Data Collection and Preprocessing Phase

Date	15 July 2024
Team ID	739791
Project Title	Flight Delay Prediction using Machine Learning.
Maximum Marks	6 Marks

Data Exploration and Preprocessing Template

Dataset variables will be statistically analyzed to identify patterns and outliers, with Python employed for preprocessing tasks like normalization and feature engineering. Data cleaning will address missing values and outliers, ensuring quality for subsequent analysis and modeling, and forming a strong foundation for insights and predictions.

Section	Description
Data Overview	

	YEAR	QUARTER	MONTH	DAY_OF_MONTH	DAY_OF_WEEK	FL_NUM	ORIGIN_AIRPORT_ID	DEST_AIRPORT_ID	CRS_DEP_TIME	DEP_TIME
count	11231.0	11231.000000	11231.000000	11231.000000	11231.000000	11231.000000	11231.000000	11231.000000	11231.000000	11124.000000
mean	2016.0	2.544475	6.628973	15.790758	3.960199	1334.325617	12334.516695	12302.274508	1320.798326	1327.189410
std	0.0	1.090701	3.354678	8.782056	1.995257	811.875227	1595.026510	1601.988550	490.737845	500.306462
min	2016.0	1.000000	1.000000	1.000000	1.000000	7.000000	10397.000000	10397.000000	10.000000	1.000000
25%	2016.0	2.000000	4.000000	8.000000	2.000000	624.000000	10397.000000	10397.000000	905.000000	905.000000
50%	2016.0	3.000000	7.000000	16.000000	4.000000	1267.000000	12478.000000	12478.000000	1320.000000	1324.000000
75%	2016.0	3.000000	9.000000	23.000000	6.000000	2032.000000	13487.000000	13487.000000	1735.000000	1739.000000
max	2016.0	4.000000	12.000000	31.000000	7.000000	2853.000000	14747.000000	14747.000000	2359.000000	2400.000000

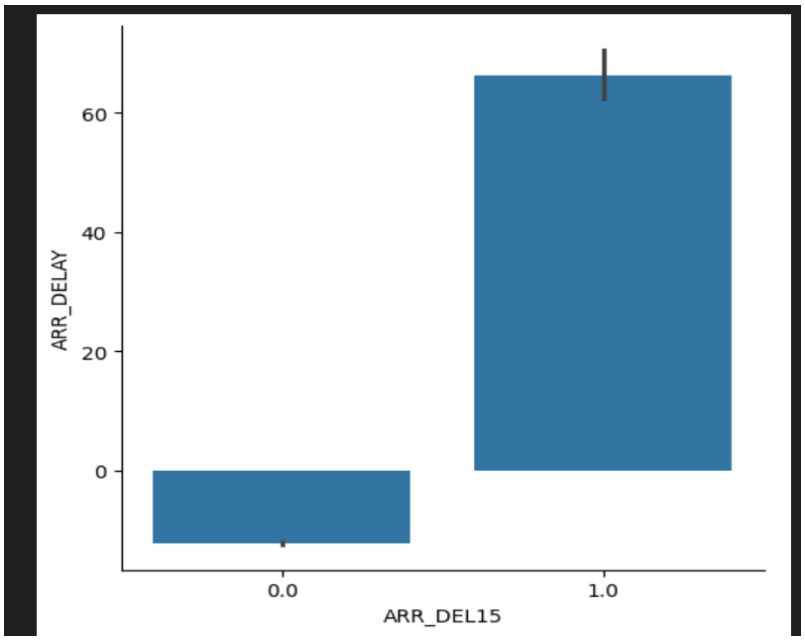
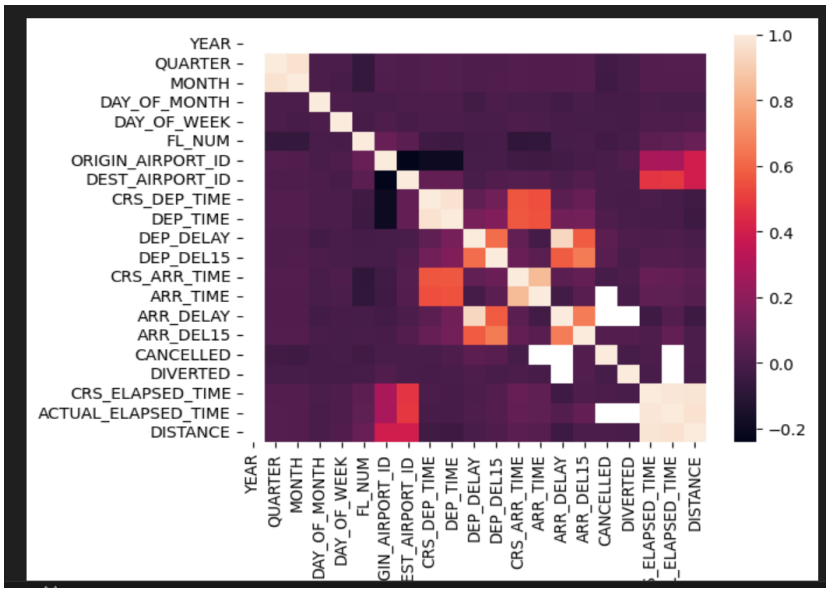
8 rows × 21 columns

