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

In [2]:
```
df = pd.read_csv("https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/001/551/original/delhiv
```

In [3]:
```
df
```

Out[3]:

	data	trip_creation_time	route_schedule_uuid	route_type	trip_uuid	source_center	source_name
0	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)
1	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)
2	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)
3	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)
4	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)
...	...	...	...	...	...	...	...
144862	training	2018-09-20 16:24:28.436231	thanos::sroute:f0569d2f-4e20-4c31-8542-67b86d5...	Carting	trip-153746066843555182	IND131028AAB	Sonipat_Kundli_H (Haryana)
144863	training	2018-09-20 16:24:28.436231	thanos::sroute:f0569d2f-4e20-4c31-8542-67b86d5...	Carting	trip-153746066843555182	IND131028AAB	Sonipat_Kundli_H (Haryana)
144864	training	2018-09-20 16:24:28.436231	thanos::sroute:f0569d2f-4e20-4c31-8542-67b86d5...	Carting	trip-153746066843555182	IND131028AAB	Sonipat_Kundli_H (Haryana)
144865	training	2018-09-20 16:24:28.436231	thanos::sroute:f0569d2f-4e20-4c31-8542-67b86d5...	Carting	trip-153746066843555182	IND131028AAB	Sonipat_Kundli_H (Haryana)
144866	training	2018-09-20 16:24:28.436231	thanos::sroute:f0569d2f-4e20-4c31-8542-67b86d5...	Carting	trip-153746066843555182	IND131028AAB	Sonipat_Kundli_H (Haryana)

144867 rows × 24 columns

In [4]:
```
df.shape
```

Out[4]:
```
(144867, 24)
```

Dropping all the unnecessary columns

In [5]:
```
unknown = df.iloc[:,df.columns.str.contains('factor|cutoff')].columns
for i in unknown:
  df.drop(i,axis=1,inplace=True)
```

Dropping rows with missing values

In [6]:

```
df_na = pd.DataFrame(df.isna().sum())
df_na['percent'] = df.isna().sum() *100/len(df)
df_na['percent'] = df_na['percent'].round(3)
df_na
```

Out[6]:

	0	percent
data	0	0.000
trip_creation_time	0	0.000
route_schedule_uuid	0	0.000
route_type	0	0.000
trip_uuid	0	0.000
source_center	0	0.000
source_name	293	0.202
destination_center	0	0.000
destination_name	261	0.180
od_start_time	0	0.000
od_end_time	0	0.000
start_scan_to_end_scan	0	0.000
actual_distance_to_destination	0	0.000
actual_time	0	0.000
osrm_time	0	0.000
osrm_distance	0	0.000
segment_actual_time	0	0.000
segment_osrm_time	0	0.000
segment_osrm_distance	0	0.000

In [7]:

```
df.dropna(how='any', inplace=True)
```

In [8]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 144316 entries, 0 to 144866
Data columns (total 19 columns):
 #   Column                          Non-Null Count   Dtype  
---  ------                          --------------   -----  
 0   data                            144316 non-null  object 
 1   trip_creation_time              144316 non-null  object 
 2   route_schedule_uuid             144316 non-null  object 
 3   route_type                      144316 non-null  object 
 4   trip_uuid                       144316 non-null  object 
 5   source_center                   144316 non-null  object 
 6   source_name                     144316 non-null  object 
 7   destination_center              144316 non-null  object 
 8   destination_name                144316 non-null  object 
 9   od_start_time                   144316 non-null  object 
 10  od_end_time                     144316 non-null  object 
 11  start_scan_to_end_scan          144316 non-null  float64
 12  actual_distance_to_destination  144316 non-null  float64
 13  actual_time                     144316 non-null  float64
 14  osrm_time                       144316 non-null  float64
 15  osrm_distance                   144316 non-null  float64
 16  segment_actual_time             144316 non-null  float64
 17  segment_osrm_time               144316 non-null  float64
 18  segment_osrm_distance           144316 non-null  float64
dtypes: float64(8), object(11)
memory usage: 22.0+ MB
```

In [10]:

```
df.describe()
```

Out[10]:

	start_scan_to_end_scan	actual_distance_to_destination	actual_time	osrm_time	osrm_distance	segment_actual_tim
count	144316.000000	144316.000000	144316.000000	144316.000000	144316.000000	144316.00000
mean	963.697698	234.708498	417.996237	214.437055	285.549785	36.17537
std	1038.082976	345.480571	598.940065	308.448543	421.717826	53.52429
min	20.000000	9.000045	9.000000	6.000000	9.008200	-244.00000
25%	161.000000	23.352027	51.000000	27.000000	29.896250	20.00000
50%	451.000000	66.135322	132.000000	64.000000	78.624400	28.00000
75%	1645.000000	286.919294	516.000000	259.000000	346.305400	40.00000
max	7898.000000	1927.447705	4532.000000	1686.000000	2326.199100	3051.00000

In [11]:

```
df.nunique()
```

Out[11]:

```
data                                   2
trip_creation_time                 14787
route_schedule_uuid                 1497
route_type                             2
trip_uuid                          14787
source_center                       1496
source_name                         1496
destination_center                  1466
destination_name                    1466
od_start_time                      26223
od_end_time                        26223
start_scan_to_end_scan              1914
actual_distance_to_destination    143965
actual_time                         3182
osrm_time                           1531
osrm_distance                     137544
segment_actual_time                  746
segment_osrm_time                    214
segment_osrm_distance             113497
dtype: int64
```

In [12]:

```
df['od_start_time'] = pd.to_datetime(df['od_start_time'])
df['od_end_time'] = pd.to_datetime(df['od_end_time'])
```

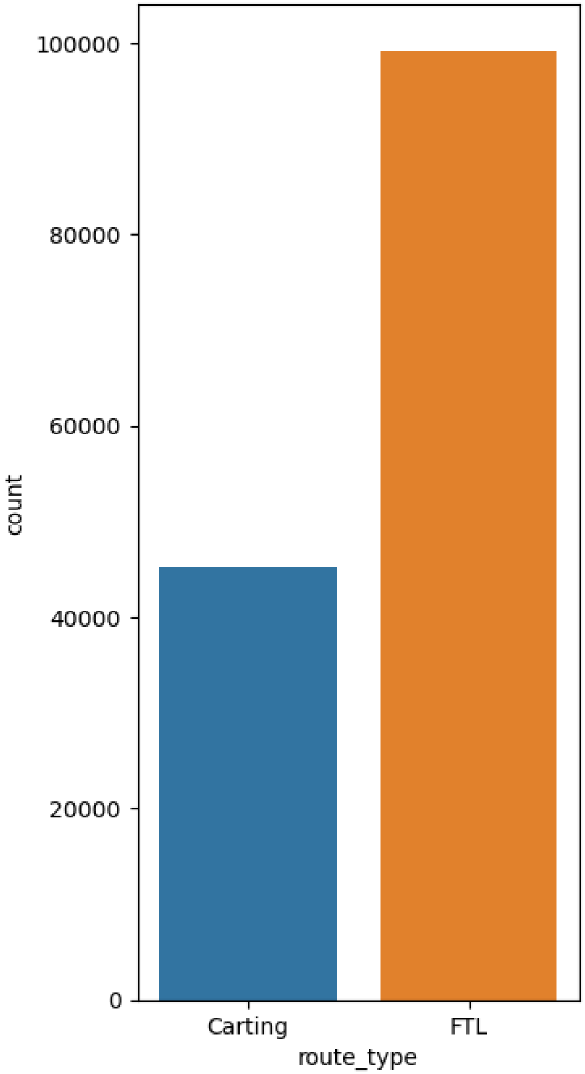
In [14]:

