Uber Ride Data Analysis

This dataset contains details of uber rides of a customer.
Dataset: The dataset contains Start Date, End Date, Start Location, End Location, Miles Driven and Purpose of drive (Business, Personal, Meals etc) dataset (https://www.kaggle.com/zusmani/uberdrives).

Objective

To fetch insights from the behavior of an common Uber customer.

Importing libraries

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import calendar

import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))
```

```
/kaggle/input/uberdrives/My Uber Drives - 2016.csv
```

Loading dataset

In [2]:
```
df = pd.read_csv('/kaggle/input/uberdrives/My Uber Drives - 2016.csv')
df.head()
```

Out[2]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	PURPOSE*
0	1/1/2016 21:11	1/1/2016 21:17	Business	Fort Pierce	Fort Pierce	5.1	Meal/Entertain
1	1/2/2016 1:25	1/2/2016 1:37	Business	Fort Pierce	Fort Pierce	5.0	NaN
2	1/2/2016 20:25	1/2/2016 20:38	Business	Fort Pierce	Fort Pierce	4.8	Errand/Supplies
3	1/5/2016 17:31	1/5/2016 17:45	Business	Fort Pierce	Fort Pierce	4.7	Meeting
4	1/6/2016 14:42	1/6/2016 15:49	Business	Fort Pierce	West Palm Beach	63.7	Customer Visit

In [3]:
```
df.tail()
```

Out[3]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	PURPOSE*
1151	12/31/2016 13:24	12/31/2016 13:42	Business	Kar?chi	Unknown Location	3.9	Temporary Site
1152	12/31/2016 15:03	12/31/2016 15:38	Business	Unknown Location	Unknown Location	16.2	Meeting
1153	12/31/2016 21:32	12/31/2016 21:50	Business	Katunayake	Gampaha	6.4	Temporary Site
1154	12/31/2016 22:08	12/31/2016 23:51	Business	Gampaha	Ilukwatta	48.2	Temporary Site
1155	Totals	NaN	NaN	NaN	NaN	12204.7	NaN

In [4]:
```
print(df.shape)
df.dtypes
```

```
(1156, 7)
```

Out[4]:
```
START_DATE*     object
END_DATE*       object
CATEGORY*       object
START*          object
STOP*           object
MILES*         float64
PURPOSE*        object
dtype: object
```

There are 6 catagorical vars and 1 numeric type variable
Here STATR_DATE* and END_DATE* are in object type. We need to convert them back into datetime variable

Checking for null values

In [5]:
```
df.isna().sum()
```

Out[5]:
```
START_DATE*      0
END_DATE*        1
CATEGORY*        1
START*           1
STOP*            1
MILES*           0
PURPOSE*       503
dtype: int64
```

In [6]:
```
df[df['END_DATE*'].isna()]
```

Out[6]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	PURPOSE*
1155	Totals	NaN	NaN	NaN	NaN	12204.7	NaN

As we can see this row contains wrong data for most of the columns. We will delete it

In [7]:
```
# dropping row containing null vals
df.drop(df[df['END_DATE*'].isna()].index,axis=0,inplace=True)
```

In [8]:
```
df.isna().sum()
```

Out[8]:
```
START_DATE*      0
END_DATE*        0
CATEGORY*        0
START*           0
STOP*            0
MILES*           0
PURPOSE*       502
dtype: int64
```

In [9]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1155 entries, 0 to 1154
Data columns (total 7 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   START_DATE*  1155 non-null   object 
 1   END_DATE*    1155 non-null   object 
 2   CATEGORY*    1155 non-null   object 
 3   START*       1155 non-null   object 
 4   STOP*        1155 non-null   object 
 5   MILES*       1155 non-null   float64
 6   PURPOSE*     653 non-null    object 
dtypes: float64(1), object(6)
memory usage: 72.2+ KB
```

