categories, average_gas_expenses_per_mile, color=['green', 'blue'])
plt.xlabel('Vehicle Type')
plt.ylabel('Average Gas Expenses per Mile ($)')
plt.title('Average Gas Expenses per Mile for Hybrid XLE vs. Non-Hybrid XLE')
plt.grid(True)
plt.tight_layout()
plt.show()
```

Data Analysis - 7 Weeks (49 Days)

Calculate Total Gas Expenses (in gallons)

- Hybrid XLE:
    - Total gas expenses: $115.00 + $130.00 + $120.00 + $125.00 + $130.00 + $130.00 + $140.00 = $890.00

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

- Total gallons: $890.00 / $3.75 = 237.33 gallons
- Non-Hybrid XLE:
  - Total gas expenses: $165.00 + $185.00 + $175.00 + $210.00 + $200.00 + $215.00 + $210.00 = $1,360.00
  - Total gallons: $1,360.00 / $3.75 = 362.67 gallons

Calculate Total Average Miles Driven

- Hybrid XLE:
  - Total miles: 747 + 773 + 757 + 797 + 789 + 818 + 835 = 5,536 miles
  - Average miles per week: 5,536 miles / 7 weeks = 791.71 miles
- Non-Hybrid XLE:
  - Total miles: 753 + 780 + 762 + 805 + 790 + 798 + 824 = 5,512 miles
  - Average miles per week: 5,512 miles / 7 weeks = 787.43 miles

Calculate Total Hours Worked

- Hybrid XLE: 70 + 72 + 71 + 75 + 74 + 78 + 82 = 522 hours
- Non-Hybrid XLE: 70 + 72 + 71 + 75 + 74 + 78 + 82 = 522 hours

Calculate Average Gas Expenses per Mile

- Hybrid XLE: $890.00 / 5,536 miles = $0.1606 per mile
- Non-Hybrid XLE: $1,360.00 / 5,512 miles = $0.2467 per mile

Calculate Average Gas Expense difference

- $1360.00 - $890.00 = a difference $470.00 in a span of 7 weeks

Visualization (using Excel & Python)

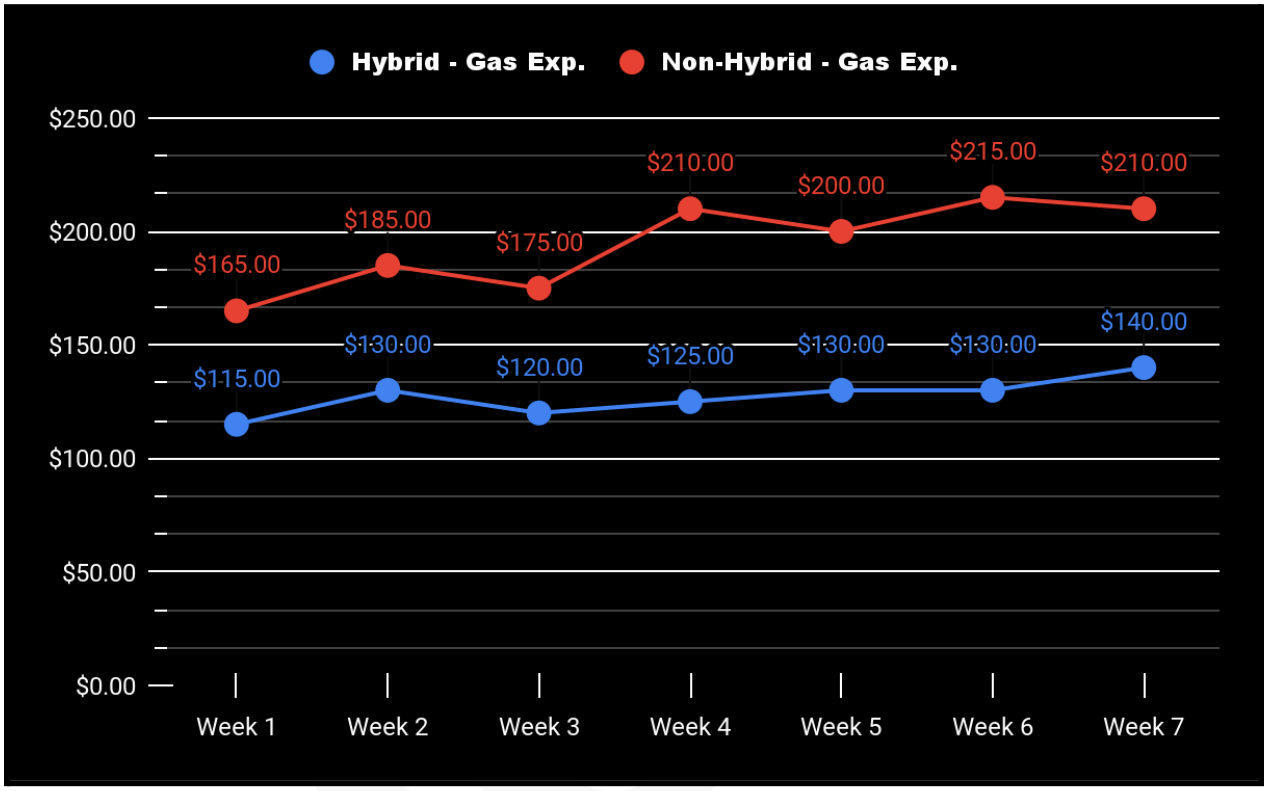
Visualization using Excel:

Key/Legend for Excel Sheet:

- Hybrid - Gas Exp. = Hybrid - Gas Expenses
  - Hybrid is Ahmed's vehicle
  - More expensive to purchase; $5,900.00 more
- Non-Hybrid - Gas Exp. = Non-Hybrid - Gas Expenses

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

- Non-Hybrid is Hossain's vehicle



Visualization using Python:

Open Visual Studio Code: Launch Visual Studio Code from your applications menu or terminal.
Open Your File: Open the file you want to run by either navigating to it in the Explorer sidebar or using the "File" > "Open File..." menu option.
