1. Project Title and Introduction

```
# ============================================================
#                   UBER TRIPS DATA ANALYSIS
#                  Internship Project - Vcodez
#                    Author: Suriyaprakash
# ============================================================

print("Uber Trips Data Analysis - Internship Project (Vcodez)")
print("Author: Suriyaprakash")
```

```
Uber Trips Data Analysis - Internship Project (Vcodez)
Author: Suriyaprakash
```

2. Install & Import Required Libraries

```
!pip install plotly ipywidgets seaborn --quiet
from google.colab import output
output.enable_custom_widget_manager()

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
from ipywidgets import interact, Dropdown
from IPython.display import display, clear_output
```

```
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.6/1.6 MB 50.0 MB/s eta 0:00:00
```

3. Load Dataset

```
import pandas as pd

# Load data
df = pd.read_csv("uber_trips_chennai.csv", parse_dates=["timestamp"])
df.head()
```

	trip_id	city	timestamp	pickup_zone	pickup_lat	pickup_lng	drop_zone	drop_lat	drop_lng	distance_km	trip_durati
0	1502	Chennai	2024-03-29 07:24:00	Velachery	12.989118	80.208643	Ambattur	13.100438	80.154493	13.64	
1	2587	Chennai	2024-03-01 06:27:00	Kodambakkam	13.067049	80.216374	Besant Nagar	12.982317	80.247181	10.85	
			2024-01-								

4. Basic Info & Structure

```
# Inspect data structure
df.shape, df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5000 entries, 0 to 4999
Data columns (total 17 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   trip_id            5000 non-null   int64
 1   city               5000 non-null   object
 2   timestamp          5000 non-null   datetime64[ns]
 3   pickup_zone        5000 non-null   object
 4   pickup_lat         4900 non-null   float64
 5   pickup_lng         4900 non-null   float64
 6   drop_zone          5000 non-null   object
 7   drop_lat           5000 non-null   float64
 8   drop_lng           5000 non-null   float64
```

```
 9   distance_km        4900 non-null   float64
 10  trip_duration_min  5000 non-null   int64
 11  fare_inr           4900 non-null   float64
 12  payment_type       5000 non-null   object
 13  platform           5000 non-null   object
 14  is_shared          5000 non-null   int64
 15  driver_id          5000 non-null   object
 16  customer_id        5000 non-null   object
dtypes: datetime64[ns](1), float64(6), int64(3), object(7)
memory usage: 664.2+ KB
((5000, 17), None)
```

5. Summary Statistics

```
df.describe(include='all').T
```

	count	unique	top	freq	mean	min	25%	50%	75%	max	
trip_id	5000.0	NaN	NaN	NaN	2500.5	1.0	1250.75	2500.5	3750.25	5000.0	1443.520
city	5000	1	Chennai	5000	NaN	NaN	NaN	NaN	NaN	NaN	N
timestamp	5000	NaN	NaN	NaN	2024-02-15 18:29:24.504000	2024-01-01 00:53:00	2024-01-25 01:17:30	2024-02-15 19:37:30	2024-03-08 21:18:15	2024-03-31 23:38:00	N
pickup_zone	5000	15	Thiruvanmiyur	367	NaN	NaN	NaN	NaN	NaN	NaN	N
pickup_lat	4900.0	NaN	NaN	NaN	13.025211	12.909225	12.979087	13.015566	13.080833	13.165239	0.064
pickup_lng	4900.0	NaN	NaN	NaN	80.215563	80.109111	80.206611	80.222316	80.244338	80.293365	0.041
drop_zone	5000	15	Madhavaram	376	NaN	NaN	NaN	NaN	NaN	NaN	N
drop_lat	5000.0	NaN	NaN	NaN	13.025152	12.908643	12.978655	13.015356	13.081857	13.166141	0.06
drop_lng	5000.0	NaN	NaN	NaN	80.216517	80.110301	80.207552	80.223152	80.246191	80.287416	0.041
distance_km	4900.0	NaN	NaN	NaN	9.682492	0.5	4.23	9.295	14.45	29.28	6.318
trip_duration_min	5000.0	NaN	NaN	NaN	24.2462	5.0	10.0	22.0	35.25	85.0	15.649
fare_inr	4900.0	NaN	NaN	NaN	204.516416	40.0	104.565	193.58	287.8875	644.49	116.732
payment_type	5000	3	Card	2299	NaN	NaN	NaN	NaN	NaN	NaN	N
platform	5000	2	App	4560	NaN	NaN	NaN	NaN	NaN	NaN	N
is_shared	5000.0	NaN	NaN	NaN	0.1252	0.0	0.0	0.0	0.0	1.0	0.330
driver_id	5000	799	D0084	16	NaN	NaN	NaN	NaN	NaN	NaN	N

6. Missing Values

```
df.isna().sum().sort_values(ascending=False)
```

	0
pickup_lat	100
fare_inr	100
pickup_lng	100
distance_km	100
trip_id	0
pickup_zone	0
drop_zone	0
timestamp	0
city	0
drop_lng	0
drop_lat	0
trip_duration_min	0
payment_type	0
platform	0
is_shared	0
driver_id	0
customer_id	0

dtype: int64

7. Descriptive Statistics for Distance, Fare & Trip Duration

```
df[["distance_km", "fare_inr", "trip_duration_min"]].describe()
```

	distance_km	fare_inr	trip_duration_min
count	4900.000000	4900.000000	5000.000000
mean	9.682492	204.516416	24.246200
std	6.318274	116.732721	15.649938
min	0.500000	40.000000	5.000000
25%	4.230000	104.565000	10.000000
50%	9.295000	193.580000	22.000000
75%	14.450000	287.887500	35.250000
max	29.280000	644.490000	85.000000

8. Top 10 Most Frequent Pickup Zones and Drop Zones

```
df["pickup_zone"].value_counts().head(10)
df["drop_zone"].value_counts().head(10)
```

drop_zone	count
Madhavaram	376
Mylapore	353
Thiruvanmiyur	349
Ambattur	347
Velachery	342
Sholinganallur	342
Adyar	329
Kodambakkam	323

9. Missing Values Count for Each Column

```
df.isnull().sum()
```

	0
trip_id	0
city	0
timestamp	0
pickup_zone	0
pickup_lat	100
pickup_lng	100
drop_zone	0
drop_lat	0
drop_lng	0
distance_km	100
trip_duration_min	0
fare_inr	100
payment_type	0
platform	0
is_shared	0
driver_id	0
customer_id	0

dtype: int64

10. Total Number of Duplicate Rows in the Dataset

```
df.duplicated().sum()
```

```
np.int64(0)
```

11. Count of Unique Values in Each Column

```
df.nunique()
```

	0
trip_id	5000
city	1
timestamp	4905
pickup_zone	15
pickup_lat	4843
pickup_lng	4770
drop_zone	15
drop_lat	4939
drop_lng	4853
distance_km	1941
trip_duration_min	73
fare_inr	4401
payment_type	3
platform	2
is_shared	2
driver_id	799
customer_id	3749

dtype: int64

12. Frequency Count of All Unique Rows in the Dataset

```
df.value_counts()
```

trip_id	city	timestamp	pickup_zone	pickup_lat	pickup_lng	drop_zone	drop_lat	drop_lng	distance_km	trip_duratic
4983	**Chennai**	**2024-01-06 09:30:00**	**Tambaram**	**12.924171**	**80.132299**	**Velachery**	**12.992503**	**80.218735**	**11.15**	**16**
4981	**Chennai**	**2024-02-07 11:08:00**	**T. Nagar**	**13.048958**	**80.240020**	**Besant Nagar**	**12.977524**	**80.246056**	**7.61**	**30**
4980	**Chennai**	**2024-03-12 12:22:00**	**Besant Nagar**	**12.978948**	**80.258918**	**Ambattur**	**13.098333**	**80.156645**	**17.45**	**35**
4978	**Chennai**	**2024-03-28 15:12:00**	**Velachery**	**12.988821**	**80.216111**	**Madhavaram**	**13.151615**	**80.217214**	**17.23**	**34**
4976	**Chennai**	**2024-01-09 16:01:00**	**Kodambakkam**	**13.063365**	**80.220727**	**Mylapore**	**13.021226**	**80.272839**	**7.64**	**21**
...	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**
5	**Chennai**	**2024-01-26**	**Besant Nagar**	**12.987448**	**80.261660**	**Sholinganallur**	**12.934351**	**80.217788**	**6.91**	**15**