```
df2 = df.copy()
df2
categ_cols = ['route_type']
cat_count = df2[categ_cols].melt().groupby(['variable', 'value'])[['value']].size().reset_index(name='co
s = df2[categ_cols].melt().variable.value_counts()
cat_count['Percent'] = cat_count['counts'].div(cat_count['variable'].map(s)).mul(100).round().astype('in
cat_count.groupby(['variable', 'value']).first()
```

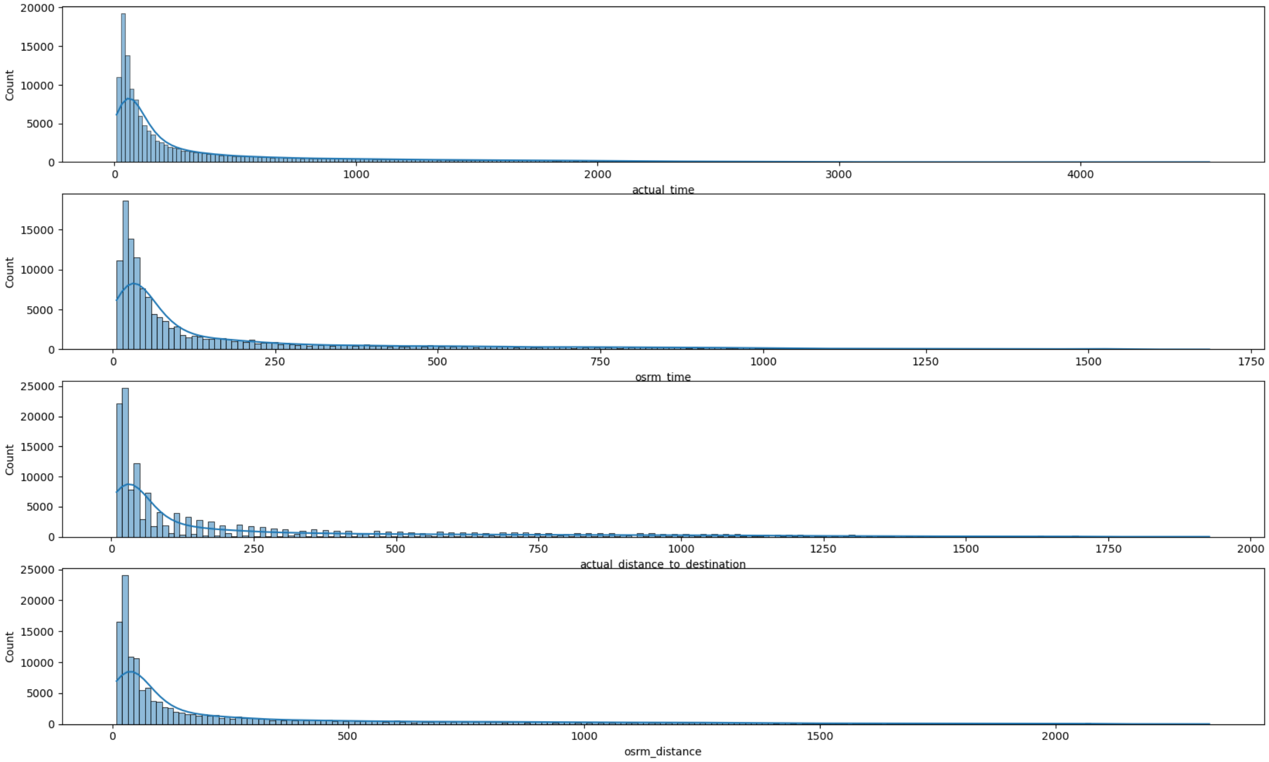
Out[14]:

		counts	Percent
variable	**value**		
route_type	**Carting**	45184	31
	FTL	99132	69

In [19]:
```
plt.figure(figsize = (12,8))
cat_cols = ['route_type']
for i in range (len(cat_cols)):
  plt.subplot(1, 3, i+1)
  sns.countplot(data=df, x=cat_cols[i])
```



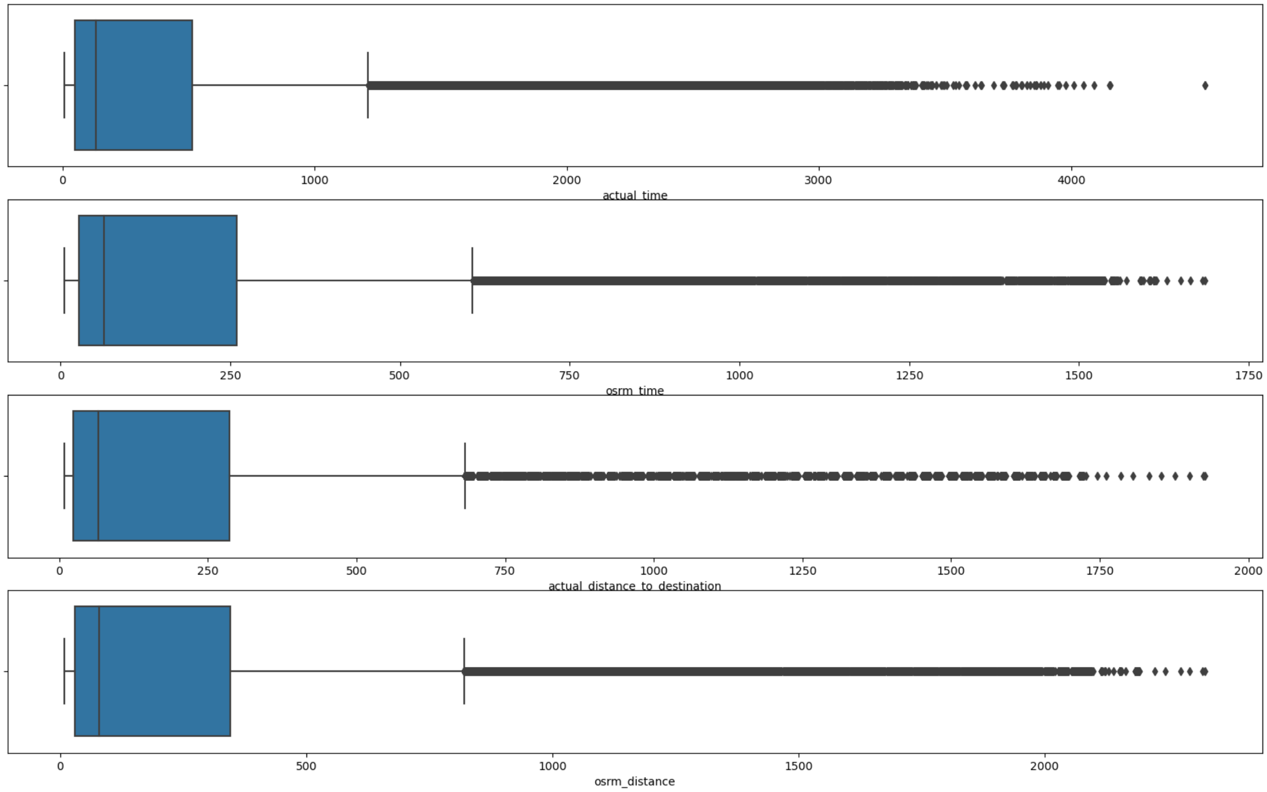
In [20]:
```
plt.figure(figsize = (20,12))
n_cols = ['actual_time','osrm_time','actual_distance_to_destination','osrm_distance']
for i in range (len(n_cols)):
  plt.subplot(len(n_cols),1, i+1)
  sns.histplot(data = df, x = n_cols[i], kde = True)
```



Variables show above have extreme right skewed distribution

In [21]:

```
plt.figure(figsize = (20,12))
n_cols = ['actual_time','osrm_time','actual_distance_to_destination','osrm_distance']
for i in range (len(n_cols)):
  plt.subplot(len(n_cols),1, i+1)
  sns.boxplot(data = df, x = n_cols[i])
```



In [22]:

```
df['segment_key'] = df['trip_uuid'] + df['source_center'] + df['destination_center']
segment_cols = ['segment_actual_time','segment_osrm_distance','segment_osrm_time']
for col in segment_cols:
  df[col+'_sum'] = df.groupby('segment_key')[col].cumsum()
df[[col + '_sum' for col in segment_cols]].head()
```

Out[22]:

	segment_actual_time_sum	segment_osrm_distance_sum	segment_osrm_time_sum
0	14.0	11.9653	11.0
1	24.0	21.7243	20.0
2	40.0	32.5395	27.0
3	61.0	45.5619	39.0
4	67.0	49.4772	44.0

In [23]:

```
segment_data = {
    'data' : 'first',
    'trip_creation_time' : 'first',
    'route_schedule_uuid' : 'first',
    'route_type' : 'first',
    'trip_uuid' : 'first',

    'source_center' : 'first',
    'source_name' : 'first',

    'destination_center' : 'last',
    'destination_name' : 'last',

    'od_start_time' : 'first',
    'od_end_time' : 'first',
    'start_scan_to_end_scan' : 'first',

    'actual_distance_to_destination' : 'last',
    'actual_time' : 'last',

    'osrm_time' : 'sum',
    'osrm_distance' : 'sum',

    'segment_actual_time_sum' : 'sum',
    'segment_osrm_distance_sum' : 'sum',
    'segment_osrm_time_sum' : 'sum'
}
```

In [24]:

```
segment = df.groupby('segment_key').agg(segment_data).reset_index()
segment = segment.sort_values(by=['segment_key','od_end_time'],ascending=True).reset_index()
```

Creating Feature

In [25]:

```
segment['od_time_diff_hour'] = (segment['od_end_time'] - segment['od_start_time']).dt.total_seconds()/6
```

In [26]:
```
segment
```

Out[26]:

ance_to_destination	actual_time	osrm_time	osrm_distance	segment_actual_time_sum	segment_osrm_distance_sum	segment_osri
383.759164	732.0	3464.0	4540.1261	6434.0	6343.4400	
440.973689	830.0	4323.0	6037.6386	9082.0	7878.6704	
24.644021	47.0	55.0	60.3157	95.0	60.3159	
48.542890	96.0	155.0	209.1151	301.0	208.1935	
237.439610	611.0	1427.0	1975.7409	2584.0	2062.8567	
...	...	...	...	...	...	
33.627182	51.0	106.0	106.7084	116.0	105.9520	
33.673835	90.0	108.0	111.8555	172.0	164.2574	
12.661945	30.0	22.0	25.5371	50.0	25.5370	
40.546740	233.0	59.0	76.5169	278.0	76.5169	
25.534793	42.0	47.0	51.2851	71.0	51.2851	

Here we are actually calculating the time taken between od_start_time and od_end_time. Also, leveraging it a feature for further analysis.

In [29]:
```
trip_data = {
    'data' : 'first',
    'trip_creation_time' : 'first',
    'route_schedule_uuid' : 'first',
    'route_type' : 'first',
    'trip_uuid' : 'first',

