Importing required Libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
from haversine import haversine
import seaborn as sns
```

Reading the data

In [2]:
```
data=pd.read_csv("C:/Users/AYRUS/Desktop/nyc_taxi_trip_duration.csv")
```

In [3]:
```
data.head()
```

Out[3]:

	id	vendor_id	pickup_datetime	dropoff_datetime	passenger_count	pickup_longitude	pi
0	id1080784	2	2016-02-29 16:40:21	2016-02-29 16:47:01	1	-73.953918	
1	id0889885	1	2016-03-11 23:35:37	2016-03-11 23:53:57	2	-73.988312	
2	id0857912	2	2016-02-21 17:59:33	2016-02-21 18:26:48	2	-73.997314	
3	id3744273	2	2016-01-05 09:44:31	2016-01-05 10:03:32	6	-73.961670	
4	id0232939	1	2016-02-17 06:42:23	2016-02-17 06:56:31	1	-74.017120	

Performing EDA

In [4]:
```
# Converting vendor_id and store_and_fwd_flag as category
data['vendor_id']=data['vendor_id'].astype('category')
data['store_and_fwd_flag']=data['store_and_fwd_flag'].astype('category')
```

In [5]:
```
# Converting pickup_datetime and dropoff_datetime in datetime format
data['pickup_datetime']=pd.to_datetime(data['pickup_datetime'],format='%Y-%m-%d %
data['dropoff_datetime']=pd.to_datetime(data['dropoff_datetime'],format='%Y-%m-%d
```

Extracting More information from datetime columns

In [6]:
```
# Creating new column and storing hour value
data['pickup_hour']=data['pickup_datetime'].dt.hour
```

In [7]:
```
# Creating new column and storing pickup time of day value
data['pick_time_of_the_day']=data.pickup_hour.apply(lambda y:(y%24+4)//4).replace
```

In [8]:
```
# Creating new day_of_the_week column which stores the day of week
data['day_of_the_week']=data.pickup_datetime.apply(lambda x:x.day_name())
```

In [9]:
```
# Converting  trip duration in hours to second
data['trip_duration_in_hours']=data.trip_duration.apply(lambda x: x/3600)
```

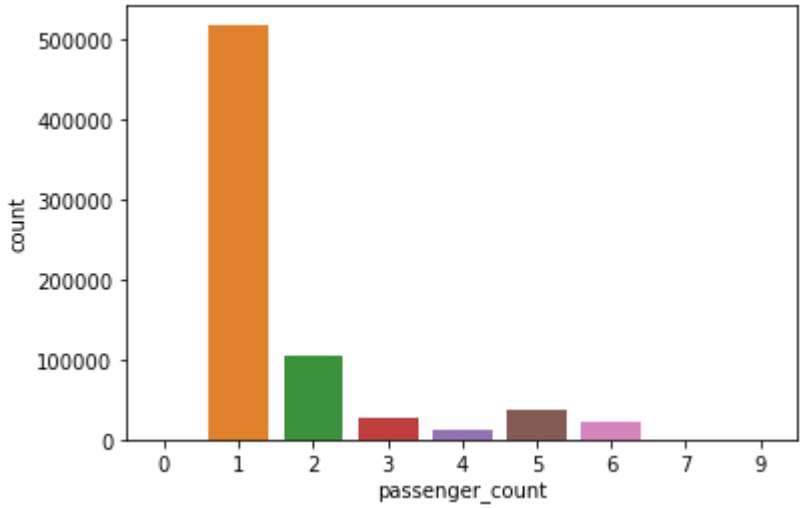
In [10]:
```
data['trip_duration'].sort_values(ascending=False)
```

Out[10]:
```
21813     1939736
259437      86391
119185      86387
177225      86378
496391      86377
            ...
672240          1
102646          1
533760          1
512833          1
622664          1
Name: trip_duration, Length: 729322, dtype: int64
```

In [11]:
```
data.drop(data[data['trip_duration']==1939736].index,inplace=True)
```

In [12]:
```
sns.countplot(x='passenger_count',data=data)
```

Out[12]:
```
<AxesSubplot:xlabel='passenger_count', ylabel='count'>
```



In [13]:
```
data.passenger_count.value_counts()
```

Out[13]:
```
1    517414
2    105097
5     38926
3     29692
6     24107
4     14050
0        33
7         1
9         1
Name: passenger_count, dtype: int64
```

In [14]:
```
data=data[data['passenger_count']!=0]
data=data[data['passenger_count']<=6]
```

In [15]:
```
data.passenger_count.value_counts()
```

Out[15]:
```
1    517414
2    105097
5     38926
3     29692
6     24107
4     14050
Name: passenger_count, dtype: int64
```

In [16]:
```
#Transforming day of week - Monday (0) to Sunday (6)
data['pickup_day_of_week']=data['pickup_datetime'].dt.dayofweek
```

In [17]:
```
#Transforming pick up time of the day
condition=[data['pick_time_of_the_day']=='Late Night',
           data['pick_time_of_the_day']=='Early Morning',
           data['pick_time_of_the_day']=='Morning',
           data['pick_time_of_the_day']=='Afternoon',
           data['pick_time_of_the_day']=='Evening',
           data['pick_time_of_the_day']=='Night']