13. Filling Missing Values Using Forward Fill (FFill) Method

```
df.fillna(method='ffill',inplace=True)
```

```
/tmp/ipython-input-4116506308.py:1: FutureWarning: DataFrame.fillna with 'method' is deprecated and will raise in a future versi
  df.fillna(method='ffill',inplace=True)
```

14. Extracting Date, Hour, Weekday, and Month from Timestamp

```
df["date"] = df["timestamp"].dt.date
df["hour"] = df["timestamp"].dt.hour
df["weekday"] = df["timestamp"].dt.day_name()
df["month"] = df["timestamp"].dt.month_name()
```

15. Preview of First 10 Rows of the Updated Dataset

```
df.head(10)
```

	trip_id	city	timestamp	pickup_zone	pickup_lat	pickup_lng	drop_zone	drop_lat	drop_lng	distance_km	...	fare_ir
0	1502	Chennai	2024-03-29 07:24:00	Velachery	12.989118	80.208643	Ambattur	13.100438	80.154493	13.64	...	308.1
1	2587	Chennai	2024-03-01 06:27:00	Kodambakkam	13.067049	80.216374	Besant Nagar	12.982317	80.247181	10.85	...	231.9
2	2654	Chennai	2024-01-17 11:03:00	Velachery	12.988139	80.218606	Sholinganallur	12.927868	80.220284	7.98	...	149.4
3	1056	Chennai	2024-01-02 20:31:00	Madhavaram	13.143002	80.226513	Velachery	12.987756	80.223668	17.07	...	266.5
4	706	Chennai	2024-01-03 12:17:00	Besant Nagar	12.977208	80.259067	Perambur	13.104840	80.213597	15.83	...	252.4
5	107	Chennai	2024-03-26 06:09:00	Tambaram	12.928306	80.132782	Adyar	13.011949	80.249988	15.69	...	263.2
6	590	Chennai	2024-02-10 05:12:00	Tambaram	12.926544	80.123945	Anna Nagar	13.085074	80.200740	18.87	...	284.1
7	2469	Chennai	2024-01-29 18:36:00	Adyar	13.013886	80.245824	Adyar	13.019218	80.255978	1.33	...	45.4
8	2414	Chennai	2024-01-31 07:35:00	T. Nagar	13.044295	80.235618	T. Nagar	13.040132	80.228649	1.33	...	63.7
9	1601	Chennai	2024-03-07 02:04:00	T. Nagar	13.035774	80.236249	T. Nagar	13.035082	80.236710	0.50	...	40.0

10 rows × 21 columns

16. Zone Distribution

```
df["pickup_zone"].value_counts()
```

pickup_zone	count
Thiruvanmiyur	367
T. Nagar	359
Kodambakkam	356
Ambattur	355
Velachery	342
Chromepet	336
Sholinganallur	332
Perambur	326
Guindy	326
Tambaram	326
Madhavaram	326
Anna Nagar	321
Mylapore	320
Adyar	319
Besant Nagar	289

dtype: int64

17. Adding Vehicle Type Column and Checking Distribution

```
import numpy as np

# Randomly assign vehicle types
df["vehicle_type"] = np.random.choice(["Uber Go", "Auto", "UberXL", "Bike"], size=len(df), p=[0.4, 0.3, 0.2, 0.1])

# Check that it worked
df["vehicle_type"].value_counts()
```

vehicle_type	count
Uber Go	2050
Auto	1483
UberXL	985
Bike	482

dtype: int64

18. Saving the Updated Dataset with Vehicle Type Added

```
df.to_csv("uber_trips_chennai_cleaned.csv", index=False)
print("✅ Vehicle type column added and saved!")
```

```
✅ Vehicle type column added and saved!
```

19. Reloading Dataset and Reapplying All Cleaning & Feature Engineering Steps

This describes that you're reloading the CSV and applying the same transformations (FFill, date extraction, vehicle type assignment, etc.)

```
import pandas as pd
import numpy as np

# Load data from the original CSV
```

```
df = pd.read_csv("uber_trips_chennai_cleaned.csv", parse_dates=["timestamp"])

# Fill missing values using forward fill, as done previously
df.fillna(method='ffill', inplace=True)

# Extract date and time components, as done previously
df["date"] = df["timestamp"].dt.date
df["hour"] = df["timestamp"].dt.hour
df["weekday"] = df["timestamp"].dt.day_name()
df["month"] = df["timestamp"].dt.month_name()

# Randomly assign vehicle types, as done previously
df["vehicle_type"] = np.random.choice(["Uber Go", "Auto", "UberXL", "Bike"], size=len(df), p=[0.4, 0.3, 0.2, 0.1])

print("DataFrame 'df' has been reloaded and prepared with all previous transformations.")
display(df.head())
```

```
DataFrame 'df' has been reloaded and prepared with all previous transformations.
/tmp/ipython-input-3276841162.py:8: FutureWarning: DataFrame.fillna with 'method' is deprecated and will raise in a future versi
  df.fillna(method='ffill', inplace=True)
```

	trip_id	city	timestamp	pickup_zone	pickup_lat	pickup_lng	drop_zone	drop_lat	drop_lng	distance_km	...	payment
0	1502	Chennai	2024-03-29 07:24:00	Velachery	12.989118	80.208643	Ambattur	13.100438	80.154493	13.64	...	
1	2587	Chennai	2024-03-01 06:27:00	Kodambakkam	13.067049	80.216374	Besant Nagar	12.982317	80.247181	10.85	...	
2	2654	Chennai	2024-01-17 11:03:00	Velachery	12.988139	80.218606	Sholinganallur	12.927868	80.220284	7.98	...	
3	1056	Chennai	2024-01-02 20:31:00	Madhavaram	13.143002	80.226513	Velachery	12.987756	80.223668	17.07	...	
4	706	Chennai	2024-01-03 12:17:00	Besant Nagar	12.977208	80.259067	Perambur	13.104840	80.213597	15.83	...	