    'source_center' : 'first',
    'source_name' : 'first',

    'destination_center' : 'last',
    'destination_name' : 'last',

    'start_scan_to_end_scan' : 'sum',
    'actual_distance_to_destination' : 'sum',
    'actual_time' : 'sum',
    'osrm_time' : 'sum',
    'osrm_distance' : 'sum',

    'segment_actual_time_sum' : 'sum',
    'segment_osrm_distance_sum' : 'sum',
    'segment_osrm_time_sum' : 'sum'
}
```

In [30]:
```
trip = segment.groupby('trip_uuid').agg(trip_data).reset_index(drop=True)
trip
```

Out[30]:

	data	trip_creation_time	route_schedule_uuid	route_type	trip_uuid	source_center	source_na
0	training	2018-09-12 00:00:16.535741	thanos::sroute:d7c989ba-a29b-4a0b-b2f4-288cdc6...	FTL	trip-153671041653548748	IND209304AAA	Kanpur_Central_H (Uttar Prade
1	training	2018-09-12 00:00:22.886430	thanos::sroute:3a1b0ab2-bb0b-4c53-8c59-eb2a2c0...	Carting	trip-153671042288605164	IND561203AAB	Doddablpur_ChikaDPP (Karnata
2	training	2018-09-12 00:00:33.691250	thanos::sroute:de5e208e-7641-45e6-8100-4d9fb1e...	FTL	trip-153671043369099517	IND000000ACB	Gurgaon_Bilaspur_ (Harya
3	training	2018-09-12 00:01:00.113710	thanos::sroute:f0176492-a679-4597-8332-bbd1c7f...	Carting	trip-153671046011330457	IND400072AAB	Mumbai H (Maharasht
4	training	2018-09-12 00:02:09.740725	thanos::sroute:d9f07b12-65e0-4f3b-bec8-df06134...	FTL	trip-153671052974046625	IND583101AAA	Bellary_Dc (Karnata
...	...	...	...	...	...	...	
14782	test	2018-10-03 23:55:56.258533	thanos::sroute:8a120994-f577-4491-9e4b-b7e4a14...	Carting	trip-153861095625827784	IND160002AAC	Chandigarh_Mehmdpur (Punj
14783	test	2018-10-03 23:57:23.863155	thanos::sroute:b30e1ec3-3bfa-4bd2-a7fb-3b75769...	Carting	trip-153861104386292051	IND121004AAB	FBD_Balabhgarh_D (Harya
14784	test	2018-10-03 23:57:44.429324	thanos::sroute:5609c268-e436-4e0a-8180-3db4a74...	Carting	trip-153861106442901555	IND208006AAA	Kanpur_GovndNgr_ (Uttar Prade
14785	test	2018-10-03 23:59:14.390954	thanos::sroute:c5f2ba2c-8486-4940-8af6-d1d2a6a...	Carting	trip-153861115439069069	IND627005AAA	Tirunelveli_VdkkuS (Tamil Na
14786	test	2018-10-03 23:59:42.701692	thanos::sroute:412fea14-6d1f-4222-8a5f-a517042...	FTL	trip-153861118270144424	IND583119AAA	Sandur_WrdN1DPP (Karnata

14787 rows × 17 columns

Treating Outliers

In [31]:

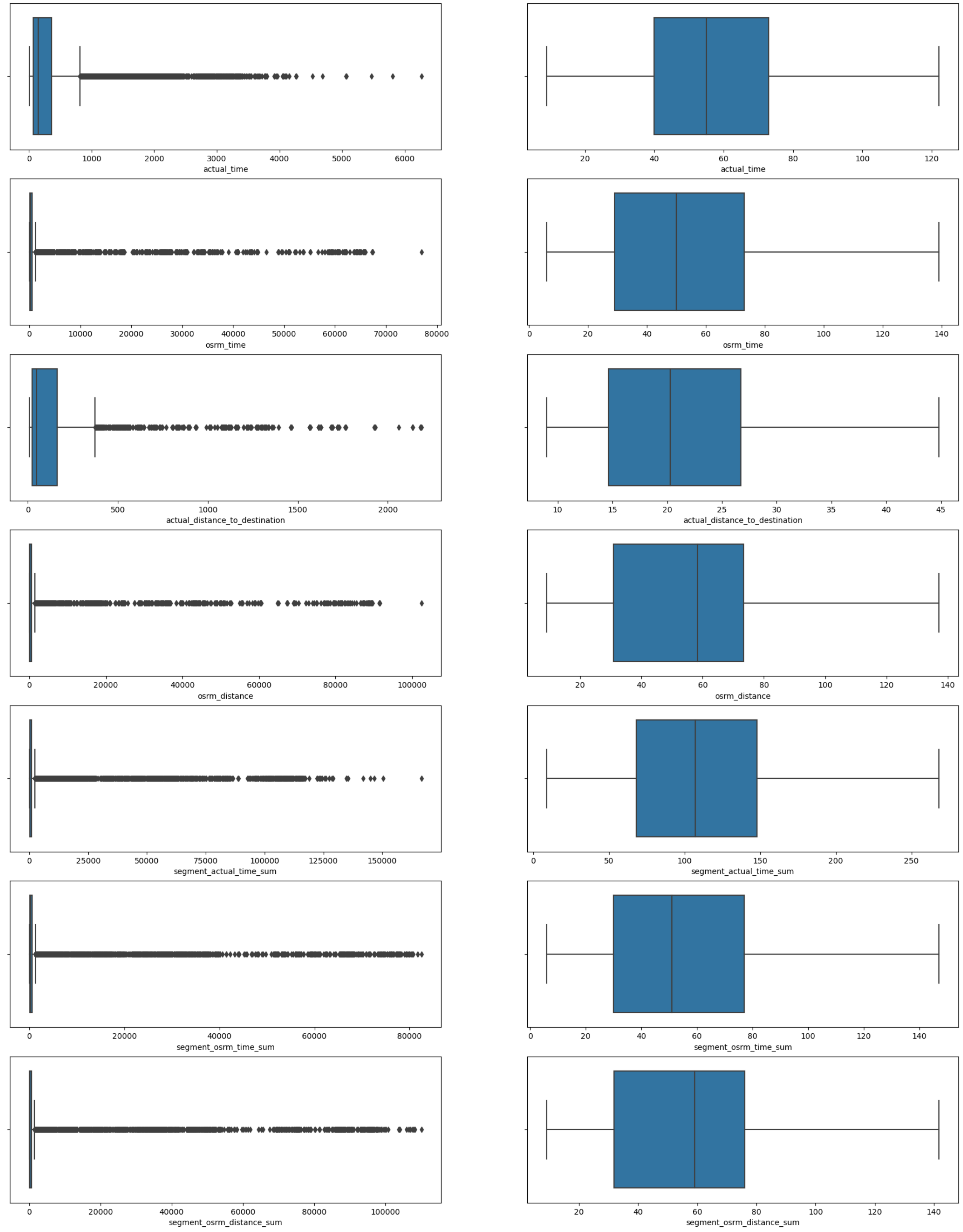
```
trip_new = trip.copy()

def rabbit(col):
  q1=col.quantile(0.25)
  q3=col.quantile(0.75)
  IQR=q3-q1
  outliers = trip[((col<(q1-1.5*IQR)) | (col>(q3+1.5*IQR)))]
  return outliers

cols = ['actual_time', 'osrm_time','actual_distance_to_destination','osrm_distance','segment_actual_time

n=1
while n!=0:
  n=0
  for x in cols:
    outliers = rabbit(trip[x]).index
    trip.drop(outliers,inplace=True)
    n+=len(outliers)


fig, axis = plt.subplots(nrows=len(cols), ncols=2, figsize=(22, len(cols)*4))
for i in range (len(cols)):
  for j in ([0,1]):
    if j==0:
      sns.boxplot(data = trip_new, x = cols[i], ax = axis[i, j])
    else:
      sns.boxplot(data = trip, x = cols[i], ax = axis[i, j])
```



T-Test for checking the mean of actual time Vs osrm_time

In [66]:

```
from scipy.stats import ttest_ind

null_hypothesis = 'mean of actual_time is not higher than mean of osrm_time'
alternate_hypothesis = 'mean of actual_time is higher than mean of osrm_time'

sample1 = trip['actual_time']
sample2 = trip['osrm_time']
t_stat, p_value = ttest_ind(sample1, sample2, equal_var=False, alternative='greater')
print('T_stat :' ,t_stat, 'P value :' ,p_value)

if(p_value < 0.05):
  print('Since, p-value < 0.05, we reject null hypothesis')
  print(alternate_hypothesis)
else:
  print('Since p-value > 0.05, we fail to reject null hypothesis')
  print(null_hypothesis)
```