choice=[0,1,2,3,4,5]

data['pick_time_of_the_day_in_numbers']=np.select(condition,choice)
```

In [18]:
```
# define a function to calculate distance
def calc_distance(df):
    pickup = (df['pickup_latitude'], df['pickup_longitude'])
    drop = (df['dropoff_latitude'], df['dropoff_longitude'])
    return haversine(pickup, drop)
```

In [19]:
```
# creating a new column to store the distance value
data['total_distance'] = data.apply(lambda x: calc_distance(x), axis = 1)
```

In [20]:
```
# calculating speed
data['speed'] = (data.total_distance/(data.trip_duration/3600))
```

Shuffling and Creating Train and Test Set

In [21]:
```
from sklearn.utils import shuffle

# Shuffling the Dataset
data = shuffle(data, random_state = 42)

#creating 4 divisions
div = int(data.shape[0]/4)

# 3 parts to train set and 1 part to test set
train = data.loc[:3*div+1,:]
test = data.loc[3*div+1:]
```

In [22]:
```
train.head()
```

Out[22]:

	id	vendor_id	pickup_datetime	dropoff_datetime	passenger_count	pickup_longitud
327115	id3409206	1	2016-04-13 19:13:06	2016-04-13 20:09:14	1	-73.99181
642546	id0775978	1	2016-03-09 22:45:37	2016-03-09 22:54:14	2	-73.99146
500012	id2056331	1	2016-03-23 22:46:29	2016-03-23 22:53:36	2	-73.98487
217796	id0698750	2	2016-01-01 03:13:08	2016-01-01 03:31:02	1	-73.94348
319765	id2047272	2	2016-03-08 22:12:53	2016-03-08 22:20:18	3	-73.98135

In [23]:
```
test.head()
```

Out[23]:

	id	vendor_id	pickup_datetime	dropoff_datetime	passenger_count	pickup_longitud
546964	id0107411	2	2016-02-23 15:22:09	2016-02-23 15:29:57	1	-73.95735
207141	id2054450	1	2016-06-02 14:52:46	2016-06-02 15:49:14	1	-73.86325
637544	id3748355	2	2016-06-24 09:33:41	2016-06-24 09:38:29	1	-73.96664
721586	id2252210	1	2016-06-26 22:24:27	2016-06-26 22:37:12	1	-73.96629
639710	id3986761	2	2016-01-11 01:41:02	2016-01-11 01:49:06	1	-74.00502

In [24]:
```
# storing simple mean in a new column in the test set as "simple_mean"
test['simple_mean'] = train['trip_duration'].mean()
```

Importing Mean Absolute Error

In [25]:
```
#calculating mean absolute error
from sklearn.metrics import mean_absolute_error as MAE

simple_mean_error = MAE(test['trip_duration'] , test['simple_mean'])
k1=simple_mean_error
print(k1)
```