Now we have null data only in Purpose column.
As we have more than 55% data missing. So I am dropping this columns and excluding this from this analysis.
You may also delete the null value rows and include this column in the analysis.

```
sns.countplot(df['PURPOSE*'], order=df['PURPOSE*'].value_counts().index)
```

In [10]:
```
# droppig Purpose
df.drop(['PURPOSE*'],axis=1,inplace=True)
df.head(2)
```

Out[10]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*
0	1/1/2016 21:11	1/1/2016 21:17	Business	Fort Pierce	Fort Pierce	5.1
1	1/2/2016 1:25	1/2/2016 1:37	Business	Fort Pierce	Fort Pierce	5.0

Checking for duplicate rows

In [11]:
```
df[df.duplicated()]
```

Out[11]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*
492	6/28/2016 23:34	6/28/2016 23:59	Business	Durham	Cary	9.9

We will remove this duplicate row

In [12]:
```
df.drop(df[df.duplicated()].index, axis=0, inplace=True)
df[df.duplicated()]
```

Out[12]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*

Converting start_date & end_date cols into datetime

In [13]:
```
df['START_DATE*'] = pd.to_datetime(df['START_DATE*'], format='%m/%d/%Y %H:%M')
df['END_DATE*'] = pd.to_datetime(df['END_DATE*'], format='%m/%d/%Y %H:%M')
df.dtypes
```

Out[13]:
```
START_DATE*    datetime64[ns]
END_DATE*      datetime64[ns]
CATEGORY*              object
START*                 object
STOP*                  object
MILES*                float64
dtype: object
```

EDA

Univariate

1. Category

In [14]:
```
df['CATEGORY*'].unique()
```

Out[14]:
```
array(['Business', 'Personal'], dtype=object)
```

There are 2 ride-categories... Business: For work related & Personal: For personal travel

In [15]:
```
df[['CATEGORY*','MILES*']].groupby(['CATEGORY*']).agg(tot_miles=('MILES*','sum'))
```

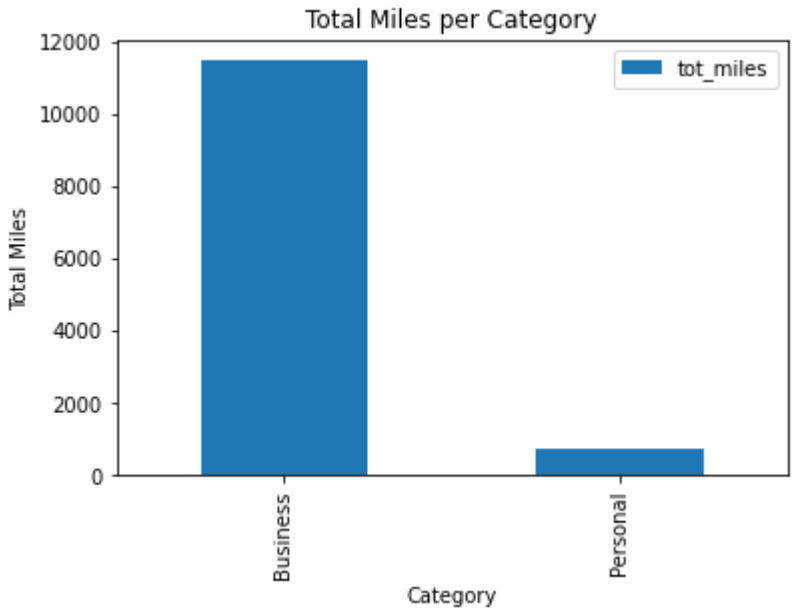
Out[15]:

CATEGORY*	tot_miles
Business	11477.1
Personal	717.7

In [16]:
```
plt.figure()
df[['CATEGORY*','MILES*']].groupby(['CATEGORY*']).agg(tot_miles=('MILES*','sum')).p
plt.xlabel('Category')
plt.ylabel('Total Miles')
plt.title('Total Miles per Category')
```

Out[16]:
```
Text(0.5, 1.0, 'Total Miles per Category')

<Figure size 432x288 with 0 Axes>
```



User mainly uses Uber cabs for its Business purposes

- Around 94% miles was consumed during Business trips.
- Only 6% miles were consumed during personal trips.