```
T_stat : 6.307544212335 P value : 1.477951388534912e-10
Since, p-value < 0.05, we reject null hypothesis
mean of actual_time is higher than mean of osrm_time
```

T-Test for checking the mean of osrm_distance is similer to as that of segment_osrm_distance_sum

In [65]:

```
null_hypothesis = 'mean of osrm_distance is similer as mean of segment_osrm_distance_sum'
alternate_hypothesis = 'mean of osrm_distance is higher than mean of segment_osrm_distance_sum'

sample1 = trip['osrm_distance']
sample2 = trip['segment_osrm_distance_sum']
t_stat, p_value = ttest_ind(sample1, sample2, equal_var=False, alternative='greater')
print('T_stat :' ,t_stat, 'P value :' ,p_value)

if(p_value < 0.05):
  print('Since, p-value < 0.05, we reject null hypothesis')
  print(alternate_hypothesis)
else:
  print('Since p-value > 0.05, we fail to reject null hypothesis')
  print(null_hypothesis)
```

```
T_stat : -3.4156110488999936 P value : 0.9996805751383507
Since p-value > 0.05, we fail to reject null hypothesis
mean of osrm_distance is similer as mean of segment_osrm_distance_sum
```

In [43]:

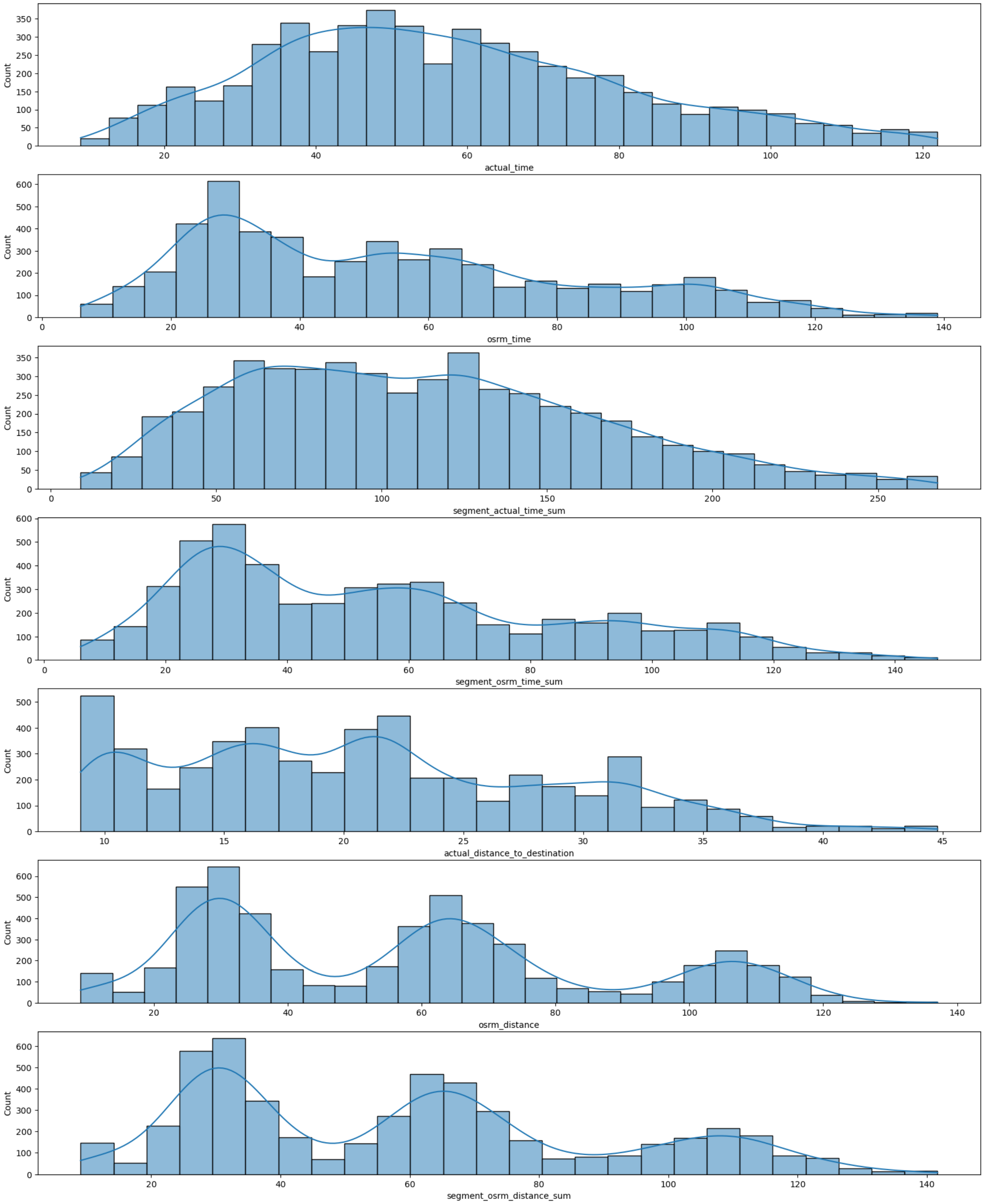
```
from scipy import stats

num_cols = ['actual_time','osrm_time','segment_actual_time_sum','segment_osrm_time_sum','actual_distanc

for i in (num_cols):
  stat, p_value = stats.shapiro(sample1)
  if(p_value < 0.05):
    print(i, ": sample is not normally distributed, do non parametric test")
  else:
    print(i, ": sample is normally distributed, can do parametric test")
```

```
actual_time : sample is not normally distributed, do non parametric test
osrm_time : sample is not normally distributed, do non parametric test
segment_actual_time_sum : sample is not normally distributed, do non parametric test
segment_osrm_time_sum : sample is not normally distributed, do non parametric test
actual_distance_to_destination : sample is not normally distributed, do non parametric test
osrm_distance : sample is not normally distributed, do non parametric test
segment_osrm_distance_sum : sample is not normally distributed, do non parametric test
```

In [45]:
```
plt.figure(figsize = (20,25))
num_cols = ['actual_time','osrm_time','segment_actual_time_sum','segment_osrm_time_sum','actual_distanc
for i in range (len(num_cols)):
  plt.subplot(len(num_cols),1, i+1)
  sns.histplot(data = trip, x = num_cols[i], kde = True)
```



In [61]:
```
from scipy.stats import mannwhitneyu

null_hypothesis = 'mean of both samples are similer'
alternate_hypothesis = 'means of both samples are different'

sample1 = trip['actual_time']
sample2 = trip['osrm_time']
# perform mann whitney test
stat, p_value = mannwhitneyu(sample1, sample2)
print('Stat :' ,stat, 'P value :' ,p_value)
# Level of significance
alpha = 0.05
# conclusion
if p_value < alpha:
    print('Reject Null Hypothesis (Significant difference between two samples)')
else:
    print('Fail to Reject Null Hypothesis (No significant difference between two samples)')
```

```
Stat : 14829121.0 P value : 1.2348725672742332e-23
Reject Null Hypothesis (Significant difference between two samples)
```

Normalization

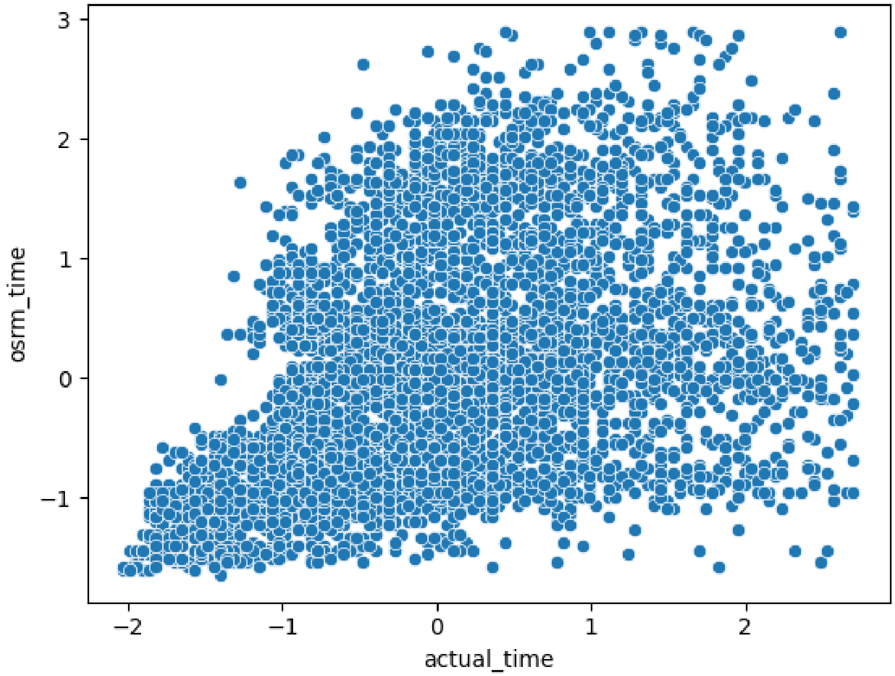
In [48]:
```
df_ao = trip[["actual_time", "osrm_time"]]
```

In [71]:
```
from sklearn.preprocessing import StandardScaler, MinMaxScaler