5 rows × 22 columns

20. Advanced Data Cleaning, Outlier Removal & Feature Engineering

This covers everything you're doing:

✓ Filling missing numeric values ✓ Dropping missing coordinates ✓ Removing duplicates ✓ Filtering unrealistic outliers ✓ Creating time-based features ✓ Creating derived metrics ✓ Assigning vehicle types ✓ Saving the cleaned dataset

```
import pandas as pd
import numpy as np

df = pd.read_csv("uber_trips_chennai_cleaned.csv", parse_dates=["timestamp"])

# Fill missing numeric values
df["fare_inr"].fillna(df["fare_inr"].median(), inplace=True)
df["distance_km"].fillna(df["distance_km"].median(), inplace=True)

# Drop rows missing coordinates
df.dropna(subset=["pickup_lat","pickup_lng"], inplace=True)

# Remove duplicates
df.drop_duplicates(inplace=True)

# Filter unrealistic outliers
df = df[(df["distance_km"] <= 40) & (df["fare_inr"] <= 2000)]

# Time-based features
df["date"] = df["timestamp"].dt.date
df["hour"] = df["timestamp"].dt.hour
df["weekday"] = df["timestamp"].dt.day_name()
df["month"] = df["timestamp"].dt.month_name()
```

```
# Derived metrics
df["fare_per_km"] = df["fare_inr"] / df["distance_km"]
df["is_weekend"] = df["weekday"].isin(["Saturday","Sunday"])

# Vehicle type column
df["vehicle_type"] = np.random.choice(["Uber Go","Auto","UberXL","Bike"], size=len(df))

df.to_csv("uber_trips_cleaned.csv", index=False)
df.head()
```

```
/tmp/ipython-input-1907999033.py:7: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chaine
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are sett

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df


  df["fare_inr"].fillna(df["fare_inr"].median(), inplace=True)
/tmp/ipython-input-1907999033.py:8: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chaine
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are sett

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df


  df["distance_km"].fillna(df["distance_km"].median(), inplace=True)
```

	trip_id	city	timestamp	pickup_zone	pickup_lat	pickup_lng	drop_zone	drop_lat	drop_lng	distance_km	...	is_shar
0	1502	Chennai	2024-03-29 07:24:00	Velachery	12.989118	80.208643	Ambattur	13.100438	80.154493	13.64	...	
1	2587	Chennai	2024-03-01 06:27:00	Kodambakkam	13.067049	80.216374	Besant Nagar	12.982317	80.247181	10.85	...	
2	2654	Chennai	2024-01-17 11:03:00	Velachery	12.988139	80.218606	Sholinganallur	12.927868	80.220284	7.98	...	
3	1056	Chennai	2024-01-02 20:31:00	Madhavaram	13.143002	80.226513	Velachery	12.987756	80.223668	17.07	...	
4	706	Chennai	2024-01-03 12:17:00	Besant Nagar	12.977208	80.259067	Perambur	13.104840	80.213597	15.83	...	

5 rows × 24 columns

21. Installing Streamlit for Interactive Dashboard Development

```
!pip install streamlit -q
```

```
                                        10.2/10.2 MB 58.8 MB/s eta 0:00:00
                                        6.9/6.9 MB 85.8 MB/s eta 0:00:00
```

22. Creating the Streamlit Dashboard Script (uber_dashboard.py)

```
%%writefile uber_dashboard.py

import streamlit as st
import pandas as pd
import plotly.express as px

df = pd.read_csv("uber_trips_cleaned.csv")

st.title("Uber Trips Dashboard - Chennai")

st.subheader("Key Metrics")
col1, col2, col3 = st.columns(3)
col1.metric("Total Trips", df.shape[0])
col2.metric("Total Revenue (INR)", f"{df['fare_inr'].sum():,.2f}")
col3.metric("Average Fare per Trip (INR)", f"{df['fare_inr'].mean():,.2f}")

col4, col5, col6 = st.columns(3)
```

```
col4.metric("Average Distance per Trip (km)", f"{df['distance_km'].mean():,.2f}")
col5.metric("Average Trip Duration (min)", f"{df['trip_duration_min'].mean():,.2f}")
col6.metric("Trips with Shared Ride", df['is_shared'].sum())

st.subheader("Trip Distribution")
fig = px.histogram(df, x="hour", title="Trips by Hour of Day")
st.plotly_chart(fig)

fig2 = px.histogram(df, x="weekday", title="Trips by Weekday")
st.plotly_chart(fig2)

fig3 = px.histogram(df, x="vehicle_type", title="Trips by Vehicle Type")
st.plotly_chart(fig3)

st.subheader("Zone Analysis")
col7, col8 = st.columns(2)
with col7:
    st.write("**Most Frequent Pickup Zones**")
    st.dataframe(df["pickup_zone"].value_counts().head())
with col8:
    st.write("**Most Frequent Drop Zones**")
    st.dataframe(df["drop_zone"].value_counts().head())

st.subheader("Payment & Platform Analysis")
col9, col10 = st.columns(2)
with col9:
    st.write("**Payment Type Distribution**")
    st.dataframe(df["payment_type"].value_counts())
with col10:
    st.write("**Platform Distribution**")
    st.dataframe(df["platform"].value_counts())
```

```
Writing uber_dashboard.py
```