START*

In [17]:
```
len(df['START*'].unique())
```

Out[17]:
```
177
```

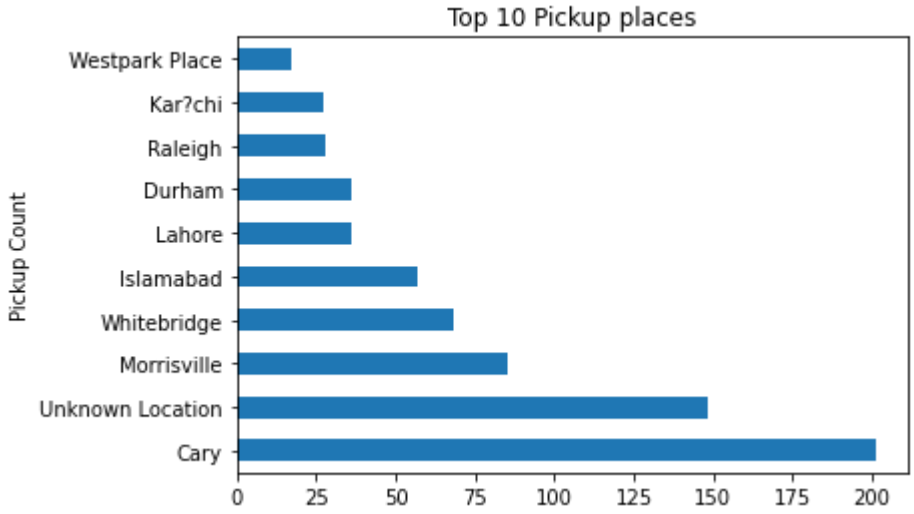
There are 177 unique starting points

In [18]:
```
# Top 10 Start places
df['START*'].value_counts(ascending=False)[:10]
```

Out[18]:
```
Cary               201
Unknown Location   148
Morrisville         85
Whitebridge         68
Islamabad           57
Lahore              36
Durham              36
Raleigh             28
Kar?chi             27
Westpark Place      17
Name: START*, dtype: int64
```

In [19]:
```
df['START*'].value_counts(ascending=False)[:10].plot(kind='barh',ylabel='Places',xl
```

Out[19]: <AxesSubplot:title={'center':'Top 10 Pickup places'}, ylabel='Pickup Count'>



Cary is the most popular Starting point for this user

STOP*

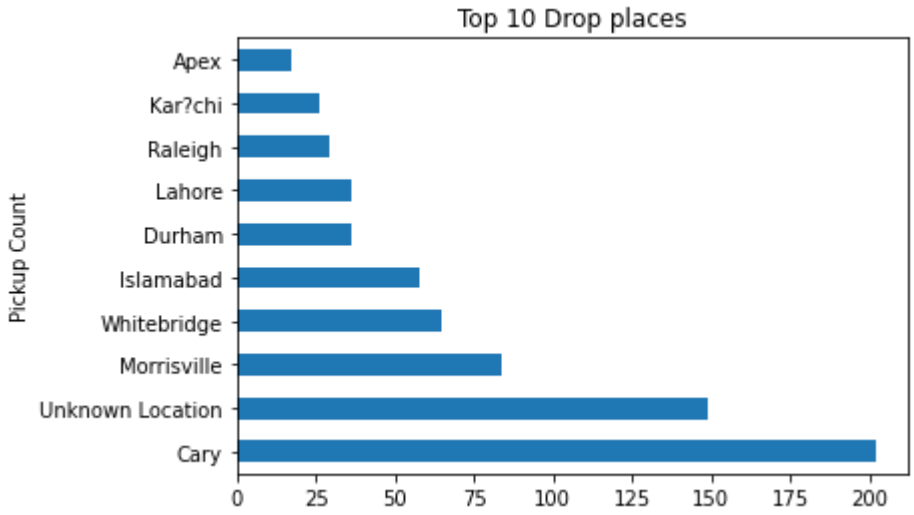
In [20]:
```
len(df['STOP*'].unique())
```