df_ao_ss = StandardScaler().fit_transform(df_ao)
```

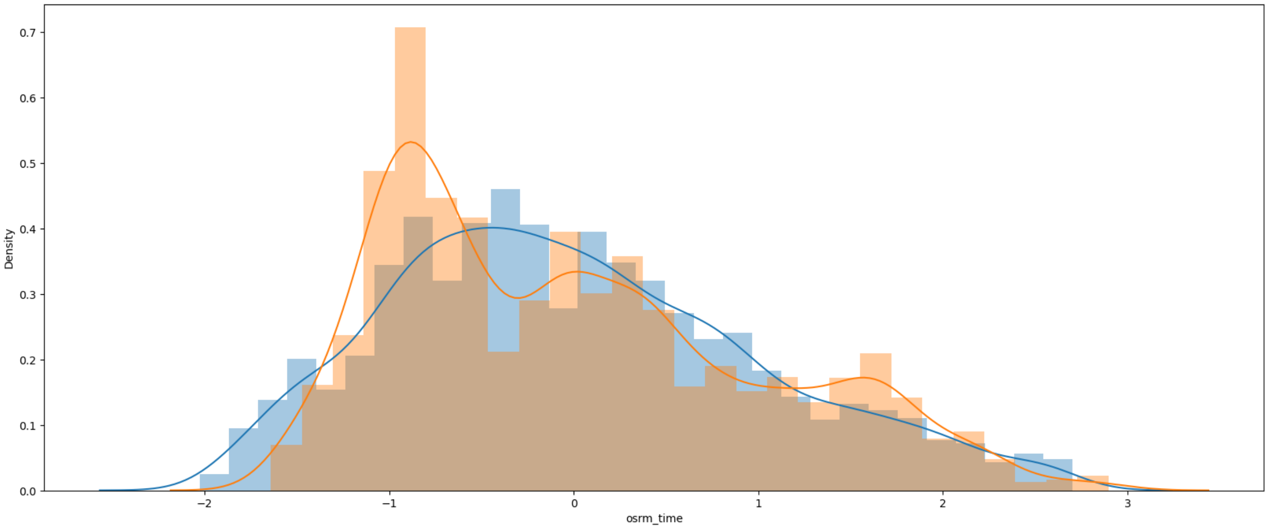
In [50]:
```
df_ao_ss = pd.DataFrame(df_ao_ss, columns=["actual_time", "osrm_time"])
```

In [51]:
```
sns.scatterplot(x = df_ao_ss["actual_time"], y = df_ao_ss["osrm_time"])
plt.show()
```



In [60]:
```
plt.figure(figsize = (20,8))
sns.distplot(df_ao_ss['actual_time'])
sns.distplot(df_ao_ss['osrm_time'])
plt.show()
```

```
D:\games\Anaconda\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a depr
ecated function and will be removed in a future version. Please adapt your code to use either `displot
` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histogr
ams).
  warnings.warn(msg, FutureWarning)
D:\games\Anaconda\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a depr
ecated function and will be removed in a future version. Please adapt your code to use either `displot
` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histogr
ams).
  warnings.warn(msg, FutureWarning)
```



In [64]:
```
null_hypothesis = 'mean of actual_time is similer to osrm_time'
alternate_hypothesis = 'mean of actual_time is different than osrm_time'

sample1 = df_ao_ss['actual_time']
sample2 = df_ao_ss['osrm_time']
t_stat, p_value = ttest_ind(sample1, sample2)
print('T_stat :' ,t_stat, 'P value :' ,p_value)

if(p_value < 0.05):
  print('Since, p-value < 0.05, we reject null hypothesis')
  print(alternate_hypothesis)
else:
  print('Since p-value > 0.05, we fail to reject null hypothesis')
  print(null_hypothesis)
```

```
T_stat : -4.301138070642346e-15 P value : 0.9999999999999966
Since p-value > 0.05, we fail to reject null hypothesis
mean of actual_time is similer to osrm_time
```

In [67]:
```
df_ao_ss.mean()
```

Out[67]:
```
actual_time   -8.176061e-17
osrm_time     -6.540849e-18
dtype: float64
```

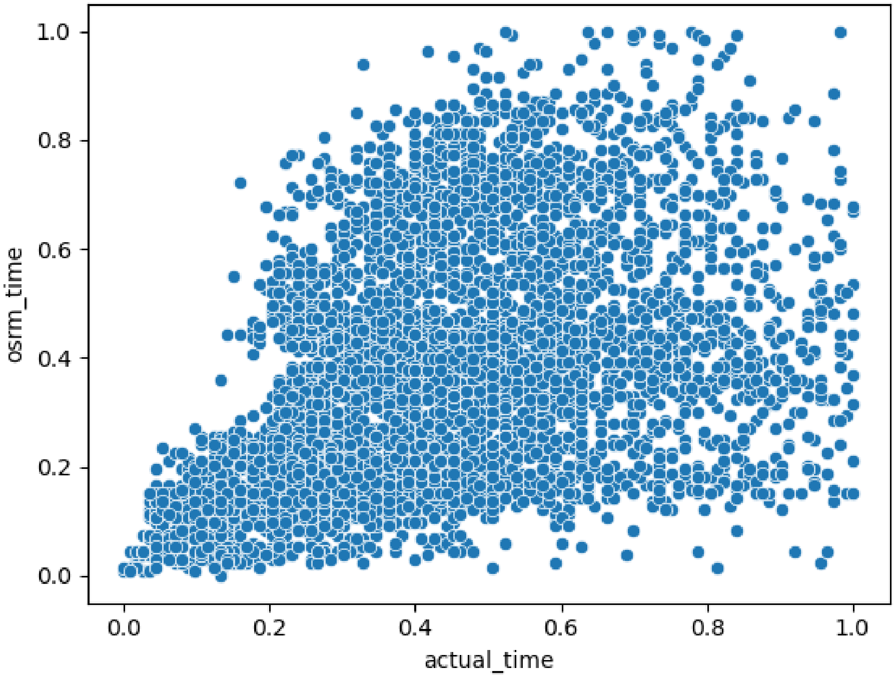
In [75]:
```
df_ao_mm = MinMaxScaler().fit_transform(df_ao)
```

In [76]:
```
df_ao_mm = pd.DataFrame(df_ao_mm, columns=["actual_time", "osrm_time"])
```

In [77]:
```
df_ao_mm.mean()
```

Out[77]:
```
actual_time    0.428626
osrm_time      0.361746
dtype: float64
```

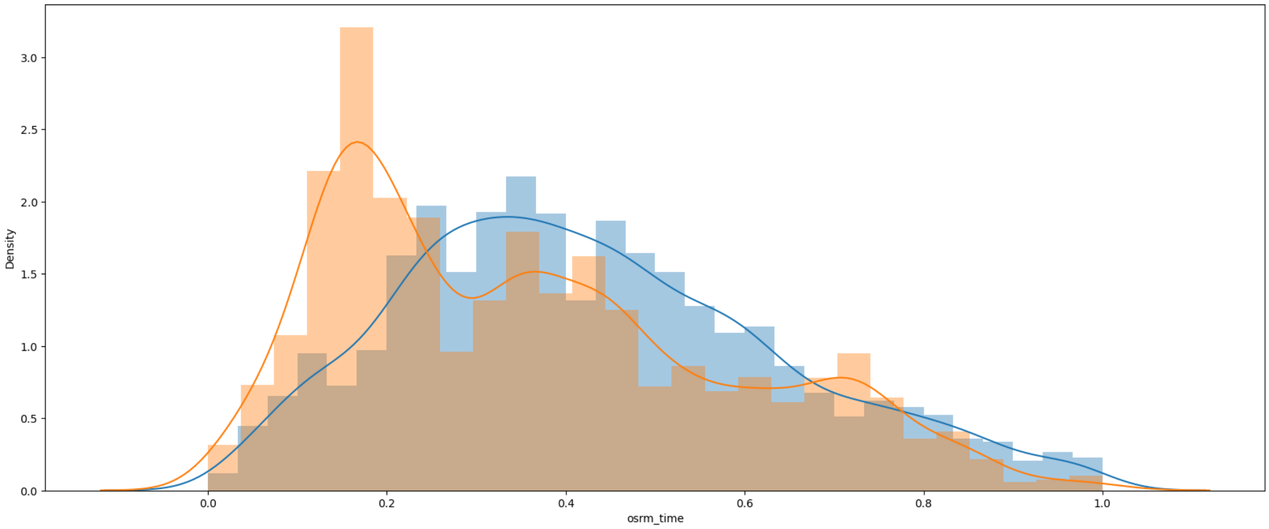
In [78]:
```
sns.scatterplot(x = df_ao_mm["actual_time"], y = df_ao_mm["osrm_time"])
plt.show()
```



In [79]:
```
plt.figure(figsize = (20,8))

sns.distplot(df_ao_mm['actual_time'])
sns.distplot(df_ao_mm['osrm_time'])
plt.show()
```