```
619.2166118070093
```

Mean of trip duration with respect to day of week

In [26]:
```
day_of_week = pd.pivot_table(train, values='trip_duration', index = ['day_of_the_
day_of_week
```

Out[26]:

day_of_the_week	trip_duration
Friday	991.163134
Monday	887.608527
Saturday	913.308500
Sunday	895.722581
Thursday	1000.425391
Tuesday	951.364416
Wednesday	976.745333

In [27]:
```
# initializing new column to zero
test['day_of_week_mean'] = 0

# For every unique entry in day_of_the_week
for i in train['day_of_the_week'].unique():
  # Assign the mean value corresponding to unique entry
  test['day_of_week_mean'][test['day_of_the_week'] == str(i)] = train['trip_durat
```

In [28]:
```
# Calculating mean absolute error
day_of_week_error = MAE(test['trip_duration'] , test['day_of_week_mean'] )
k2=day_of_week_error
print(k2)
```

```
617.8423952237875
```

Mean of trip duration with respect to pick time of the day

In [29]:
```
pick_time_ofday = pd.pivot_table(train, values='trip_duration', index = ['pick_ti
pick_time_ofday
```

Out[29]:

pick_time_of_the_day	trip_duration
Afternoon	1036.265361
Early Morning	803.841514
Evening	993.368725
Late Night	900.405327
Morning	936.597452
Night	902.440389

In [30]:
```
# Intialising new column to 0
test['pick_time_of_day_mean'] = 0

# For every unique entry in pick time of the day
for i in train['pick_time_of_the_day'].unique():
  # Assign the mean value corresponding to unique entry
  test['pick_time_of_day_mean'][test['pick_time_of_the_day'] == i] = train['trip_
```

In [31]:
```
# calculating mean absolute error
pick_time_of_day_mean = MAE(test['trip_duration'] , test['pick_time_of_day_mean']
k3=pick_time_of_day_mean
print(k3)
```

```
617.2126886180122
```

Mean of trip duration with respect to (day of week , pick time of the day)

In [32]:
```
combine_error = pd.pivot_table(train, values = 'trip_duration', index = ['day_of_
combine_error
```

Out[32]:

		trip_duration
day_of_the_week	**pick_time_of_the_day**	
Friday	**Afternoon**	1112.996287
	Early Morning	827.379850
	Evening	1030.498331
	Late Night	930.599739
	Morning	970.067302
	Night	963.237128
Monday	**Afternoon**	969.098355
	Early Morning	806.133631
	Evening	902.258530
	Late Night	824.975474
	Morning	928.543204
	Night	803.730506
Saturday	**Afternoon**	911.925256
	Early Morning	821.376752
	Evening	953.253432
	Late Night	1002.974466
	Morning	767.335642
	Night	930.558050
Sunday	**Afternoon**	974.057451
	Early Morning	861.982496
	Evening	984.909267
	Late Night	889.631985
	Morning	713.518252
	Night	865.551665
Thursday	**Afternoon**	1122.625688
	Early Morning	797.625035
	Evening	1039.956102
	Late Night	789.184609
	Morning	1047.875391
	Night	960.755472
Tuesday	**Afternoon**	1050.837115
	Early Morning	732.572561

		trip_duration
day_of_the_week	pick_time_of_the_day	
	Evening	999.479825
	Late Night	859.441383
	Morning	1022.606745
	Night	859.987412
Wednesday	Afternoon	1114.302747
	Early Morning	809.201041
	Evening	1038.884893
	Late Night	792.122238
	Morning	1000.712488
	Night	889.034803

In [33]:
```
# intialising new empty column
test['Super_mean'] = 0