Out[20]: 188

There are 188 unique Drop points (destination)

In [21]:
```
df['STOP*'].value_counts(ascending=False)[:10].plot(kind='barh',ylabel='Places',xla
```

Out[21]: <AxesSubplot:title={'center':'Top 10 Drop places'}, ylabel='Pickup Count'>



Cary is the most popular Stop place for this user.
Maybe his home is in Cary (as mostly start & stop are from here)

In [22]:
```
df[df['START*']=='Unknown Location']['START*'].value_counts()
```

Out[22]:
```
Unknown Location    148
Name: START*, dtype: int64
```

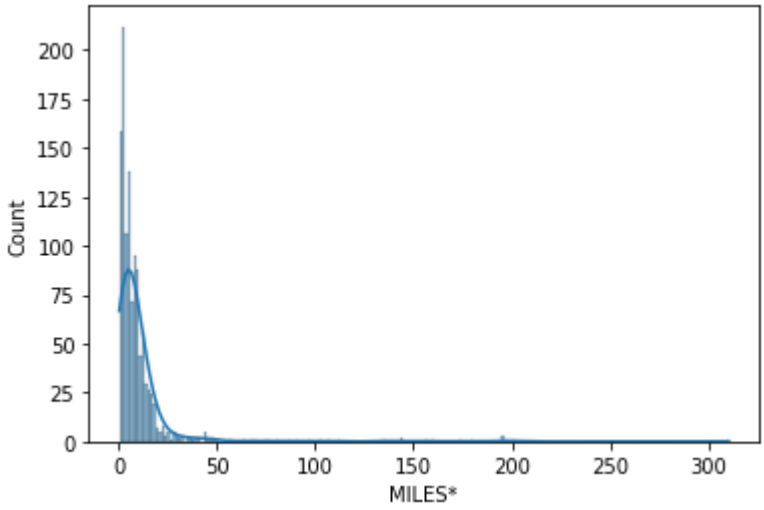
In [23]:
```
df[df['STOP*']=='Unknown Location']['STOP*'].value_counts()
```

Out[23]:
```
Unknown Location    149
Name: STOP*, dtype: int64
```

MILES*

In [24]:
```
sns.histplot(df['MILES*'],kde=True)
```

Out[24]:
```
<AxesSubplot:xlabel='MILES*', ylabel='Count'>
```



**Miles data is Rightly Skewed **

In [25]:
```
df.describe().T
```

Out[25]:

	count	mean	std	min	25%	50%	75%	max
MILES*	1154.0	10.567418	21.588452	0.5	2.9	6.0	10.4	310.3

Multivariate analysis

In [26]:
```
df.head()
```

Out[26]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7

In [27]:
```
df.groupby(['START*','STOP*'])['MILES*'].apply(print)
```

```
910    2.2
Name: (Agnew, Agnew), dtype: float64
906    4.3
Name: (Agnew, Cory), dtype: float64
908    2.2
911    2.4
Name: (Agnew, Renaissance), dtype: float64
879    15.2
Name: (Almond, Bryson City), dtype: float64
646    1.0
825    3.3
Name: (Apex, Apex), dtype: float64
58     5.5
60     5.7
80     5.7
173    5.6
410    7.2
565    5.5
616    4.6
```

In [28]:
```
df.groupby(['START*','STOP*'])['MILES*'].sum().sort_values(ascending=False)[1:11]
```

Out[28]:

START*	STOP*	
Morrisville	Cary	395.7
Cary	Durham	390.0
	Morrisville	380.0
Raleigh	Cary	365.7
Cary	Raleigh	336.5
Durham	Cary	324.5
Latta	Jacksonville	310.3
Islamabad	Unknown Location	267.0
Cary	Cary	255.9
Unknown Location	Islamabad	243.8

Name: MILES*, dtype: float64

Cary-Durham & Cary-Morrisville and vice versa are the farthest distance ride.