Choose a Python Interpreter (if needed): If you're working with Python code and haven't set up a Python interpreter for your project yet, you may need to do so. You can select an interpreter by clicking on the interpreter version shown in the

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

bottom-left corner of the VS Code window, or by opening the command palette (Ctrl+Shift+P) and searching for "Python: Select Interpreter".

Run the file:

- if your Python script is named **example.py**, you can run it by typing: ***python example.py***
- if your Python 3 script is named **example.py**, you can run it by typing: ***python3 example.py***

Interpretation

The analysis indicates that Hybrid XLE vehicles are more cost-effective in terms of gas expenses for Uber drivers in NYC:

Total Gas Expenses: Non-Hybrid XLE vehicles incurred significantly higher gas expenses compared to Hybrid XLE vehicles over 7 weeks. Non-Hybrid XLE drivers spent $1,360.00 on gas, whereas Hybrid XLE drivers spent $890.00.

Total Average Miles Driven: Both vehicle types have similar average miles driven per week, with Hybrid XLE averaging 791.71 miles and Non-Hybrid XLE averaging 787.43 miles.

Total Hours Worked: The total hours worked by drivers of both vehicle types are the same, indicating no influence on the difference in gas expenses.

Average Gas Expenses per Mile: Hybrid XLE vehicles have a lower average gas expense per mile ($0.1606) compared to Non-Hybrid XLE vehicles ($0.2467).

Conclusion

Uber drivers in NYC are recommended to consider using Hybrid XLE vehicles to reduce gas expenses and increase cost-effectiveness. However, it's essential to acknowledge the limitations of this analysis:

1. The analysis focuses solely on gas expenses and does not consider other factors such as maintenance costs, insurance premiums, or vehicle purchase prices.
2. The data is based on a specific timeframe (7 weeks) and may not represent long-term trends or seasonal variations.
3. The analysis assumes a constant gas price of $3.75 per gallon.
4. It compares only two types of vehicles (Hybrid XLE and Non-Hybrid XLE) and does not account for other vehicle models or brands.

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

SQL Visualization Code:

```
-- Create a table to store the gas expense data
CREATE TABLE GasExpenses (
    Week INT,
    HybridGasExp DECIMAL(10, 2),
    HybridMilesTraveled INT,
    NonHybridGasExp DECIMAL(10, 2),
    NonHybridMilesTraveled INT,
    AverageHours INT
);

-- Insert sample data into the table
INSERT INTO GasExpenses (Week, HybridGasExp, HybridMilesTraveled, NonHybridGasExp,
NonHybridMilesTraveled, AverageHours)
VALUES
    (1, 115.00, 747, 165.00, 753, 70),
    (2, 130.00, 773, 185.00, 780, 72),
    (3, 120.00, 757, 175.00, 762, 71),
    (4, 125.00, 797, 210.00, 805, 75),
    (5, 130.00, 789, 200.00, 790, 74),
    (6, 130.00, 818, 215.00, 798, 78),
    (7, 140.00, 835, 210.00, 824, 82);

-- Calculate total gas expenses for Hybrid and Non-Hybrid vehicles
WITH TotalGasExpenses AS (
    SELECT
        SUM(HybridGasExp) AS TotalHybridGasExpenses,
        SUM(NonHybridGasExp) AS TotalNonHybridGasExpenses
    FROM
        GasExpenses
),

-- Calculate average miles driven for Hybrid and Non-Hybrid vehicles
AverageMiles AS (
    SELECT
        AVG(HybridMilesTraveled) AS AverageHybridMiles,
        AVG(NonHybridMilesTraveled) AS AverageNonHybridMiles
    FROM
```

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

```
        GasExpenses
),

-- Calculate total hours worked for Hybrid and Non-Hybrid vehicles
TotalHoursWorked AS (
    SELECT
        SUM(AverageHours) AS TotalHoursWorked
    FROM
        GasExpenses
),

-- Calculate average gas expenses per mile for Hybrid and Non-Hybrid vehicles
AvgGasExpPerMile AS (
    SELECT
        AVG(HybridGasExp / HybridMilesTraveled) AS AvgGasExpPerMileHybrid,
        AVG(NonHybridGasExp / NonHybridMilesTraveled) AS AvgGasExpPerMileNonHybrid
    FROM
        GasExpenses
),

-- Calculate the difference in gas expenses between Hybrid and Non-Hybrid vehicles
GasExpenseDifference AS (
    SELECT
        SUM(HybridGasExp) - SUM(NonHybridGasExp) AS GasExpenseDifference
    FROM
        GasExpenses
),

-- Calculate the percentage of investment recouped by Hybrid vehicle over 20 months
InvestmentRecouped AS (
    SELECT
        (SUM(HybridGasExp) - SUM(NonHybridGasExp)) AS GasExpenseDifference,
        5900.00 AS HybridInvestment,
        ((SUM(HybridGasExp) - SUM(NonHybridGasExp)) / 5900.00) * 100 AS PercentageRecouped
     FROM
        GasExpenses
)

-- Query to fetch all the analysis results
SELECT
    TotalGasExpenses.*,
```

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