DEP_DEL15	CRS_ARR_TIME	ARR_TIME	ARR_DELAY	ARR_DEL15	CANCELLED	DIVERTED	CRS_ELAPSED_TIME	ACTUAL_ELAPSED_TIME	DISTANCE
11124.000000	11231.000000	11116.000000	11043.000000	11045.000000	11231.000000	11231.000000	11231.000000	11043.000000	11231.000000
0.142844	1537.312795	1523.978499	-2.573123	0.124672	0.010150	0.006589	190.652124	179.661233	1161.031965
0.349930	502.512494	512.536041	39.232521	0.330361	0.100241	0.080908	78.386317	77.940399	643.683379
0.000000	2.000000	1.000000	-67.000000	0.000000	0.000000	0.000000	93.000000	75.000000	509.000000
0.000000	1130.000000	1135.000000	-19.000000	0.000000	0.000000	0.000000	127.000000	117.000000	594.000000
0.000000	1559.000000	1547.000000	-10.000000	0.000000	0.000000	0.000000	159.000000	149.000000	907.000000
0.000000	1952.000000	1945.000000	1.000000	0.000000	0.000000	0.000000	255.000000	236.000000	1927.000000
1.000000	2359.000000	2400.000000	615.000000	1.000000	1.000000	1.000000	397.000000	428.000000	2422.000000

Univariate Analysis	

```
import matplotlib.pyplot as plt
flights['YEAR'].value_counts().plot(kind='pie',autopct='%.0f')
plt.show()
```

0.1s

Bivariate Analysis	
Multivariate Analysis	
Outliers and Anomalies	
Data Preprocessing Code Screenshots	

Loading Data

```
flights=pd.read_csv("flightdata.csv")
flights
```

✓ 0.1s

	YEAR	QUARTER	MONTH	DAY_OF_MONTH	DAY_OF_WEEK	UNIQUE_CARRIER	TAIL_NUM	FL_NUM	ORIGIN_AIRPORT_ID	ORIGIN	...	DEP_DEL15
0	2016	1	1	1	5	DL	N836DN	1399	10397	ATL	...	0.0
1	2016	1	1	1	5	DL	N964DN	1476	11433	DTW	...	0.0
2	2016	1	1	1	5	DL	N813DN	1597	10397	ATL	...	0.0
3	2016	1	1	1	5	DL	N587NW	1768	14747	SEA	...	0.0
4	2016	1	1	1	5	DL	N836DN	1823	14747	SEA	...	0.0
...	...	...	...	...	...	...	...	...	...	...	...	...
1226	2016	4	12	30	5	DL	N940DL	1715	11433	DTW	...	0.0
1227	2016	4	12	30	5	DL	N836DN	1770	14747	SEA	...	1.0
1228	2016	4	12	30	5	DL	N583NW	1823	11433	DTW	...	0.0
1229	2016	4	12	30	5	DL	N554NW	1901	10397	ATL	...	0.0
1230	2016	4	12	30	5	DL	N842DN	2005	10397	ATL	...	0.0