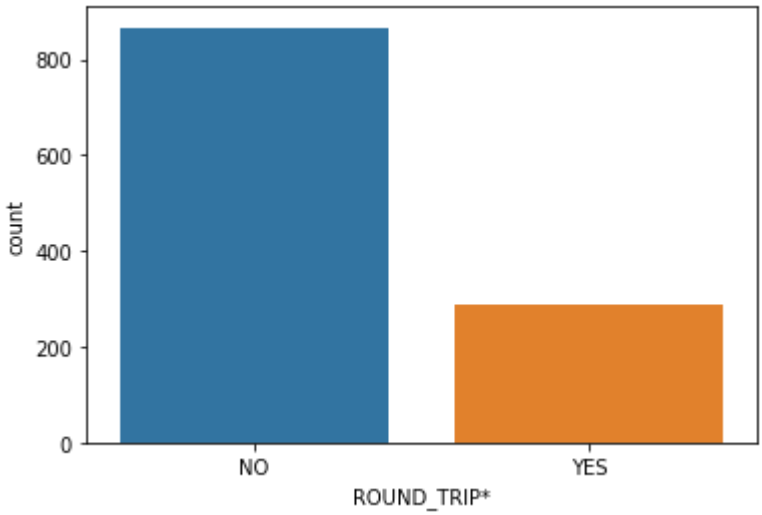
Checking for Round Trip

In [29]:
```
def is_roundtrip(df):
    if df['START*'] == df['STOP*']:
        return 'YES'
    else:
        return 'NO'

df['ROUND_TRIP*'] = df.apply(is_roundtrip, axis=1)

sns.countplot(x='ROUND_TRIP*',data=df, order=df['ROUND_TRIP*'].value_counts().index
```

Out[29]:
```
<AxesSubplot:xlabel='ROUND_TRIP*', ylabel='count'>
```



In [30]:
```
df['ROUND_TRIP*'].value_counts()
```

Out[30]:
```
NO     866
YES    288
Name: ROUND_TRIP*, dtype: int64
```

User mostly take single-trip Uber rides.

- Around 75% trip is single-trip and 25% are ROund-Trip

Calculating Ride duration

In [31]:
```
df.dtypes
```

Out[31]:
```
START_DATE*    datetime64[ns]
END_DATE*      datetime64[ns]
CATEGORY*              object
START*                 object
STOP*                  object
MILES*                float64
ROUND_TRIP*            object
dtype: object
```

In [32]:
```
df['Ride_duration'] = df['END_DATE*']-df['START_DATE*']
df.head()
```

Out[32]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	ROUND_TRIP*	Ride_duration
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	YES	0 days 00:06:00
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	YES	0 days 00:12:00
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	YES	0 days 00:13:00
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	YES	0 days 00:14:00
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	NO	0 days 01:07:00

Converting Ride_duration into Minutes

In [33]:
```
# using datetime.Timedelta  => https://pandas.pydata.org/pandas-docs/stable/user_gu
df.loc[:, 'Ride_duration'] = df['Ride_duration'].apply(lambda x: pd.Timedelta.to_py
df.head()
```

Out[33]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	ROUND_TRIP*	Ride_duration
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	YES	6.0
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	YES	12.0
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	YES	13.0
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	YES	14.0
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	NO	67.0

In [34]:

```
#Capture Hour, Day, Month and Year of Ride in a separate column
df['month'] = pd.to_datetime(df['START_DATE*']).dt.month
df['Year'] = pd.to_datetime(df['START_DATE*']).dt.year
df['Day'] = pd.to_datetime(df['START_DATE*']).dt.day
df['Hour'] = pd.to_datetime(df['START_DATE*']).dt.hour

df['day_of_week'] = pd.to_datetime(df['START_DATE*']).dt.dayofweek
days = {0:'Mon',1:'Tue',2:'Wed',3:'Thur',4:'Fri',5:'Sat',6:'Sun'}

df['day_of_week'] = df['day_of_week'].apply(lambda x: days[x])

df.head()
```

