Evalution Metric is used RMSE

I have used Root mean squared error RMSE as the evaluation metric since the target variable is continous variable.RMSE is most commonly used evaluation metrics for regression problems since it brings down the unit of the difference between predicted and actual values to the same unit as the target variable

Build a BenchMark model for the given dataset

In [1]:
```
#importing the required libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
df = pd.read_csv("nyc_taxi_trip_duration.csv")
df.head()
```

Out[2]:

	id	vendor_id	pickup_datetime	dropoff_datetime	passenger_count	pickup_longitude	pickup_latitude	dropoff_longitude	dropoff_latitude	store_and_fwd_flag	trip_duration
0	id1080784	2	2016-02-29 16:40:21	2016-02-29 16:47:01	1	-73.953918	40.778873	-73.963875	40.771164	N	400
1	id0889885	1	2016-03-11 23:35:37	2016-03-11 23:53:57	2	-73.988312	40.731743	-73.994751	40.694931	N	1100
2	id0857912	2	2016-02-21 17:59:33	2016-02-21 18:26:48	2	-73.997314	40.721458	-73.948029	40.774918	N	1635
3	id0374273	2	2016-01-05 00:44:31	2016-01-05 10:03:32	6	-73.961670	40.759720	-73.956779	40.780628	N	1141
4	id0323939	1	2016-02-17 06:42:23	2016-02-17 06:56:31	1	-74.017120	40.708469	-73.988182	40.740631	N	848

In [3]:
```
df['trip_duration_hour'] = df['trip_duration'].apply(lambda x: x/3600)
df.drop(columns=['trip_duration'], inplace=True)
```

In [4]:
```
df['pickup_datetime'] = pd.to_datetime(df['pickup_datetime'], format = '%Y-%m-%d %H:%M:%S')
df['dropoff_datetime'] = pd.to_datetime(df['dropoff_datetime'], format = '%Y-%m-%d %H:%M:%S')
```

In [5]:
```
df['pickup_hour'] = df['pickup_datetime'].dt.hour
df['pickup_weekday'] = df['pickup_datetime'].dt.weekday
df['pickup_day'] = df['pickup_datetime'].dt.day
df['pickup_month'] = df['pickup_datetime'].dt.month
df['pickup_year'] = df['pickup_datetime'].dt.year
df['pickup_date'] = df['pickup_datetime'].dt.date

df['dropoff_hour'] = df['dropoff_datetime'].dt.hour
df['dropoff_weekday'] = df['dropoff_datetime'].dt.weekday
df['dropoff_day'] = df['dropoff_datetime'].dt.day
df['dropoff_month'] = df['dropoff_datetime'].dt.month
df['dropoff_year'] = df['dropoff_datetime'].dt.year
df['dropoff_date'] = df['dropoff_datetime'].dt.date
```

In [6]:
```
def time_of_day(x):
    # to calculate what time of it is now
    if x in range(6,12):
        return 'Morning'
    elif x in range(12,16):
        return 'Afternoon'
    elif x in range(16,22):
        return 'Evening'
    else:
        return 'Late night'

df['pickup_time_of_day'] = df['pickup_hour'].apply(time_of_day)
df['dropoff_time_of_day'] = df['dropoff_hour'].apply(time_of_day)
```

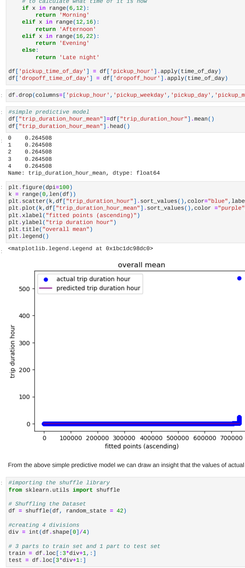
In [7]:
```
df.drop(columns=['pickup_hour','pickup_weekday','pickup_day','pickup_month','pickup_year','dropoff_hour','dropoff_weekday','dropoff_day','dropoff_month
```

In [9]:
```
#simple predictive model
df["trip_duration_hour_mean"]=df["trip_duration_hour"].mean()
df["trip_duration_hour_mean"].head()
```

Out[9]:
```
0    0.264508
1    0.264508
2    0.264508
3    0.264508
4    0.264508
Name: trip_duration_hour_mean, dtype: float64
```

In [17]:
```
plt.figure(dpi=100)
k = range(0,len(df))
plt.scatter(k,df["trip_duration_hour"].sort_values(),color="blue",label="actual trip duration hour")
plt.plot(k,df["trip_duration_hour_mean"].sort_values(),color ="purple",label="predicted trip duration hour")
plt.xlabel("fitted points (ascending)")
plt.ylabel("trip duration hour")
plt.title("overall mean")
plt.legend()
```

Out[17]:
```
<matplotlib.legend.Legend at 0x1bc1dc98dc0>
```



From the above simple predictive model we can draw an insight that the values of actual trip duration and predicted trip duration are almost same.