23. Installing ipywidgets & Plotly and Enabling Widget Support in Google Colab

```
!pip install ipywidgets plotly
from google.colab import output
output.enable_custom_widget_manager()
```

```
Requirement already satisfied: ipywidgets in /usr/local/lib/python3.12/dist-packages (7.7.1)
Requirement already satisfied: plotly in /usr/local/lib/python3.12/dist-packages (5.24.1)
Requirement already satisfied: ipykernel>=4.5.1 in /usr/local/lib/python3.12/dist-packages (from ipywidgets) (6.17.1)
Requirement already satisfied: ipython-genutils~=0.2.0 in /usr/local/lib/python3.12/dist-packages (from ipywidgets) (0.2.0)
Requirement already satisfied: traitlets>=4.3.1 in /usr/local/lib/python3.12/dist-packages (from ipywidgets) (5.7.1)
Requirement already satisfied: widgetsnbextension~=3.6.0 in /usr/local/lib/python3.12/dist-packages (from ipywidgets) (3.6.10)
Requirement already satisfied: ipython>=4.0.0 in /usr/local/lib/python3.12/dist-packages (from ipywidgets) (7.34.0)
Requirement already satisfied: jupyterlab-widgets>=1.0.0 in /usr/local/lib/python3.12/dist-packages (from ipywidgets) (3.0.16)
Requirement already satisfied: tenacity>=6.2.0 in /usr/local/lib/python3.12/dist-packages (from plotly) (8.5.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.12/dist-packages (from plotly) (25.0)
Requirement already satisfied: debugpy>=1.0 in /usr/local/lib/python3.12/dist-packages (from ipykernel>=4.5.1->ipywidgets) (1.8
Requirement already satisfied: jupyter-client>=6.1.12 in /usr/local/lib/python3.12/dist-packages (from ipykernel>=4.5.1->ipywid
Requirement already satisfied: matplotlib-inline>=0.1 in /usr/local/lib/python3.12/dist-packages (from ipykernel>=4.5.1->ipywid
Requirement already satisfied: nest-asyncio in /usr/local/lib/python3.12/dist-packages (from ipykernel>=4.5.1->ipywidgets) (1.6
Requirement already satisfied: psutil in /usr/local/lib/python3.12/dist-packages (from ipykernel>=4.5.1->ipywidgets) (5.9.5)
Requirement already satisfied: pyzmq>=17 in /usr/local/lib/python3.12/dist-packages (from ipykernel>=4.5.1->ipywidgets) (26.2.1
Requirement already satisfied: tornado>=6.1 in /usr/local/lib/python3.12/dist-packages (from ipykernel>=4.5.1->ipywidgets) (6.
Requirement already satisfied: setuptools>=18.5 in /usr/local/lib/python3.12/dist-packages (from ipython>=4.0.0->ipywidgets) (7
Collecting jedi>=0.16 (from ipython>=4.0.0->ipywidgets)
  Downloading jedi-0.19.2-py2.py3-none-any.whl.metadata (22 kB)
Requirement already satisfied: decorator in /usr/local/lib/python3.12/dist-packages (from ipython>=4.0.0->ipywidgets) (4.4.2)
Requirement already satisfied: pickleshare in /usr/local/lib/python3.12/dist-packages (from ipython>=4.0.0->ipywidgets) (0.7.5
Requirement already satisfied: prompt-toolkit!=3.0.0,!=3.0.1,<3.1.0,>=2.0.0 in /usr/local/lib/python3.12/dist-packages (from ip
Requirement already satisfied: pygments in /usr/local/lib/python3.12/dist-packages (from ipython>=4.0.0->ipywidgets) (2.19.2)
Requirement already satisfied: backcall in /usr/local/lib/python3.12/dist-packages (from ipython>=4.0.0->ipywidgets) (0.2.0)
Requirement already satisfied: pexpect>4.3 in /usr/local/lib/python3.12/dist-packages (from ipython>=4.0.0->ipywidgets) (4.9.0
Requirement already satisfied: notebook>=4.4.1 in /usr/local/lib/python3.12/dist-packages (from widgetsnbextension~=3.6.0->ipyw
Requirement already satisfied: parso<0.9.0,>=0.8.4 in /usr/local/lib/python3.12/dist-packages (from jedi>=0.16->ipython>=4.0.0
Requirement already satisfied: entrypoints in /usr/local/lib/python3.12/dist-packages (from jupyter-client>=6.1.12->ipykernel>=
Requirement already satisfied: jupyter-core>=4.9.2 in /usr/local/lib/python3.12/dist-packages (from jupyter-client>=6.1.12->ipy
Requirement already satisfied: python-dateutil>=2.8.2 in /usr/local/lib/python3.12/dist-packages (from jupyter-client>=6.1.12-
Requirement already satisfied: jinja2 in /usr/local/lib/python3.12/dist-packages (from notebook>=4.4.1->widgetsnbextension~=3.6
Requirement already satisfied: argon2-cffi in /usr/local/lib/python3.12/dist-packages (from notebook>=4.4.1->widgetsnbextension
Requirement already satisfied: nbformat in /usr/local/lib/python3.12/dist-packages (from notebook>=4.4.1->widgetsnbextension~=3
Requirement already satisfied: nbconvert>=5 in /usr/local/lib/python3.12/dist-packages (from notebook>=4.4.1->widgetsnbextensio
Requirement already satisfied: Send2Trash>=1.8.0 in /usr/local/lib/python3.12/dist-packages (from notebook>=4.4.1->widgetsnbext
Requirement already satisfied: terminado>=0.8.3 in /usr/local/lib/python3.12/dist-packages (from notebook>=4.4.1->widgetsnbexte
Requirement already satisfied: prometheus-client in /usr/local/lib/python3.12/dist-packages (from notebook>=4.4.1->widgetsnbext
```

```
Requirement already satisfied: nbclassic>=0.4.7 in /usr/local/lib/python3.12/dist-packages (from notebook>=4.4.1->widgetsnbexte
Requirement already satisfied: ptyprocess>=0.5 in /usr/local/lib/python3.12/dist-packages (from pexpect>4.3->ipython>=4.0.0->ip
Requirement already satisfied: wcwidth in /usr/local/lib/python3.12/dist-packages (from prompt-toolkit!=3.0.0,!=3.0.1,<3.1.0,>=
Requirement already satisfied: platformdirs>=2.5 in /usr/local/lib/python3.12/dist-packages (from jupyter-core>=4.9.2->jupyter
Requirement already satisfied: notebook-shim>=0.2.3 in /usr/local/lib/python3.12/dist-packages (from nbclassic>=0.4.7->noteboo
Requirement already satisfied: beautifulsoup4 in /usr/local/lib/python3.12/dist-packages (from nbconvert>=5->notebook>=4.4.1->w
Requirement already satisfied: bleach!=5.0.0 in /usr/local/lib/python3.12/dist-packages (from bleach[css]!=5.0.0->nbconvert>=5
Requirement already satisfied: defusedxml in /usr/local/lib/python3.12/dist-packages (from nbconvert>=5->notebook>=4.4.1->widge
Requirement already satisfied: jupyterlab-pygments in /usr/local/lib/python3.12/dist-packages (from nbconvert>=5->notebook>=4.4
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Requirement already satisfied: pandocfilters>=1.4.1 in /usr/local/lib/python3.12/dist-packages (from nbconvert>=5->notebook>=4
Requirement already satisfied: fastjsonschema>=2.15 in /usr/local/lib/python3.12/dist-packages (from nbformat->notebook>=4.4.1
Requirement already satisfied: jsonschema>=2.6 in /usr/local/lib/python3.12/dist-packages (from nbformat->notebook>=4.4.1->widg
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.12/dist-packages (from python-dateutil>=2.8.2->jupyter-client
Requirement already satisfied: argon2-cffi-bindings in /usr/local/lib/python3.12/dist-packages (from argon2-cffi->notebook>=4.4
Requirement already satisfied: webencodings in /usr/local/lib/python3.12/dist-packages (from bleach!=5.0.0->bleach[css]!=5.0.0
Requirement already satisfied: tinycss2<1.5,>=1.1.0 in /usr/local/lib/python3.12/dist-packages (from bleach[css]!=5.0.0->nbconv
```

24. Downloading the Cleaned Dataset to Local Machine

```
from google.colab import files
files.download('uber_trips_chennai_cleaned.csv')
```

25. Uploading, Cleaning, and Exporting the Fully Cleaned Uber Trips Dataset

```
import pandas as pd

# Upload your CSV
from google.colab import files
uploaded = files.upload()

df = pd.read_csv(list(uploaded.keys())[0])

# Additional cleaning
# Convert timestamp if present
if "timestamp" in df.columns:
    df["timestamp"] = pd.to_datetime(df["timestamp"], errors="coerce")

# Convert date column if present
if "date" in df.columns:
    df["date"] = pd.to_datetime(df["date"], errors="coerce")

# Drop rows with missing timestamp
if "timestamp" in df.columns:
    df = df.dropna(subset=["timestamp"])

# Remove remaining NaN values
df = df.dropna()

# Remove duplicates
df = df.drop_duplicates()

# Fix numeric types
numeric_cols = ["distance_km", "fare_inr", "fare_per_km", "hour"]
for col in numeric_cols:
    if col in df.columns:
        df[col] = pd.to_numeric(df[col], errors="coerce")

# Drop rows again if conversion created NaN
df = df.dropna()

# Save cleaned CSV
df.to_csv("uber_trips_fully_cleaned.csv", index=False)

# Download
files.download("uber_trips_fully_cleaned.csv")
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

26. Renaming Columns to Clean and Readable Titles for Analysis & Dashboarding

```
df.columns
```

```
Index(['trip_id', 'city', 'timestamp', 'pickup_zone', 'pickup_lat',
       'pickup_lng', 'drop_zone', 'drop_lat', 'drop_lng', 'distance_km',
       'trip_duration_min', 'fare_inr', 'payment_type', 'platform',
       'is_shared', 'driver_id', 'customer_id', 'date', 'hour', 'weekday',
       'month', 'vehicle_type'],
      dtype='object')
```

```
df = df.rename(columns={
    "trip_id": "Trip ID",
    "timestamp": "Timestamp",
    "hour": "Hour",
    "weekday": "Weekday",
    "month": "Month",
    "pickup_zone": "Pickup Zone",
    "drop_zone": "Drop Zone",
    "pickup_lat": "Pickup Latitude",
    "pickup_lng": "Pickup Longitude",
    "drop_lat": "Drop Latitude",
    "drop_lng": "Drop Longitude",
    "distance_km": "Distance (Km)",
    "fare_inr": "Fare (INR)",
    "trip_duration_min": "Trip Duration (Min)",
    "vehicle_type": "Vehicle Type",
    "payment_type": "Payment Type",
    "platform": "Platform",
    "is_shared": "Is Shared",
    "fare_per_km": "Fare per Km",
    "is_weekend": "Is Weekend", # Added comma here
    "driver_id": "Driver ID",
    "driver_name": "Driver Name",
    "driver_phone": "Driver Phone",
    "driver_email": "Driver Email",
    "driver_license": "Driver License",
    "driver_rating": "Driver Rating",
    "customer_id": "Customer ID",
    "date": "Date",
    "city": "City"
})
```