Out[34]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	ROUND_TRIP*	Ride_duration	month
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	YES	6.0	1
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	YES	12.0	1
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	YES	13.0	1
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	YES	14.0	1
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	NO	67.0	1

Addding month name instead of month number

In [35]:

```
df['month'] = df['month'].apply(lambda x: calendar.month_abbr[x])
df.head()
```

Out[35]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	ROUND_TRIP*	Ride_duration	month
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	YES	6.0	Jan
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	YES	12.0	Jan
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	YES	13.0	Jan
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	YES	14.0	Jan
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	NO	67.0	Jan

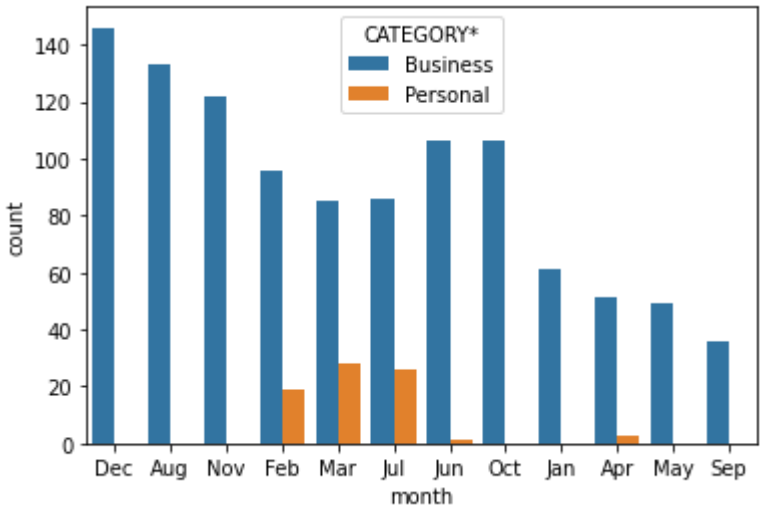
Total rides/month

In [36]:
```
print(df['month'].value_counts())
```

```
Dec    146
Aug    133
Nov    122
Feb    115
Mar    113
Jul    112
Jun    107
Oct    106
Jan     61
Apr     54
May     49
Sep     36
Name: month, dtype: int64
```

In [37]:
```
sns.countplot(x='month',data=df,order=pd.value_counts(df['month']).index,hue='CATEG
```

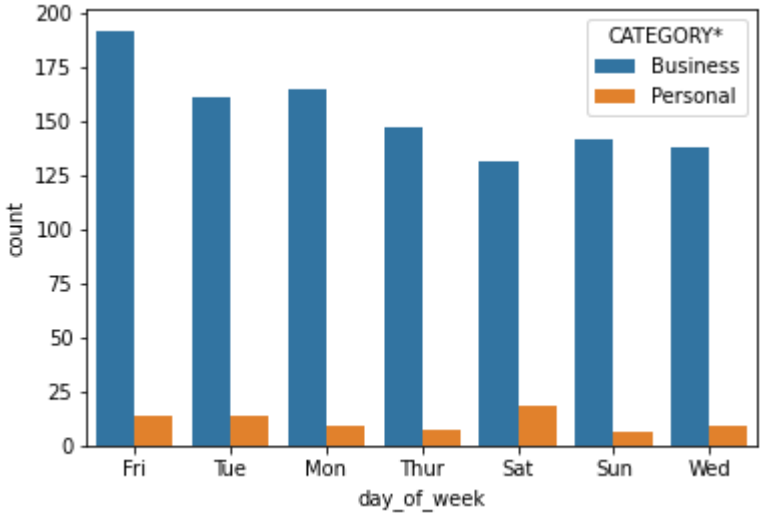
Out[37]: <AxesSubplot:xlabel='month', ylabel='count'>



Most number of rides were in month of December (all of them were Business trips)
Top 5 months having most trips were: December,August,November,February & March.
Uber Ride was used at Feb,Mar,Jul,Jun & Apr for personal trips.