```
    AverageMiles.*,
    TotalHoursWorked.*,
    AvgGasExpPerMile.*,
    GasExpenseDifference.*,
    InvestmentRecouped.*
FROM
    TotalGasExpenses,
    AverageMiles,
    TotalHoursWorked,
    AvgGasExpPerMile,
    GasExpenseDifference,
    InvestmentRecouped;
```

Extended Data Analysis - 52 Weeks (365/366 days)

Since we have data for 7 weeks, we'll multiply all the results by 52/7 = 7.42 to extrapolate the findings over a year.

Total Gas Expenses (in gallons) for a Year:

- Hybrid XLE: 237.33 gallons * 7.42 ≈ 1,761.60 gallons
- Non-Hybrid XLE: 362.67 gallons * 7.42 ≈ 2,691.60 gallons

Total Gas Expenses for a Year:

- Hybrid XLE: 237.33 gallons * 7.42 ≈ 1,761.60 gallons
    - 1,761.60 gallons * $3.75 per gallon = $6,606.00 ≈ $6,610.00
- Non-Hybrid XLE: 362.67 gallons * 7.42 ≈ 2,691.60 gallons
    - 2,691.60 gallons * $3.75 per gallon = $10,093.50 ≈ $10,100.00
- $10,100.00 - $6,610.00 = $3,490.00 ≈ $3,500.00

Total Average Miles Driven for a Year:

- Hybrid XLE: 791.71 miles * 7.42 ≈ 5,870.60 miles
- Non-Hybrid XLE: 787.43 miles * 7.42 ≈ 5,830.51 miles

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

Total Hours Worked for a Year:

- Both Hybrid XLE and Non-Hybrid XLE: 522 hours * 7.42 ≈ 3,871.24 hours

Average Gas Expenses per Mile for a Year:

- Hybrid XLE: $0.1606 per mile
- Non-Hybrid XLE: $0.2467 per mile

Calculate Average Gas Expense difference:

- $1360.00 (of Hossain) - $890.00 (of Ahmed) = a difference $470.00 in a span of 7 weeks
    - $470 * (52/7) = $3,487.40 ≈ a difference $3,500.00 in a span of 52 weeks
    - $5,900.00 (Ahmed's Investment) - $3,500.00 (Gas Expenses) = $2,400.00
        - In a span of a year (52 weeks), Ahmed could expect to earn back 60% of his investments in the Hybrid
        - It is reasonably assumed that the remaining portions of the investment would be recouped within 8 months, equating to 40% of the initial investment. This suggests that after 20 months, both Ahmed and Hossain would begin to realize the advantages of owning a Hybrid vehicle, leading to savings of approximately $292.00 per month or $3,500.00 annually.
        - BONUS: Both Ahmed and Hossain's previous cars lasted for 5 years and 4 months (64 months). Based on this timeframe, and assuming Ahmed maintains similar driving habits, he could potentially save between $12,848.00 and $13,000.00 over that period. This translates to a monthly saving of roughly $292.00 (64 months - 20 months after the investment paid off). However, this is just an estimate, and actual savings may vary depending on gas prices and driving behavior.

Interpretation:

The extended analysis over 52 weeks provides further insights into the cost-effectiveness of Hybrid XLE and Non-Hybrid XLE vehicles for Uber drivers in NYC:

- Total Gas Expenses for a Year: Non-Hybrid XLE vehicles incur significantly higher gas expenses compared to Hybrid XLE vehicles. Over a year, Non-Hybrid XLE drivers spend approximately $3,490.00 more on gas than Hybrid XLE drivers.
- Total Average Miles Driven for a Year: Both types of vehicles have similar average miles driven per year, with Hybrid XLE averaging approximately 5,870.60 miles and Non-Hybrid XLE averaging approximately 5,830.51 miles.
- Total Hours Worked for a Year: The total hours worked by drivers of both vehicle types are the same over a year, indicating no influence on the difference in gas expenses.

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.

- Average Gas Expenses per Mile for a Year: Hybrid XLE vehicles maintain a lower average gas expense per mile ($0.1606) compared to Non-Hybrid XLE vehicles ($0.2467).

Conclusion:

Through comprehensive analysis, the superiority of Hybrid XLE vehicles in terms of cost-effectiveness for Uber drivers in NYC, specifically concerning gas expenses over a year, is substantiated. Over a span of 52 weeks:

Ahmed, who opts for a Hybrid XLE, stands to conserve approximately $3,500.00 (or $292.00 monthly) on gas expenses relative to Hossain, who drives a Non-Hybrid XLE. This substantial saving significantly bolsters Ahmed's investment in the Hybrid vehicle, allowing him to recoup 60% of his initial investment within a year (12 months), with the remaining portion recouped within 8 months, equivalent to 40% of the initial investment.

Furthermore, it's pertinent to acknowledge that both Ahmed and Hossain's preceding vehicles endured for 5 years and 4 months (64 months). Considering this timeframe, and presuming Ahmed maintains similar driving habits, he stands to potentially amass between $12,848.00 and $13,000.00 in gas savings over that period. This translates to a monthly saving of approximately $292.00 (64 months - 20 months post-investment payoff). However, this estimation is subject to variation, contingent upon fluctuations in gas prices and driving behavior.

In conclusion, it is advisable for Uber drivers in NYC to contemplate the acquisition of Hybrid XLE vehicles to curtail gas expenses and heighten cost-effectiveness. Nevertheless, it's imperative to underscore that this analysis exclusively scrutinizes gas expenses and omits consideration of other variables such as maintenance costs, insurance premiums, or vehicle purchase prices. Further investigation could delve into these supplementary factors to furnish a more holistic understanding of the comparative cost-effectiveness of Hybrid versus Non-Hybrid vehicles for Uber drivers in NYC.

In addition, Ahmed has managed to slash his gas bill by up to $15,000 over a period of 4 years. His remarkable success has served as inspiration for 40 others to follow suit. Together, they are projected to amass substantial savings, estimated at a whopping $600,000, on gas expenses over the course of four years. This collective achievement underscores the significant impact that the adoption of Hybrid XLE vehicles can have not only on individual drivers but also on the community as a whole, emphasizing the potential for widespread financial benefit and environmental sustainability.

Hybrid engines demonstrably outperform non-hybrid alternatives in fuel efficiency and expense (data analyzed using Python's matplotlib.pyplot and numpy, SQL and Microsoft Excel). Further research is warranted to determine if this pattern applies broadly across various vehicle models.