```
df.columns
```

```
Index(['Trip ID', 'City', 'Timestamp', 'Pickup Zone', 'Pickup Latitude',
       'Pickup Longitude', 'Drop Zone', 'Drop Latitude', 'Drop Longitude',
       'Distance (Km)', 'Trip Duration (Min)', 'Fare (INR)', 'Payment Type',
       'Platform', 'Is Shared', 'Driver ID', 'Customer ID', 'Date', 'Hour',
       'Weekday', 'Month', 'Vehicle Type'],
      dtype='object')
```

27. Rounding Numerical Columns for Consistent Formatting and Readability

```
df["Distance (Km)"] = df["Distance (Km)"].round(2)
df["Fare (INR)"] = df["Fare (INR)"].round(2)
df["Pickup Latitude"] = df["Pickup Latitude"].round(4)
df["Pickup Longitude"] = df["Pickup Longitude"].round(4)
df["Drop Latitude"] = df["Drop Latitude"].round(4)
df["Drop Longitude"] = df["Drop Longitude"].round(4)
```

28. Saving and Downloading the Final Cleaned Dataset to CSV

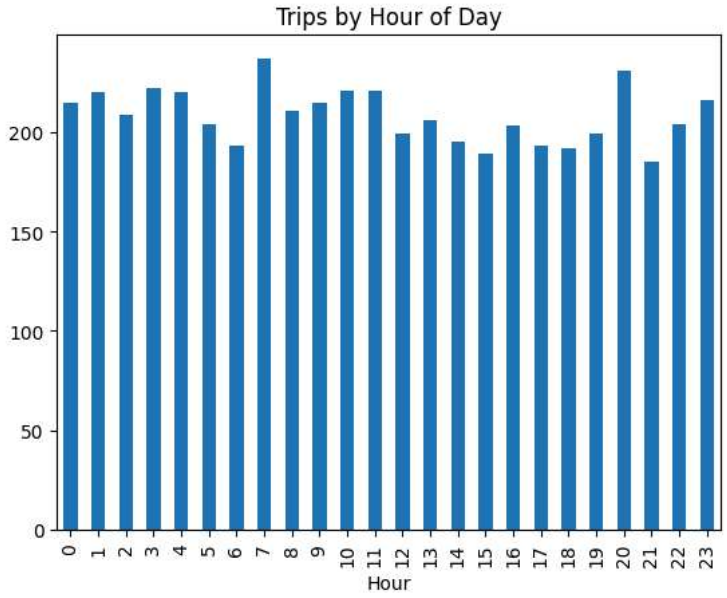
```
df.to_csv("uber_trips_final_cleaned.csv", index=False)
```

```
from google.colab import files
files.download("uber_trips_final_cleaned.csv")
```

29. Extracting Time Features and Plotting Trips by Hour of Day

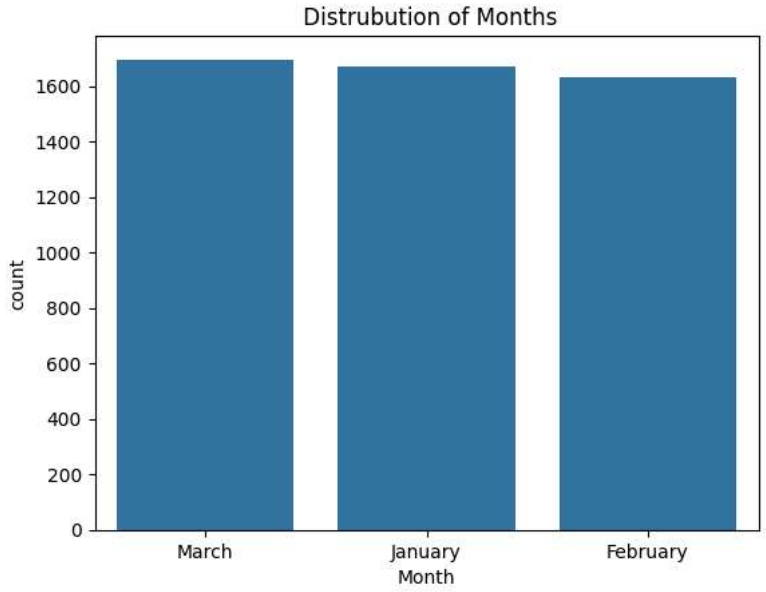
```
df["Timestamp"].min(), df["Timestamp"].max()
df["Hour"] = df["Timestamp"].dt.hour
df["Weekday"] = df["Timestamp"].dt.day_name()

df["Hour"].value_counts().sort_index().plot(kind="bar", title="Trips by Hour of Day")
```

```
<Axes: title={'center': 'Trips by Hour of Day'}, xlabel='Hour'>
```



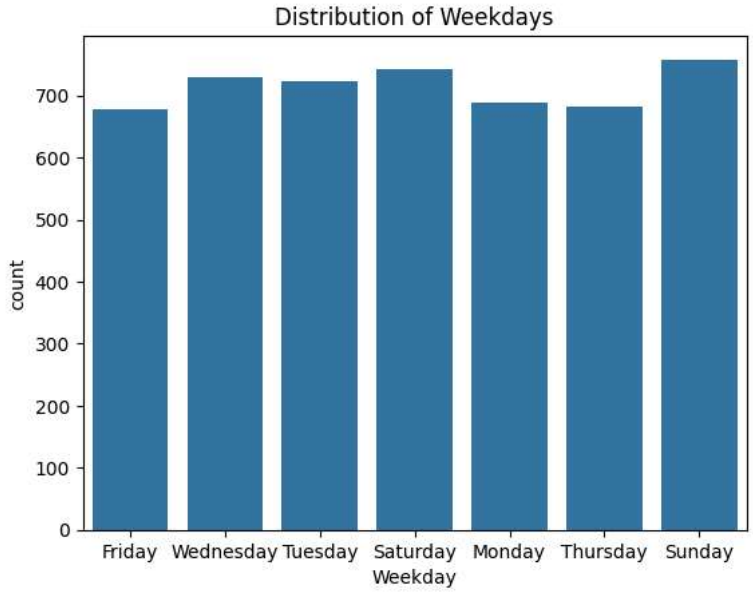
30. Distribution of Trips Across Months (Countplot)

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.countplot(x='Month',data=df)
plt.title(" Distrubution of Months")
plt.show()
```