S_ARR_TIME	ARR_TIME	ARR_DELAY	ARR_DEL15	CANCELLED	DIVERTED	CRS_ELAPSED_TIME	ACTUAL_ELAPSED_TIME	DISTANCE
2143	2102.0	-41.0	0.0	0	0	338	295.0	2182
1435	1439.0	4.0	0.0	0	0	110	115.0	528
1215	1142.0	-33.0	0.0	0	0	335	300.0	2182
1335	1345.0	10.0	0.0	0	0	196	205.0	1399
607	615.0	8.0	0.0	0	0	247	259.0	1927
...	...	...	...	...	...	...	...	...
1223	1148.0	-35.0	0.0	0	0	138	105.0	594
2046	2100.0	14.0	0.0	0	0	201	181.0	1399
2210	2154.0	-16.0	0.0	0	0	311	295.0	1927
1806	1801.0	-5.0	0.0	0	0	336	332.0	2182
925	913.0	-12.0	0.0	0	0	120	110.0	594

Handling Missing Data

```
flights=flights.fillna({'ARR_DEL15':1})
flights=flights.fillna({'dep_del15':0})
flights.iloc[177:185]
```

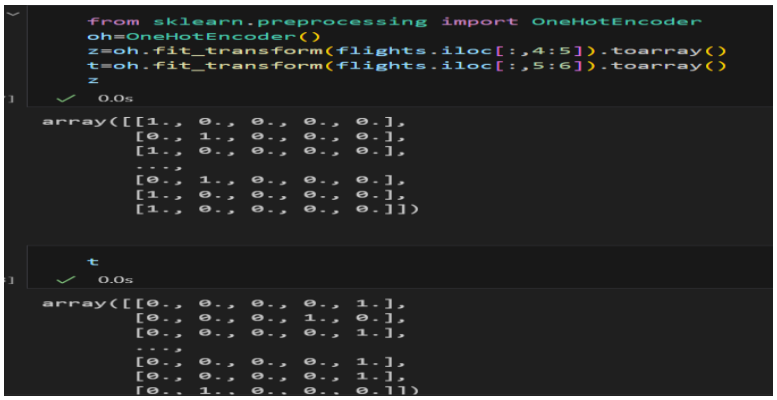
✓ 0.0s

	FL_NUM	MONTH	DAY_OF_MONTH	DAY_OF_WEEK	ORIGIN	DEST	CRS_ARR_TIME	DEP_DEL15	ARR_DEL15
177	2834	1	9	6	MSP	SEA	852	0.0	1.0
178	2839	1	9	6	DTW	JFK	1724	0.0	0.0
179	86	1	10	7	MSP	DTW	1632	NaN	1.0
180	87	1	10	7	DTW	MSP	1649	1.0	0.0
181	423	1	10	7	JFK	ATL	1600	0.0	0.0
182	440	1	10	7	JFK	ATL	849	0.0	0.0
183	485	1	10	7	JFK	SEA	1945	1.0	0.0
184	557	1	10	7	MSP	DTW	912	0.0	1.0

```
import math
for index,row in flights.iterrows():
  flights.loc[index,'CRS_ARR_TIME']=math.floor(row['CRS_ARR_TIME']/100)
flights.head()
```

✓ 3.2s

	FL_NUM	MONTH	DAY_OF_MONTH	DAY_OF_WEEK	ORIGIN	DEST	CRS_ARR_TIME	DEP_DEL15	ARR_DEL15
0	1399	1	1	5	ATL	SEA	21	0.0	0.0
1	1476	1	1	5	DTW	MSP	14	0.0	0.0
2	1597	1	1	5	ATL	SEA	12	0.0	0.0
3	1768	1	1	5	SEA	MSP	13	0.0	0.0
4	1823	1	1	5	SEA	DTW	6	0.0	0.0

Data Transformation	
Feature Engineering	Attached the codes in the final submission.
Save Processed Data	_