In [10]:
```
#importing the shuffle library
from sklearn.utils import shuffle

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

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

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

In [11]:
```
train.head()
```

Out[11]:

	id	vendor_id	pickup_datetime	dropoff_datetime	passenger_count	pickup_longitude	pickup_latitude	dropoff_longitude	dropoff_latitude	store_and_fwd_flag	trip_duration_hour
469114	id2380741	2	2016-05-21 10:40:14	2016-05-21 10:51:11	1	-73.981796	40.762035	-73.972267	40.781265	N	0.182500
694852	id3940961	2	2016-01-08 18:49:27	2016-01-08 18:52:42	5	-73.980965	40.747677	-73.982704	40.741161	N	0.054167
696324	id0833913	1	2016-05-22 00:54:10	2016-05-22 01:08:10	1	-73.951065	40.782722	-73.867691	40.833664	N	0.233333
356496	id1336849	1	2016-06-11 10:32:12	2016-06-11 10:38:00	1	-73.987625	40.762791	-73.973518	40.782909	N	0.110556
645318	id1610858	1	2016-04-03 10:45:51	2016-04-03 10:57:13	3	-73.964333	40.792503	-73.988609	40.758369	N	0.189444

In [12]:
```
test.head()
```

Out[12]:

	id	vendor_id	pickup_datetime	dropoff_datetime	passenger_count	pickup_longitude	pickup_latitude	dropoff_longitude	dropoff_latitude	store_and_fwd_flag	trip_duration_hour
546991	id2240736	1	2016-05-25 07:59:16	2016-05-25 08:05:02	1	-73.991364	40.732590	-74.000526	40.742283	N	0.096111
43126	id1423404	1	2016-01-18 12:17:13	2016-01-18 12:21:13	2	-73.966225	40.760059	-73.967606	40.763073	N	0.066667
641450	id1317268	2	2016-03-02 18:39:01	2016-03-02 18:50:12	1	-73.994926	40.766018	-74.004219	40.742523	N	0.186389
611380	id3335546	1	2016-04-06 19:17:20	2016-04-06 19:18:03	1	-73.974388	40.793781	-73.976006	40.792339	N	0.011944
62690	id2174190	2	2016-06-21 18:35:31	2016-06-21 18:40:56	3	-73.963440	40.798557	-73.979736	40.777878	N	0.090278

In [13]:
```
# storing simple mean in a new column in the test set as "simple_mean"
df["trip_duration_hour_mean"]=df["trip_duration_hour"].mean()
df["trip_duration_hour_mean"]
```

Out[13]:
```
469114    0.264508
694852    0.264508
696324    0.264508
356496    0.264508
645318    0.264508
            ...
259178    0.264508
365838    0.264508
131932    0.264508
671155    0.264508
121958    0.264508
Name: trip_duration_hour_mean, Length: 729322, dtype: float64
```

In [14]:
```
#calculating RMSE
from sklearn.metrics import mean_squared_error as mse
from math import sqrt

trip_mean_error = sqrt(mse(test['trip_duration_hour'] , test['trip_duration_hour_mean']))
trip_mean_error
```

Out[14]:
```
0.8904067655425832
```

In [15]:
```
#trip duration mean with respect to the mean of pickup time of the day
pickup = pd.pivot_table(train, values='trip_duration_hour', index = ['pickup_time_of_day'], aggfunc=np.mean)
pickup
```

Out[15]:

pickup_time_of_day	trip_duration_hour
Afternoon	0.291531
Evening	0.264078
Late night	0.255589
Morning	0.250610

In [16]:
```
# initializing new column to zero
test['pickup'] = 0