31. Distribution of Trips Across Weekdays (Countplot)

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.countplot(x='Weekday', data=df)
plt.title("Distribution of Weekdays")
plt.show()
```



32. Saving the Fully Cleaned Dataset to CSV

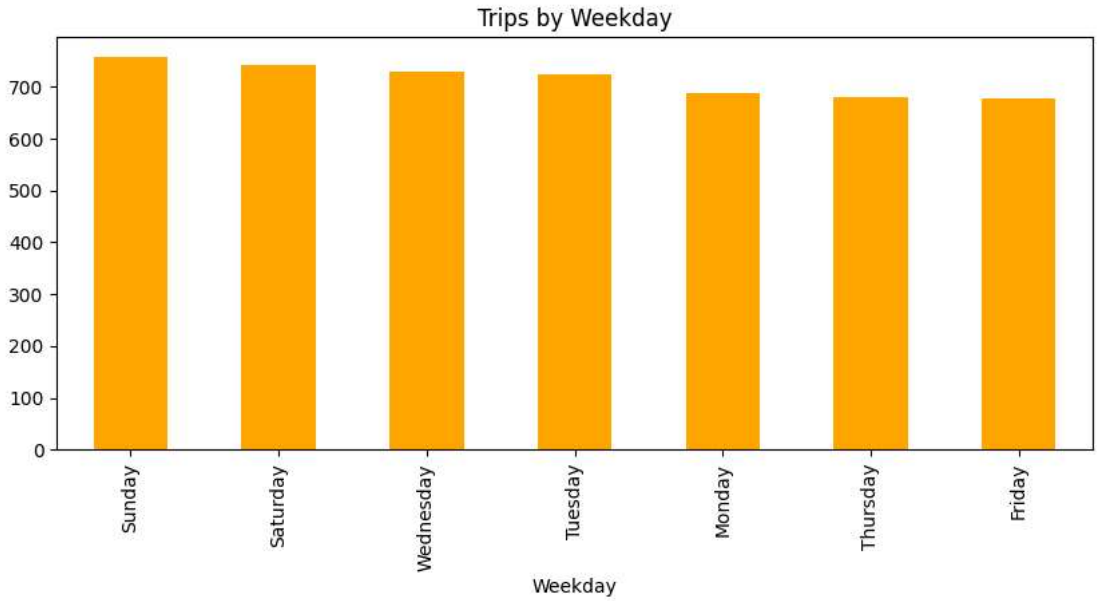
```
df.to_csv("uber_trips_fully_cleaned.csv", index=False)
print("Cleaned dataset saved ")
```

```
Cleaned dataset saved
```

33. Bar Chart of Trip Counts by Weekday

```
df["Weekday"].value_counts().plot(kind="bar", figsize=(10,4), title="Trips by Weekday", color="orange")
```

```
<Axes: title={'center': 'Trips by Weekday'}, xlabel='Weekday'>
```

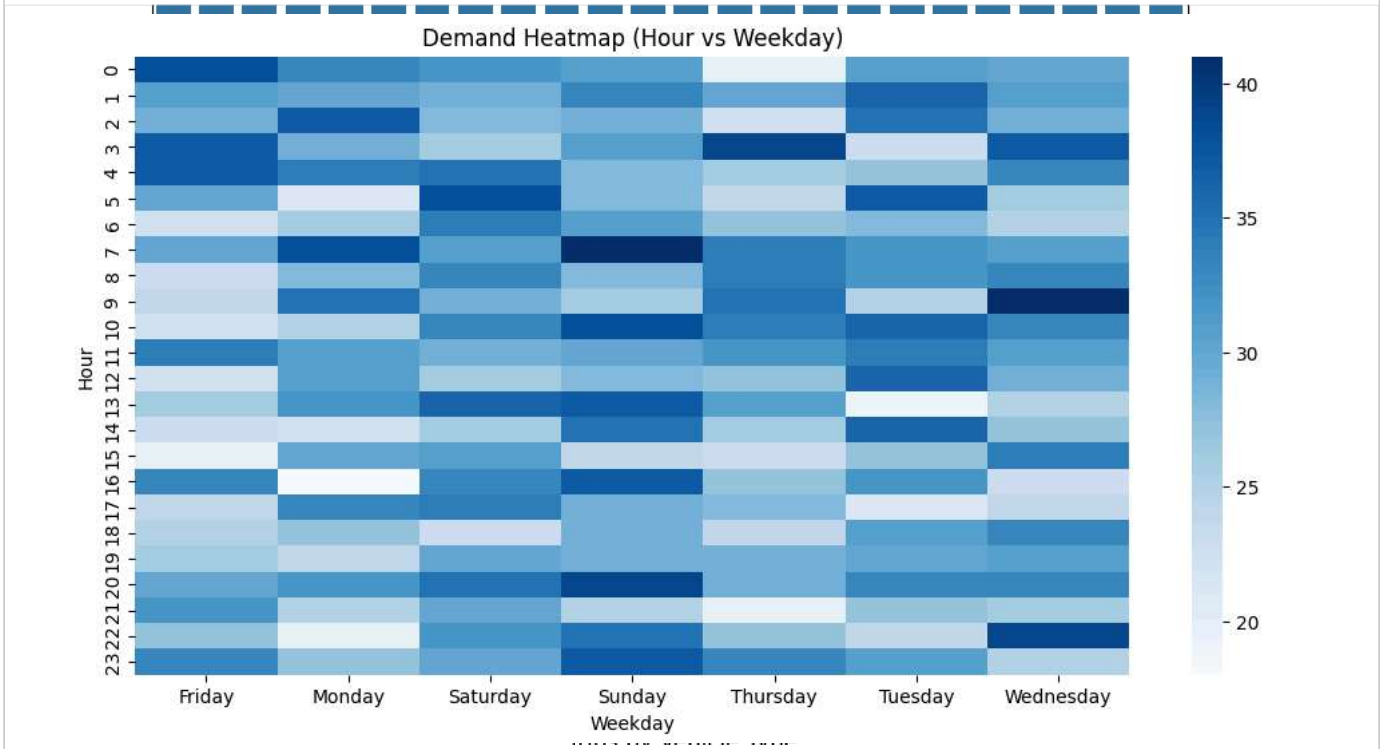


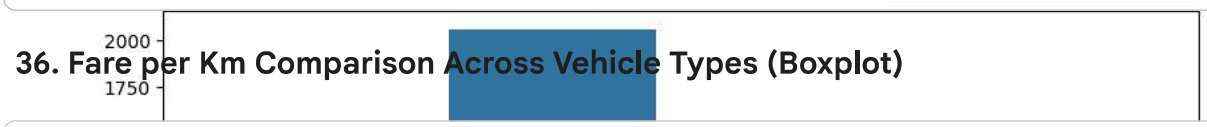
34. Distribution of Trips by Hour of Day (Countplot), Trips by Weekday (Ordered Countplot), Trips by Vehicle Type (Countplot), Correlation Matrix of Numerical Features

```
import matplotlib.pyplot as plt
import seaborn as sns

plt.figure(figsize=(10,4))
sns.countplot(x=df["Hour"])
plt.title("Trips by Hour of Day")
plt.show()

plt.figure(figsize=(10,4))
sns.countplot(x=df["Weekday"], order=["Monday","Tuesday","Wednesday","Thursday","Friday","Saturday","Sunday"])
plt.xticks(rotation=45)
plt.title("Trips by Weekday")
plt.show()

plt.figure(figsize=(10,4))
sns.countplot(x=df["Vehicle Type"])
plt.title("Trips by Vehicle Type")
plt.show()