```
D:\games\Anaconda\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a depr
ecated function and will be removed in a future version. Please adapt your code to use either `displot
` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histogr
ams).
  warnings.warn(msg, FutureWarning)
D:\games\Anaconda\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a depr
ecated function and will be removed in a future version. Please adapt your code to use either `displot
` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histogr
ams).
  warnings.warn(msg, FutureWarning)
```



In [83]:
```
from sklearn.preprocessing import LabelEncoder

label_encoder = LabelEncoder()
trip[col] = label_encoder.fit_transform(trip['route_type'])
trip[col].value_counts()
```

Out[83]:
```
0    4907
1     253
Name: segment_osrm_time, dtype: int64
```

In [81]:
```
trip['data'].value_counts()
```

Out[81]:
```
training    3599
test        1561
Name: data, dtype: int64
```

In [82]:
```
label_encoder = LabelEncoder()
trip[col] = label_encoder.fit_transform(trip['data'])
trip[col].value_counts()
```

Out[82]:
```
1    3599
0    1561
Name: segment_osrm_time, dtype: int64
```

In [92]:
```
ds = trip[['destination_name']].copy()

new = trip['source_name'].str.split(" ", n = 1, expand = True)
ds['source_city']= new[0]
ds['source_state']= new[1].str[1:-1]

new = trip['destination_name'].str.split(" ", n = 1, expand = True)
ds['destination_city']= new[0]
ds['destination_state']= new[1].str[1:-1]

ds['Corridor'] = ds['source_city']+" To "+ds['destination_city']

ds.head()
```

Out[92]:

	destination_name	source_city	source_state	destination_city	destination_state	Corridor
3	Mumbai_MiraRd_IP (Maharashtra)	Mumbai	ub (Maharashtra	Mumbai_MiraRd_IP	Maharashtra	Mumbai To Mumbai_MiraRd_IP
5	Chennai_Poonamallee (Tamil Nadu)	Chennai_Poonamallee	Tamil Nadu	Chennai_Poonamallee	Tamil Nadu	Chennai_Poonamallee To Chennai_Poonamallee
6	Chennai_Vandalur_Dc (Tamil Nadu)	Chennai_Chrompet_DPC	Tamil Nadu	Chennai_Vandalur_Dc	Tamil Nadu	Chennai_Chrompet_DPC To Chennai_Vandalur_Dc
7	HBR Layout PC (Karnataka)	HBR	ayout PC (Karnataka	HBR	ayout PC (Karnataka	HBR To HBR
9	Delhi_Bhogal (Delhi)	Delhi_Lajpat_IP	Delhi	Delhi_Bhogal	Delhi	Delhi_Lajpat_IP To Delhi_Bhogal

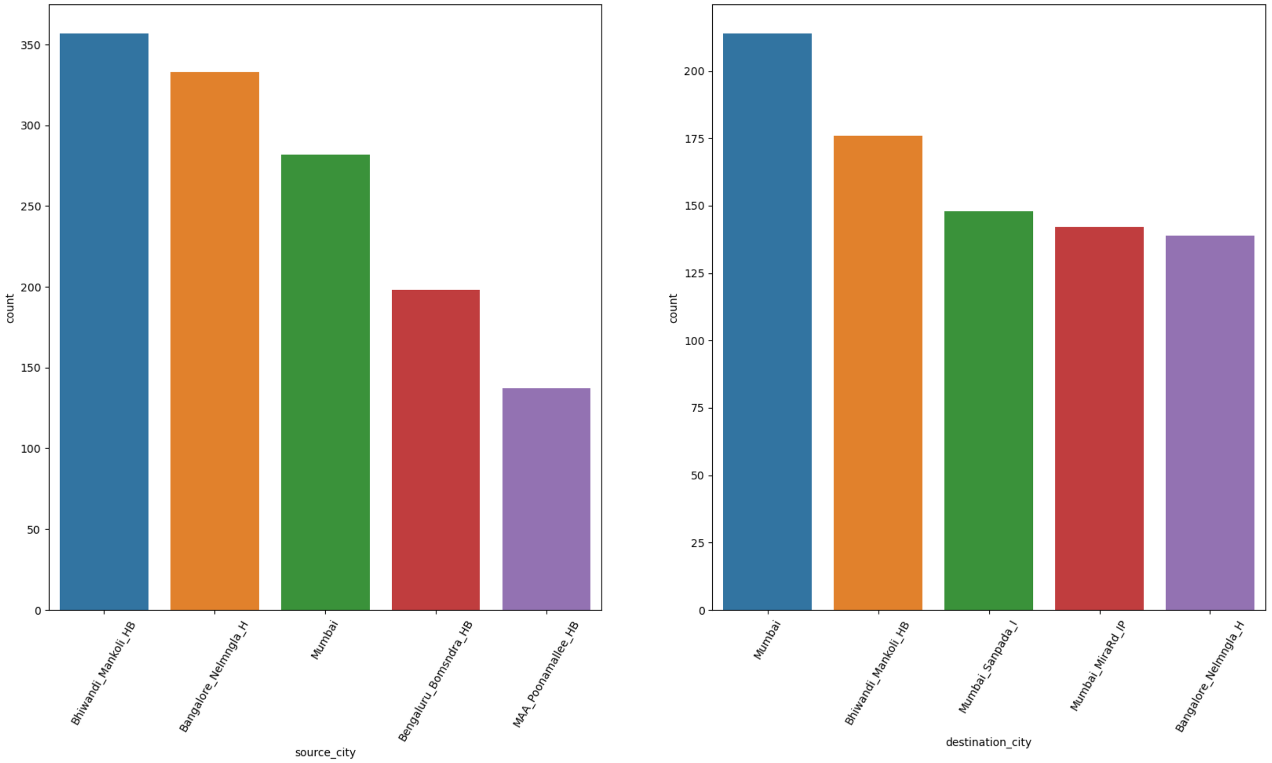
In [93]:
```
ds['Corridor'].value_counts()
```

Out[93]:
```
Bhiwandi_Mankoli_HB To Mumbai                  100
Bangalore_Nelmngla_H To Bengaluru_KGAirprt_HB   87
Mumbai_Chndivli_PC To Bhiwandi_Mankoli_HB       77
Pune_Tathawde_H To PNQ                          75
Mumbai To Mumbai_MiraRd_IP                      72
                                              ... 
Ramagundam_Pdmavati_D To Chinnur_AsnsdhRD_D      1
Delhi_Rohini_DPC To Delhi_Barwala                1
Wardha_RamaNgr_D To Deoli_Central_DPP_2          1
Nadiad_DC To Nadiad_DC                           1
Janakpuri To Delhi_Nangli_IP                     1
Name: Corridor, Length: 658, dtype: int64
```

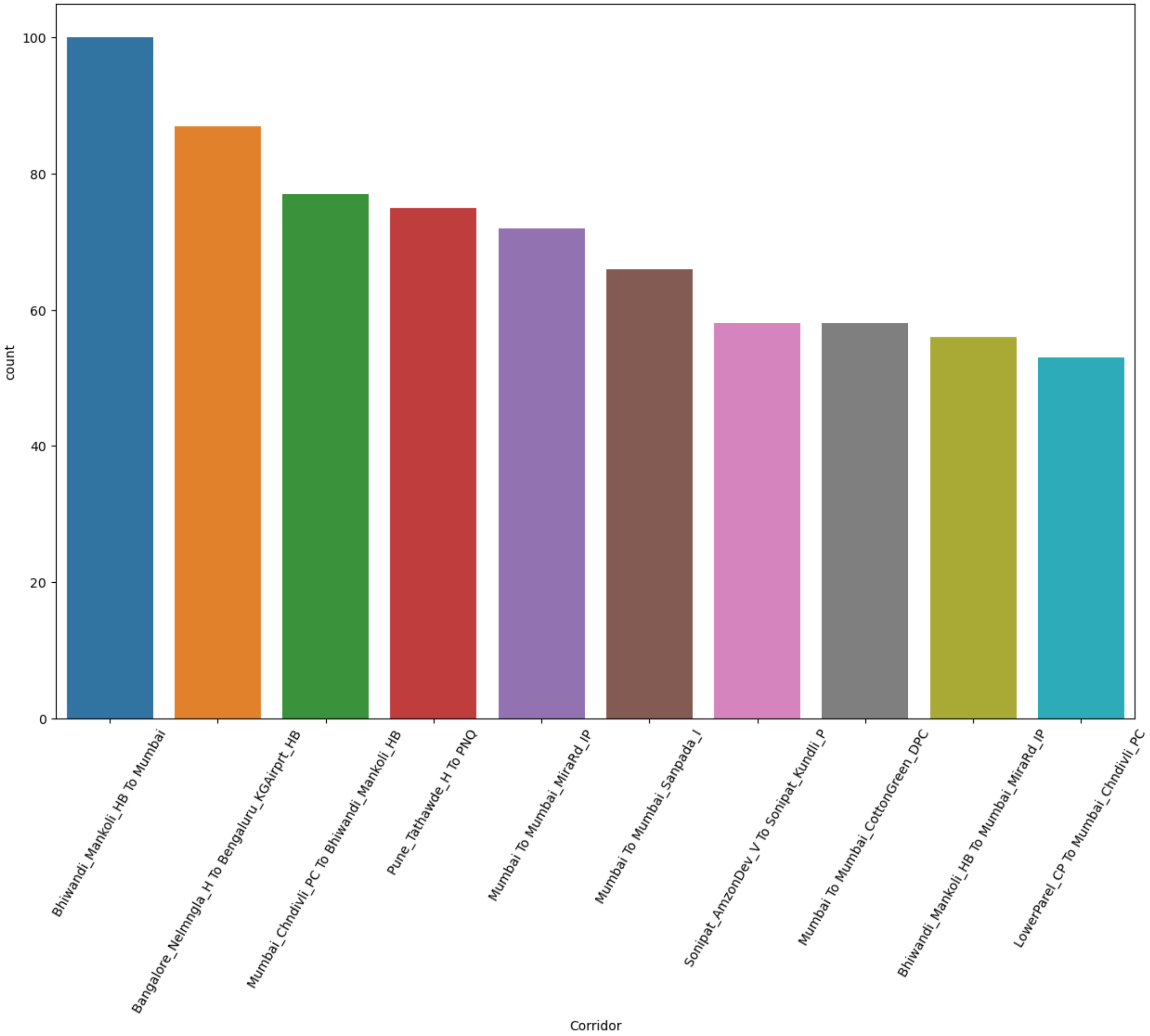
In [97]:

```
plt.figure(figsize=(20,10))
plt.subplot(1,2,1)
sns.countplot(data = ds, x = 'source_city', order = ds['source_city'].value_counts().nlargest(5).index)
plt.xticks(rotation = 60)

plt.subplot(1,2,2)
sns.countplot(data = ds, x = 'destination_city', order = ds['destination_city'].value_counts().nlargest
plt.xticks(rotation = 60)
plt.show()
```



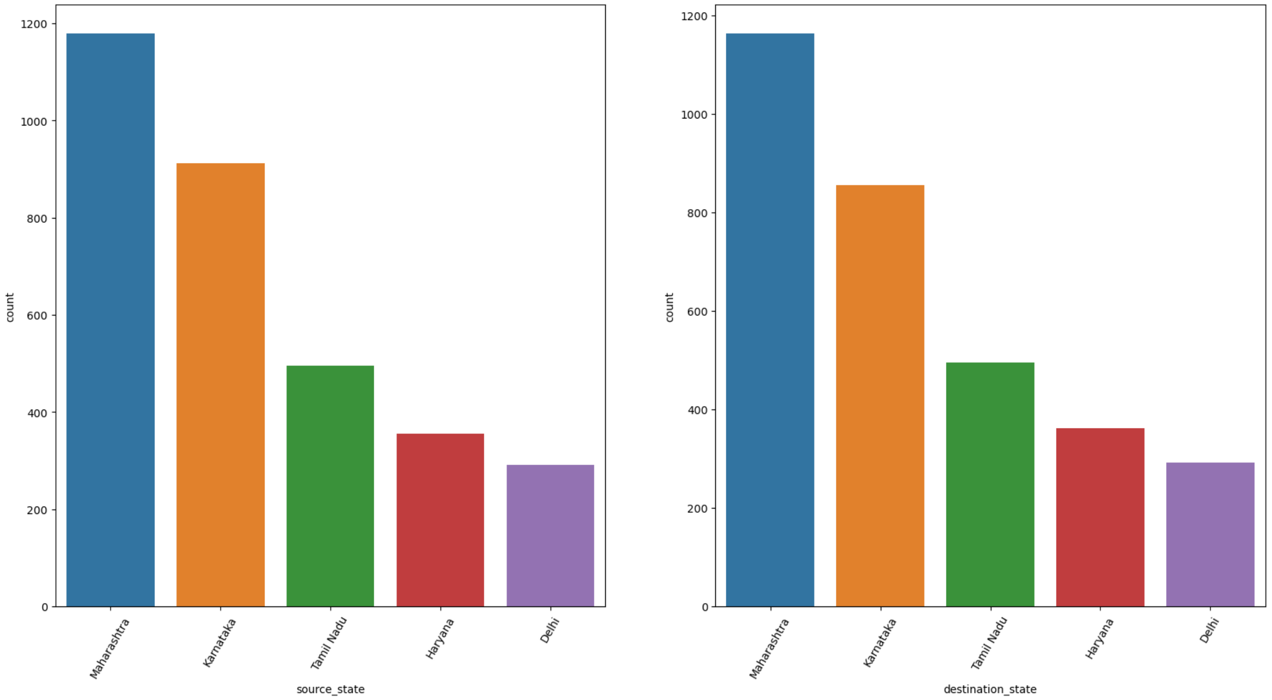
In [98]:
```
plt.figure(figsize=(15,10))
sns.countplot(data = ds, x = 'Corridor', order = ds['Corridor'].value_counts().nlargest(10).index)
plt.xticks(rotation = 60)
plt.show()
```



In [100]:
```
plt.figure(figsize=(20,10))

plt.subplot(1,2,1)
sns.countplot(data = ds, x ='source_state', order = ds['source_state'].value_counts().nlargest(5).index
plt.xticks(rotation = 60)