# Assigning variables to strings ( to shorten code length)
s2 = 'day_of_the_week'
s1 = 'pick_time_of_the_day'

# For every Unique Value in s1
for i in test[s1].unique():
  # For every Unique Value in s2
  for j in test[s2].unique():
    # Calculate and Assign mean to new column, corresponding to both unique value
    test['Super_mean'][(test[s1] == i) & (test[s2]==str(j))] = train['trip_durati
```

In [34]:
```
# calculating mean absolute error
super_mean_error = MAE(test['trip_duration'] , test['Super_mean'] )
k4=super_mean_error
print(k4)
```

```
614.2076349732165
```

Mean Error of trip duration with respect to vendor id and pick time of the day

In [35]:
```
combine_error2 = pd.pivot_table(train, values = 'trip_duration', index = ['vendor
combine_error2
```

Out[35]:

		trip_duration
vendor_id	pick_time_of_the_day	
1	Afternoon	919.080553
	Early Morning	700.924005
	Evening	874.475381
	Late Night	736.865394
	Morning	845.294923
	Night	791.386258
2	Afternoon	1140.209045
	Early Morning	900.803300
	Evening	1094.252714
	Late Night	1046.911520
	Morning	1014.371861
	Night	996.309600

In [36]:
```
# intialising new empty column
test['Super_mean2'] = 0

# Assigning variables to strings ( to shorten code length)
s3 = 'vendor_id'
s1 = 'pick_time_of_the_day'

# For every Unique Value in s1
for i in test[s1].unique():
  # For every Unique Value in s2
  for j in test[s3].unique():
    # Calculate and Assign mean to new column, corresponding to both unique value
    test['Super_mean2'][(test[s1] == i) & (test[s3]==str(j))] = train['trip_durat
```

In [37]:
```
# calculating mean absolute error
super_mean_error2 = MAE(test['trip_duration'] , test['Super_mean2'] )
k5=super_mean_error2
print(k5)
```

```
955.9752624884534
```

Mean Error of trip duration with respect to vendor id and day of the week

In [38]:
```
combine_error3 = pd.pivot_table(train, values = 'trip_duration', index = ['vendor
combine_error3
```

Out[38]:

		trip_duration
vendor_id	day_of_the_week	
1	Friday	865.987889
	Monday	802.823595
	Saturday	777.348877
	Sunday	753.822135
	Thursday	887.225736
	Tuesday	847.620776
	Wednesday	876.870775
2	Friday	1099.800625
	Monday	960.821436
	Saturday	1030.426555
	Sunday	1017.217663
	Thursday	1100.434994
	Tuesday	1040.593231
	Wednesday	1064.684819

In [39]:
```
# intialising new empty column
test['Super_mean3'] = 0

# Assigning variables to strings ( to shorten code length)
s3 = 'vendor_id'
s1 = 'day_of_the_week'

# For every Unique Value in s1
for i in test[s1].unique():
  # For every Unique Value in s2
  for j in test[s3].unique():
    # Calculate and Assign mean to new column, corresponding to both unique value
    test['Super_mean3'][(test[s1] == i) & (test[s3]==str(j))] = train['trip_durat
```

In [40]:
```
# calculating mean absolute error
super_mean_error3 = MAE(test['trip_duration'] , test['Super_mean3'] )
k6=super_mean_error3
print(k6)
```

```
955.9752624884534
```

create data for bar plot

In [41]:
```
# creating data for bar plot
create_data={'simple_mean_error':k1,
             'day_of_week_error':k2,
             'pick_time_of_day_mean':k3,
             'super_mean_error':k4,
             'super_mean_error2':k5,
             'super_mean_error3':k6}

display=list(create_data.keys())
value=list(create_data.values())

fig = plt.figure(figsize = (10, 5))

# creating the bar plot
plt.bar(display, value, color ='blue',
        )

plt.xlabel(" test error")
plt.ylabel("value of error")
plt.title("MAE of TEST data")
plt.show
```

Out[41]: <function matplotlib.pyplot.show(close=None, block=None)>