df.corr(numeric_only=True)
```

35. Demand Heatmap: Trips by Hour vs Weekday

```
pivot = df.pivot_table(index="Hour", columns="Weekday", values="Trip ID", aggfunc="count")
plt.figure(figsize=(12,6))
sns.heatmap(pivot, cmap="Blues")
plt.title("Demand Heatmap (Hour vs Weekday)")
plt.show()
```



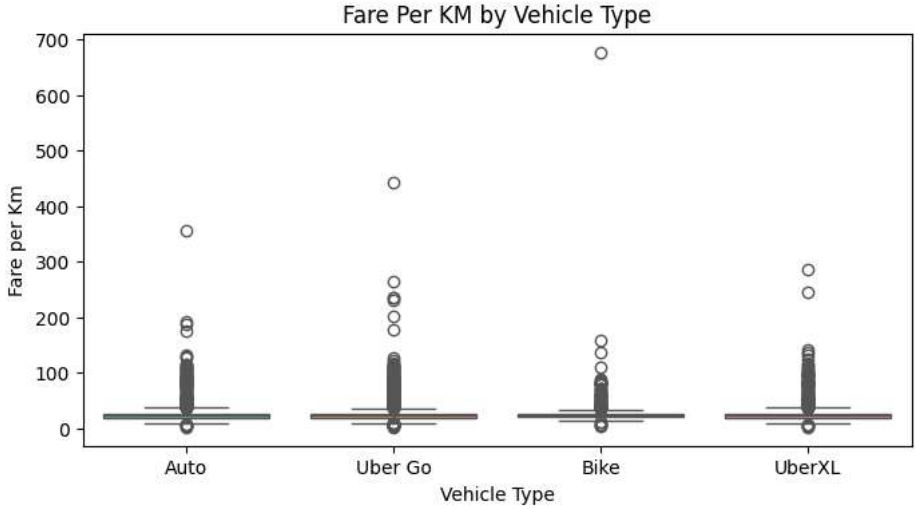


36. Fare per Km Comparison Across Vehicle Types (Boxplot)

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Ensure 'Fare per Km' column exists and is correctly named
# Check if base columns for calculation are present (they should be after previous renames)
if 'Fare (INR)' in df.columns and 'Distance (Km)' in df.columns:
    # Create 'fare_per_km' (temporary name if needed)
    if 'fare_per_km' not in df.columns and 'Fare per Km' not in df.columns:
        df['fare_per_km'] = df['Fare (INR)'] / df['Distance (Km)']

    # If 'fare_per_km' exists but 'Fare per Km' doesn't, rename it
    if 'fare_per_km' in df.columns and 'Fare per Km' not in df.columns:
        df = df.rename(columns={'fare_per_km': 'Fare per Km'})
    # If it was already named 'Fare per Km' from a previous run (e.g. from an earlier cell),
    # we don't need to do anything.

plt.figure(figsize=(8,4))
sns.boxplot(x=df["Vehicle Type"], y=df["Fare per Km"], palette="Set2")
plt.title("Fare Per KM by Vehicle Type")
plt.show()
```

Pickup Longitude	-0.001887	0.128214	1.000000	0.034773	0.088905	-0.204802	-0.191597	-0.196560	-0.013341	-0.014615
Drop Latitude	0.014194	0.093530	0.034773	1.000000	0.121884	-0.013853	-0.016952	-0.017069	0.002057	0.017133

```
/tmp/ipython-input-3559517636.py:19: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set
  sns.boxplot(data=df[df["vehicle_type"] != "Premium"], x="vehicle_type", y="fare_per_km", palette="pastel")
```



37. Interactive Dashboard: Filter Trips by Vehicle Type (Plotly + ipywidgets)

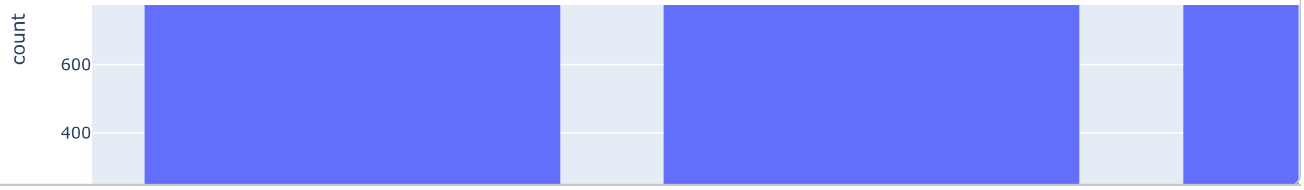
```
import pandas as pd
import plotly.express as px
from ipywidgets import interact, Dropdown

df = pd.read_csv("uber_trips_cleaned.csv")

@interact(
    vehicle=Dropdown(options=["All"] + sorted(df["vehicle_type"].unique()), description="Vehicle:")
)
def update(vehicle):
    # Apply filter
    filtered = df if vehicle == "All" else df[df["vehicle_type"] == vehicle]

    # Chart 1: Trips by Hour
    fig1 = px.histogram(filtered, x="hour", title="Trips by Hour")
    fig1.show()

    # Chart 2: Trips by Weekday
    fig2 = px.histogram(filtered, x="weekday", title="Trips by Weekday")
    fig2.show()

    # Chart 3: Trips by Vehicle Type
    fig3 = px.histogram(filtered, x="vehicle_type", title="Trips by Vehicle Type")
    fig3.show()
```

38. Importing Display Utility for Rendering Outputs in Jupyter Notebook

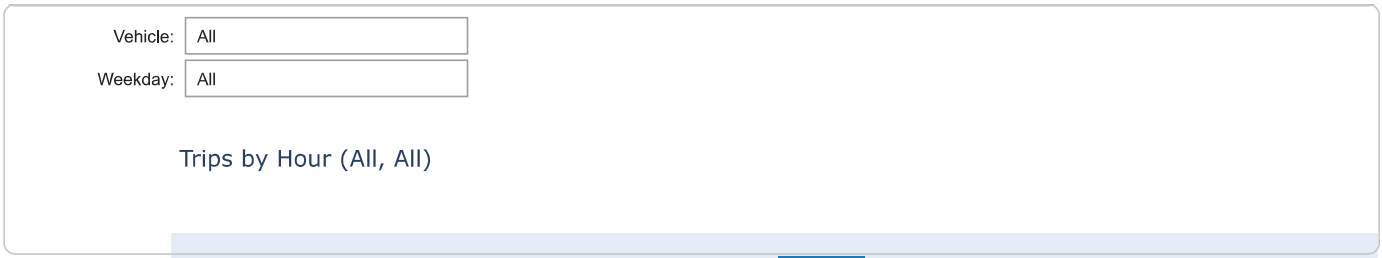
```
from IPython.display import display
```

39. Advanced Interactive Dashboard with Multi-Filter (Vehicle Type + Weekday) Using Plotly & ipywidgets

```
import pandas as pd
import plotly.express as px
from ipywidgets import interact, Dropdown
from IPython.display import display

df = pd.read_csv("uber_trips_cleaned.csv")

# Ensure weekday is string for filtering
df["weekday"] = df["weekday"].astype(str)

@interact(
    vehicle=Dropdown(options=["All"] + sorted(df["vehicle_type"].unique()), description="Vehicle:"),
    weekday=Dropdown(options=["All"] + sorted(df["weekday"].unique()), description="Weekday:")
)
def update(vehicle, weekday):

    # Filter dataset
    filtered = df.copy()
    if vehicle != "All":
        filtered = filtered[filtered["vehicle_type"] == vehicle]
    if weekday != "All":
        filtered = filtered[filtered["weekday"] == weekday]

    # CHART 1 — Trips by Hour (Blue)
    fig1 = px.histogram(
        filtered,
        x="hour",
        title=f"Trips by Hour ({vehicle}, {weekday})",
        color_discrete_sequence=["#1f77b4"]  # Blue
    )
    display(fig1)

    # CHART 2 — Trips by Weekday (Green)
    fig2 = px.histogram(
        filtered,
        x="weekday",
        title=f"Trips by Weekday ({vehicle}, {weekday})",
        color_discrete_sequence=["#2ca02c"]  # Green
    )
    display(fig2)

    # CHART 3 — Trips by Vehicle Type (Orange)
    fig3 = px.histogram(
        filtered,
        x="vehicle_type",
        title=f"Trips by Vehicle Type ({vehicle}, {weekday})",
        color_discrete_sequence=["#ff7f0e"]  # Orange
    )
    display(fig3)
```