In [38]:
```
sns.countplot(x='day_of_week',data=df,order=pd.value_counts(df['day_of_week']).inde
```

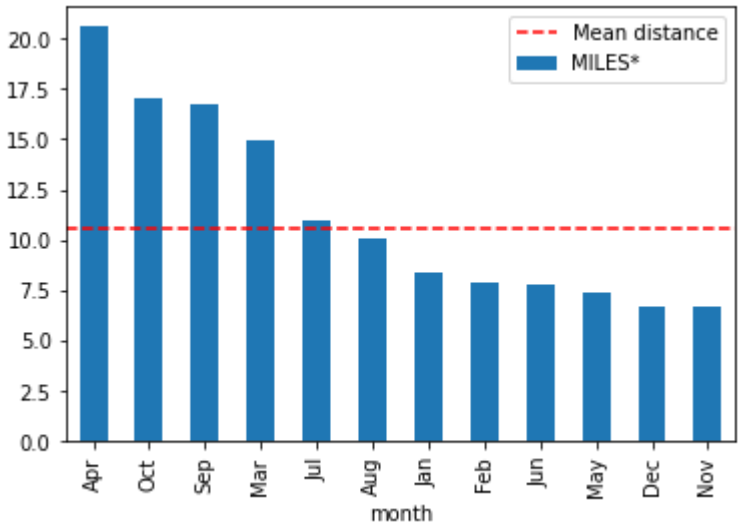
Out[38]: <AxesSubplot:xlabel='day_of_week', ylabel='count'>



FRIDAY was the day at which uber rides were mostly used

Average distance covered/month

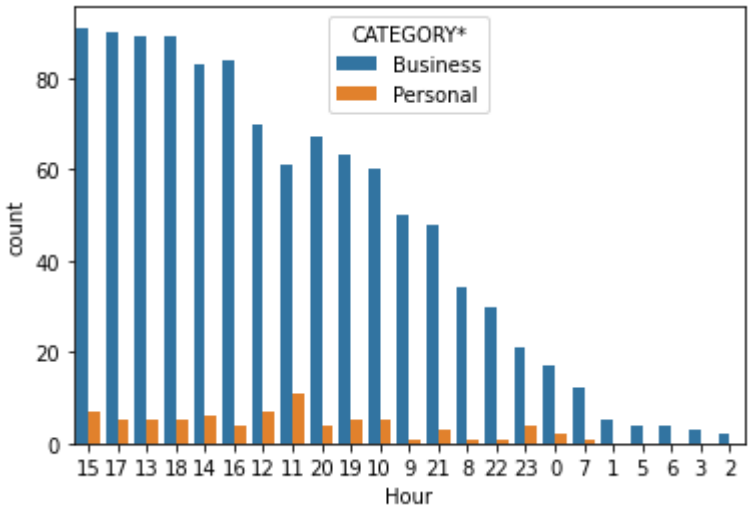
In [39]:
```
df.groupby('month').mean()['MILES*'].sort_values(ascending = False).plot(kind='bar'
plt.axhline(df['MILES*'].mean(), linestyle='--', color='red', label='Mean distance'
plt.legend()
plt.show()
```



User's Longest ride were on April & shortest were on November

In [40]:
```
sns.countplot(x='Hour',data=df,order=pd.value_counts(df['Hour']).index,hue='CATEGOR
```

Out[40]: <AxesSubplot:xlabel='Hour', ylabel='count'>



Maximim number of trips were on Evening & at noon.