# For every unique entry in pickup longitude
for i in train['pickup_time_of_day'].unique():
  # Assign the mean value corresponding to unique entry
  test['pickup'][test['pickup_time_of_day'] == str(i)] = train['trip_duration_hour'][train['pickup_time_of_day'] == str(i)].mean()
```

In [18]:
```
#calculating RMSE
pickup_error = sqrt(mse(test['trip_duration_hour'] , test['pickup'] ))
pickup_error
```

Out[18]:
```
0.8903816016040094
```

The RMSE of the trip duration hour mean with respect to the mean of pickup time of the day is higher than the simple mean of the trip duration hour

In [21]:
```
#trip duration mean with respect to the mean of dropoff time of the day
dropoff =pd.pivot_table(train, values='trip_duration_hour', index = ['dropoff_time_of_day'], aggfunc=np.mean)
dropoff
```

Out[21]:

dropoff_time_of_day	trip_duration_hour
Afternoon	0.264258
Evening	0.269666
Late night	0.256343
Morning	0.247905

In [22]:
```
# initializing new column to zero
test['dropoff'] = 0

# For every unique entry in pickup latitude
for i in train['dropoff_time_of_day'].unique():
  # Assign the mean value corresponding to unique entry
  test['dropoff'][test['dropoff_time_of_day'] == str(i)] = train['trip_duration_hour'][train['dropoff_time_of_day'] == str(i)].mean()
```

In [23]:
```
#calculating mean absolute error
dropoff_error = sqrt(mse(test['trip_duration_hour'] , test['dropoff'] ))
dropoff_error
```

Out[23]:
```
0.8903865469170373
```

The pick up time error is same as dropoff time error

In [24]:
```
#mtrip duration mean with respect to the mean of passenger count
pass_count = pd.pivot_table(train, values='trip_duration_hour', index = ["passenger_count"], aggfunc=np.mean)
pass_count
```

Out[24]:

passenger_count	trip_duration_hour
0	0.092981
1	0.255343
2	0.277822
3	0.287332
4	0.285759
5	0.299641
6	0.300193

In [29]:
```
# initializing new column to zero
test['pass_count'] = 0

# For every unique entry in passenger count
for i in train['passenger_count'].unique():
  # Assign the mean value corresponding to unique entry
  test['pass_count'][test['passenger_count'] == str(i)] = train['trip_duration_hour'][train['passenger_count'] == str(i)].mean()
```

In [30]:
```
pass_count_error = sqrt(mse(test['trip_duration_hour'] , test['pass_count'] ))
pass_count_error
```

Out[30]:
```
0.9290781075032716
```

The pass count error is more than both pickup and dropoff error

In [31]:
```
store_and_fwd = pd.pivot_table(train, values='trip_duration_hour', index = ["store_and_fwd_flag"], aggfunc=np.mean)
store_and_fwd
```

Out[31]:

store_and_fwd_flag	trip_duration_hour
N	0.264109
Y	0.304058

In [32]:
```
# initializing new column to zero
test['store_and_fwd'] = 0

# For every unique entry in pickup latitude
for i in train['store_and_fwd_flag'].unique():
  # Assign the mean value corresponding to unique entry
  test['store_and_fwd'][test['store_and_fwd_flag'] == str(i)] = train['trip_duration_hour'][train['store_and_fwd_flag'] == str(i)].mean()
```

In [33]:
```
str_and_fwd_error = sqrt(mse(test['store_and_fwd'] , test['trip_duration_hour'] ))
str_and_fwd_error
```

Out[33]:
```
0.8904020727484228
```

In [34]:
```
combo = pd.pivot_table(train, values = 'trip_duration_hour', index = ['passenger_count','pickup_time_of_day','dropoff_time_of_day'], aggfunc = np.mean)
combo
```

Out[34]:

			trip_duration_hour
passenger_count	pickup_time_of_day	dropoff_time_of_day	
0	Afternoon	Afternoon	0.305417
	Evening	Evening	0.054352
		Late night	0.106944
	Late night	Late night	0.023856
	Morning	Afternoon	0.432222
...	...	...	...
6	Late night	Late night	0.282054
		Morning	0.313738
	Morning	Afternoon	0.376369
		Late night	16.731944
		Morning	0.267228

75 rows × 1 columns

conclusions

- THe error of simple mean of trip duration hour is 0.89040676 which is also equal to rmse of dropp time and pickup time of the day where as the str_fwd_error is 0.89040207 there is only slighlty deference and
- The rmse of passanger count is little high 0.92907810
- The pickup time error , dropoff time error and pass_count error 0.89040676

In [ ]:
```

```