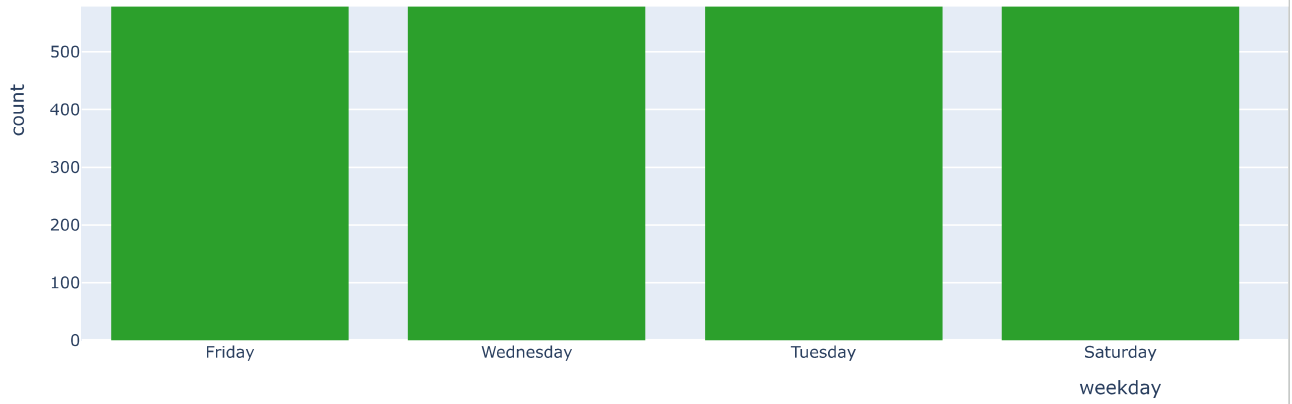


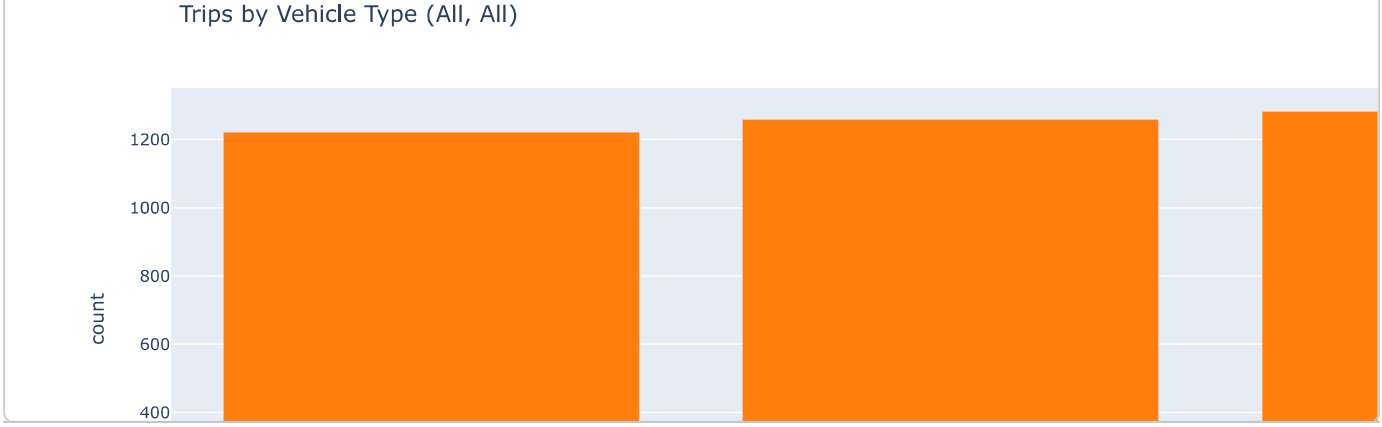

200
0
Auto
Bike
vehicle_type



40. Pickup and Drop-off Location Maps

```
# Pickup Map
fig4 = px.scatter_mapbox(
    df,
    lat="pickup_lat",
    lon="pickup_lng",
    color="pickup_zone",
    zoom=10,
    title="Pickup Locations Map",
    height=600
)

fig4.update_layout(mapbox_style="open-street-map")
fig4.show()

# Drop Map
fig5 = px.scatter_mapbox(
    df,
    lat="drop_lat",
    lon="drop_lng",
    color="drop_zone",
    zoom=10,
    title="Drop Locations Map",
    height=600
)

fig5.update_layout(mapbox_style="open-street-map")
fig5.show()
```





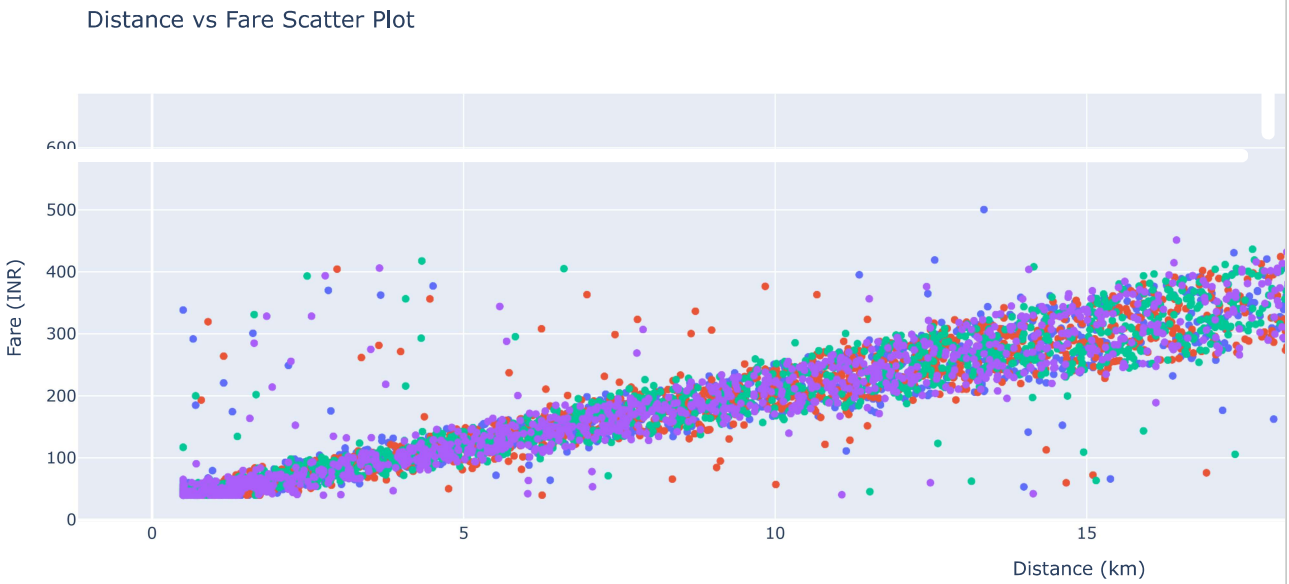
Pickup Locations Map

Drop Locations Map

41. Distance vs Fare Scatter Plot

```
fig6 = px.scatter(
    df,
    x="distance_km",
    y="fare_inr",
    color="vehicle_type",
    title="Distance vs Fare Scatter Plot",
    labels={"distance_km": "Distance (km)", "fare_inr": "Fare (INR)"},
    height=500
```

```
)

fig6.show()
```



42. Advanced Interactive Uber Trips Dashboard

```
import pandas as pd
import plotly.express as px
from ipywidgets import interact, Dropdown
from IPython.display import display, clear_output

df = pd.read_csv("uber_trips_chennai_cleaned.csv")

df["weekday"] = df["weekday"].astype(str)

BLUE = ["#1f77b4"]   # your selected blue color

@interact(
    vehicle=Dropdown(options=["All"] + sorted(df["vehicle_type"].unique()), description="Vehicle:"),
    weekday=Dropdown(options=["All"] + sorted(df["weekday"].unique()), description="Weekday:")
)
def dashboard(vehicle, weekday):

    clear_output(wait=True)
    print("📊 Uber Trips Dashboard — Filtered Results")

    # Filtering
    temp = df.copy()
    if vehicle != "All":
```