Calculating Trip speed

In [41]:
```
1 df.head()
```

Out[41]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	ROUND_TRIP*	Ride_duration	month
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	YES	6.0	Jan
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	YES	12.0	Jan
2	2016-01-02 20:25:00	2016-01-02 20:38:00	Business	Fort Pierce	Fort Pierce	4.8	YES	13.0	Jan
3	2016-01-05 17:31:00	2016-01-05 17:45:00	Business	Fort Pierce	Fort Pierce	4.7	YES	14.0	Jan
4	2016-01-06 14:42:00	2016-01-06 15:49:00	Business	Fort Pierce	West Palm Beach	63.7	NO	67.0	Jan

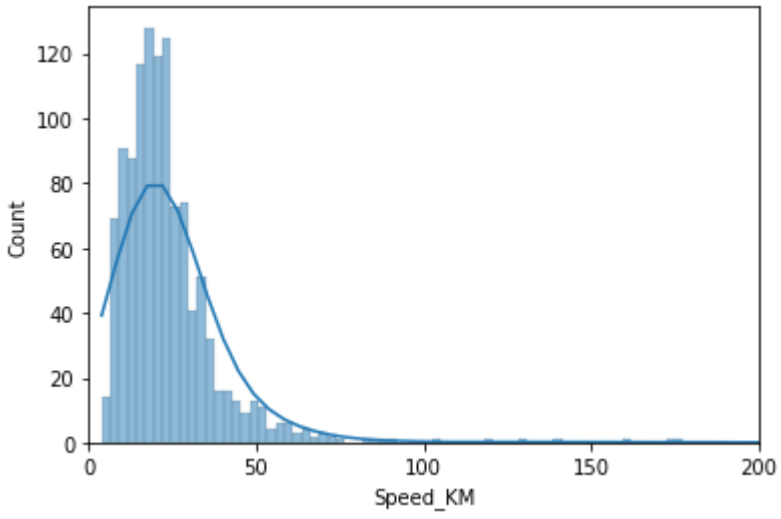
In [42]:
```
1 df['Duration_hours'] = df['Ride_duration']/60
2 df['Speed_KM'] = df['MILES*']/df['Duration_hours']
3 df.head(2)
```

Out[42]:

	START_DATE*	END_DATE*	CATEGORY*	START*	STOP*	MILES*	ROUND_TRIP*	Ride_duration	month
0	2016-01-01 21:11:00	2016-01-01 21:17:00	Business	Fort Pierce	Fort Pierce	5.1	YES	6.0	Jan
1	2016-01-02 01:25:00	2016-01-02 01:37:00	Business	Fort Pierce	Fort Pierce	5.0	YES	12.0	Jan

In [43]:
```
1 fig, ax = plt.subplots()
2 sns.histplot(x='Speed_KM',data=df,kde=True,ax=ax)
3 ax.set_xlim(1,31)
4 ax.set_xticks([x*50 for x in range(0,5)])
5
```

Out[43]:
```
[<matplotlib.axis.XTick at 0x7f1511c32d10>,
 <matplotlib.axis.XTick at 0x7f1511d5e890>,
 <matplotlib.axis.XTick at 0x7f151170f810>,
 <matplotlib.axis.XTick at 0x7f1511ac2b90>,
 <matplotlib.axis.XTick at 0x7f151170ff10>]
```



Speed is right skewed

Conclusion

- **User mainly uses Uber cabs for its Business purposes**
  - Around 94% miles was consumed during Business trips.
  - Only 6% miles were consumed during personal trips.
- There are 177 unique starting points
  - **Cary is most poplular starting point for this driver.**
- There are 188 unique Stop points.
  - **Cary is most poplular drop point for this driver.**
- **Cary-Durham & Cary-Morrisville and vice versa are the User's longest distance Uber ride.**
- **User usually takes single-trip Uber rides.**
  - Around 75% trip is single-trip and 25% are Round-Trip.
- **User's Most number of rides were in month of December & Least were in September.**
- **Friday has maximum number of trips.**
- **Afternoons and evenings seem to have the maximum number of trips.**
- **User's Longest ride were on April & shortest were on November**