plt.subplot(1,2,2)
sns.countplot(data = ds, x ='destination_state', order = ds['destination_state'].value_counts().nlarges
plt.xticks(rotation = 60)
plt.show()
```



In [101]:
```
ds.describe()
```

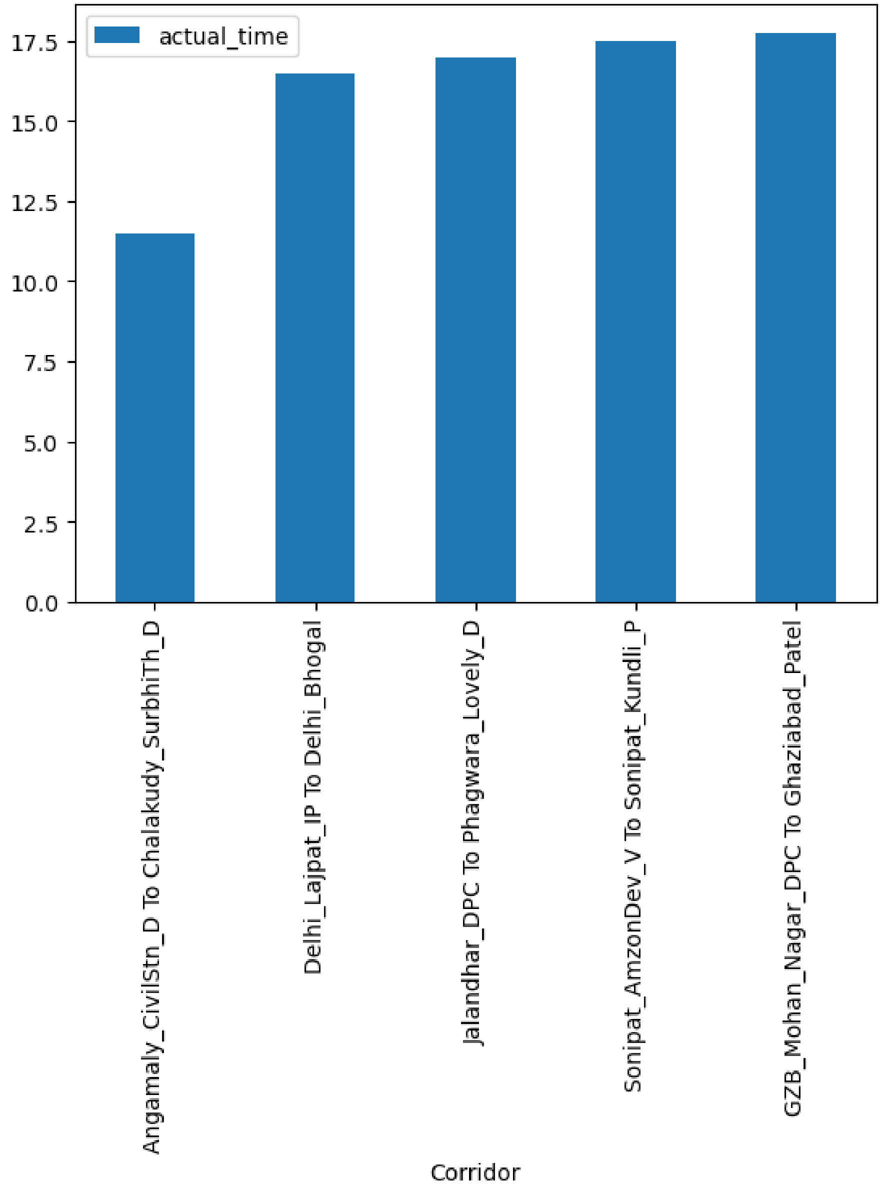
Out[101]:

	destination_name	source_city	source_state	destination_city	destination_state	Corridor
count	5160	5160	5160	5160	5160	5160
unique	415	391	42	411	44	658
top	Mumbai Hub (Maharashtra)	Bhiwandi_Mankoli_HB	Maharashtra	Mumbai	Maharashtra	Bhiwandi_Mankoli_HB To Mumbai
freq	212	357	1179	214	1164	100

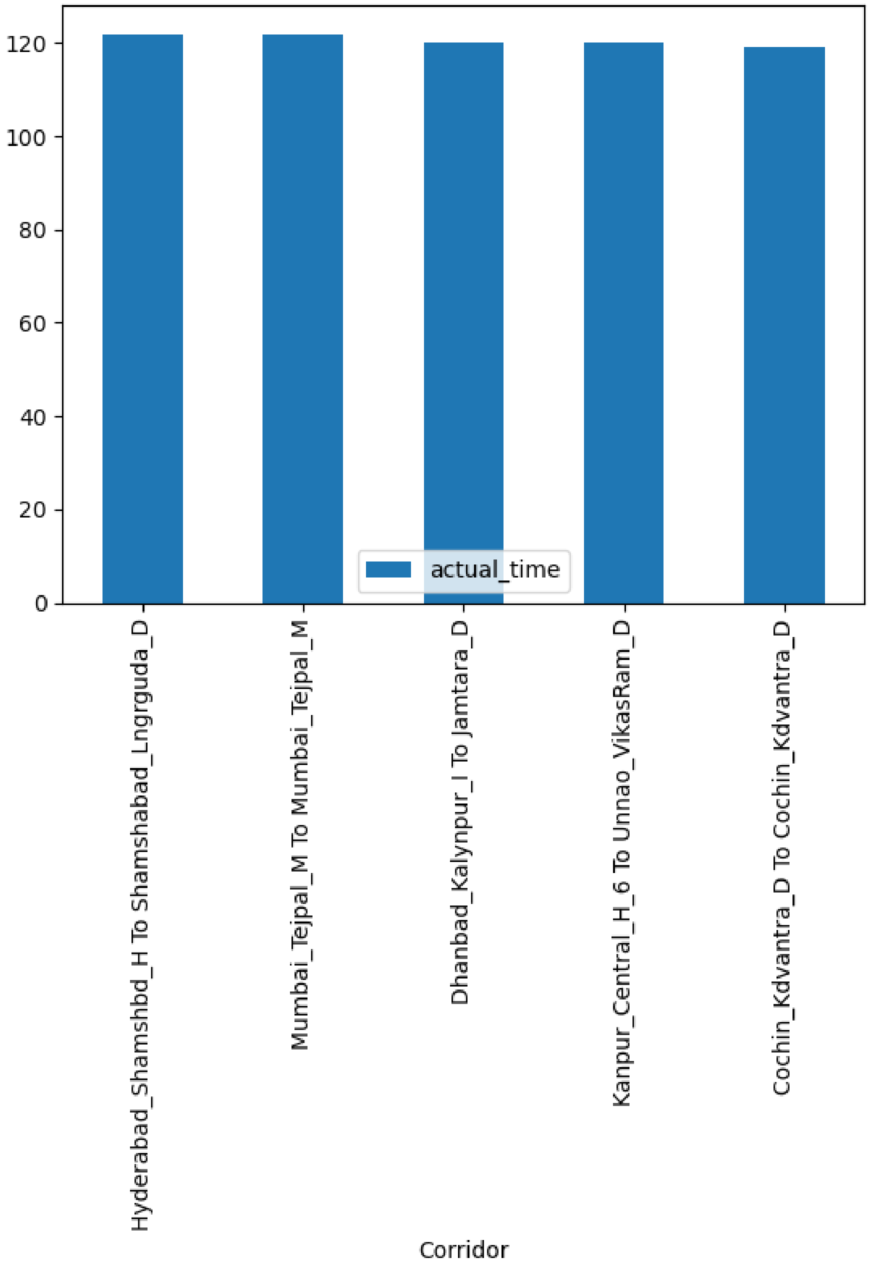
In [102]:
```
dn = pd.concat([trip,ds],axis=1)
```

In [103]:

```
dn.groupby('Corridor').agg({'actual_time':'mean'}).nsmallest(5,columns='actual_time').plot(kind='bar')
plt.show()
```



```
In [104]: dn.groupby('Corridor').agg({'actual_time':'mean'}).nlargest(5,columns='actual_time').plot(kind='bar')
          plt.show()
```



```
In [105]: dn.describe()
```

```
Out[105]:
       start_scan_to_end_scan  actual_distance_to_destination  actual_time   osrm_time  osrm_distance  segment_actual_time_su
count             5160.000000                     5160.000000  5160.000000  5160.000000   5160.000000               5160.0000
mean               155.022481                       20.817280    57.434690    54.112209     57.274155                111.9312
std                121.042528                        8.006889    23.920582    29.317440     29.436978                 54.4814
min                 23.000000                        9.002461     9.000000     6.000000      9.072900                  9.0000
25%                 89.000000                       14.641301    40.000000    29.000000     30.853800                 68.0000
50%                127.000000                       20.266599    55.000000    50.000000     58.327150                107.0000
75%                182.000000                       26.713161    73.000000    73.000000     73.351800                148.0000
max               2701.000000                       44.794445   122.000000   139.000000    137.075200                268.0000
```

In [106]:

```
trip_cr = df[['trip_creation_time']].copy()
trip_cr['trip_creation_time'] = pd.to_datetime(trip_cr['trip_creation_time'])
trip_cr['year'] = trip_cr['trip_creation_time'].dt.year
trip_cr['month'] = trip_cr['trip_creation_time'].dt.month
trip_cr['day'] = trip_cr['trip_creation_time'].dt.day
trip_cr
```

Out[106]:

	trip_creation_time	year	month	day
0	2018-09-20 02:35:36.476840	2018	9	20
1	2018-09-20 02:35:36.476840	2018	9	20
2	2018-09-20 02:35:36.476840	2018	9	20
3	2018-09-20 02:35:36.476840	2018	9	20
4	2018-09-20 02:35:36.476840	2018	9	20
...	...	...	...	...
144862	2018-09-20 16:24:28.436231	2018	9	20
144863	2018-09-20 16:24:28.436231	2018	9	20
144864	2018-09-20 16:24:28.436231	2018	9	20
144865	2018-09-20 16:24:28.436231	2018	9	20
144866	2018-09-20 16:24:28.436231	2018	9	20

144316 rows × 4 columns

In [107]:

```
trip_cr['year'].value_counts()
```

Out[107]:

```
2018    144316
Name: year, dtype: int64
```

In [108]:

```
trip_cr['month'].value_counts()
```

Out[108]:

```
9     126932
10     17384
Name: month, dtype: int64
```

Handelling missing values

In [85]:

```
from sklearn.impute import SimpleImputer

new_df = pd.read_csv('https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/001/551/original/de
new_df.head()
```

Out[85]:

	data	trip_creation_time	route_schedule_uuid	route_type	trip_uuid	source_center	source_name	desti
0	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)	IN
1	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)	IN
2	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)	IN
3	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)	IN
4	training	2018-09-20 02:35:36.476840	thanos::sroute:eb7bfc78-b351-4c0e-a951-fa3d5c3...	Carting	trip-153741093647649320	IND388121AAA	Anand_VUNagar_DC (Gujarat)	IN

5 rows × 24 columns

In [86]:

```
new_df.isna().sum()
```

Out[86]:

```
data                               0
trip_creation_time                 0
route_schedule_uuid                0
route_type                         0
trip_uuid                          0
source_center                      0
source_name                      293
destination_center                 0
destination_name                 261
od_start_time                      0
od_end_time                        0
start_scan_to_end_scan             0
is_cutoff                          0
cutoff_factor                      0
cutoff_timestamp                   0
actual_distance_to_destination     0
actual_time                        0
osrm_time                          0
osrm_distance                      0
factor                             0
segment_actual_time                0
segment_osrm_time                  0
segment_osrm_distance              0
segment_factor                     0
dtype: int64
```

In [88]:

```
new_df['source_name']  = SimpleImputer(strategy="most_frequent").fit_transform(new_df[['source_name']])
```

In [89]:

```
new_df['destination_name'] = SimpleImputer(strategy="most_frequent").fit_transform(new_df[['destination_
```

In [90]:
```
new_df.isna().sum()
```

Out[90]:
```
data                             0
trip_creation_time               0
route_schedule_uuid              0
route_type                       0
trip_uuid                        0
source_center                    0
source_name                      0
destination_center               0
destination_name                 0
od_start_time                    0
od_end_time                      0
start_scan_to_end_scan           0
is_cutoff                        0
cutoff_factor                    0
cutoff_timestamp                 0
actual_distance_to_destination   0
actual_time                      0
osrm_time                        0
osrm_distance                    0
factor                           0
segment_actual_time              0
segment_osrm_time                0
segment_osrm_distance            0
segment_factor                   0
dtype: int64
```

We can clearly see that there are no missing values, post operating

In [ ]:
```

```