03_Merged_Data_EDA

April 15, 2022

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

[8]:
```
# Load the data
Dec_eda = pd.read_csv('C:\\maha\\508\\Dec_EDA.csv')
```

[9]:
```
Dec_eda.head(5)
```

[9]:

	DAY_OF_MONTH	DAY_OF_WEEK	OP_UNIQUE_CARRIER	TAIL_NUM	ORIGIN_AIRPORT_ID	\
0	8	7	WN	N8651A	15016	
1	8	7	WN	N939WN	15016	
2	8	7	WN	N7741C	15016	
3	8	7	WN	N550WN	15016	
4	8	7	WN	N8319F	15016	

	ORIGIN	DEST	DEP_DEL15	DEP_TIME_BLK	ARR_TIME_BLK	…	\
0	STL	SAN	0.0	1100-1159	1300-1359	…	
1	STL	SAT	0.0	1200-1259	1400-1459	…	
2	STL	SAT	0.0	2100-2159	0001-0559	…	
3	STL	SEA	0.0	0900-0959	1200-1259	…	
4	STL	SFO	1.0	1800-1859	2000-2059	…	

	CARRIER_NAME	PILOTS_COPILOTS	PASSENGER_HANDLING	\
0	Southwest Airlines Co.	8989	9668	
1	Southwest Airlines Co.	8989	9668	
2	Southwest Airlines Co.	8989	9668	
3	Southwest Airlines Co.	8989	9668	
4	Southwest Airlines Co.	8989	9668	

	PASS_GEN_SVC_ADMIN	MAINTENANCE	PRCP	SNOW	SNWD	TMAX	AWND
0	15475	2482	0.02	0.0	0.0	58.0	9.84
1	15475	2482	0.02	0.0	0.0	58.0	9.84
2	15475	2482	0.02	0.0	0.0	58.0	9.84
3	15475	2482	0.02	0.0	0.0	58.0	9.84
4	15475	2482	0.02	0.0	0.0	58.0	9.84

```
[5 rows x 32 columns]
```

[13]:
```
Dec_eda.shape
```

[13]:
```
(558026, 32)
```

[15]:
```
Dec_eda.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 558026 entries, 0 to 558025
Data columns (total 32 columns):
 #   Column                Non-Null Count   Dtype
---  ------                --------------   -----
 0   DAY_OF_MONTH          558026 non-null  int64
 1   DAY_OF_WEEK           558026 non-null  int64
 2   OP_UNIQUE_CARRIER     558026 non-null  object
 3   TAIL_NUM              558026 non-null  object
 4   ORIGIN_AIRPORT_ID     558026 non-null  int64
 5   ORIGIN                558026 non-null  object
 6   DEST                  558026 non-null  object
 7   DEP_DEL15             558026 non-null  float64
 8   DEP_TIME_BLK          558026 non-null  object
 9   ARR_TIME_BLK          558026 non-null  object
 10  CANCELLED             558026 non-null  float64
 11  CRS_ELAPSED_TIME      558026 non-null  float64
 12  DISTANCE              558026 non-null  float64
 13  DISTANCE_GROUP        558026 non-null  int64
 14  CARRIER_DELAY         114633 non-null  float64
 15  WEATHER_DELAY         114633 non-null  float64
 16  NAS_DELAY             114633 non-null  float64
 17  SECURITY_DELAY        114633 non-null  float64
 18  LATE_AIRCRAFT_DELAY   114633 non-null  float64
 19  MANUFACTURE_YEAR      542820 non-null  float64
 20  NUMBER_OF_SEATS       542820 non-null  float64
 21  AIRLINE_ID            558026 non-null  int64
 22  CARRIER_NAME          558026 non-null  object
 23  PILOTS_COPILOTS       558026 non-null  int64
 24  PASSENGER_HANDLING    558026 non-null  int64
 25  PASS_GEN_SVC_ADMIN    558026 non-null  int64
 26  MAINTENANCE           558026 non-null  int64
 27  PRCP                  558026 non-null  float64
 28  SNOW                  558026 non-null  float64
 29  SNWD                  558026 non-null  float64
 30  TMAX                  558026 non-null  float64
 31  AWND                  558026 non-null  float64
dtypes: float64(16), int64(9), object(7)
```

```
memory usage: 136.2+ MB
```

[17]:
```
Dec_eda.nunique()
```

[17]:
```
DAY_OF_MONTH             31
DAY_OF_WEEK               7
OP_UNIQUE_CARRIER        17
TAIL_NUM               5471
ORIGIN_AIRPORT_ID        96
ORIGIN                   96
DEST                    341
DEP_DEL15                 2
DEP_TIME_BLK             19
ARR_TIME_BLK             19
CANCELLED                 1
CRS_ELAPSED_TIME        458
DISTANCE               1444
DISTANCE_GROUP           11
CARRIER_DELAY           804
WEATHER_DELAY           410
NAS_DELAY               418
SECURITY_DELAY           83
LATE_AIRCRAFT_DELAY     560
MANUFACTURE_YEAR         32
NUMBER_OF_SEATS          77
AIRLINE_ID               17
CARRIER_NAME             17
PILOTS_COPILOTS          17
PASSENGER_HANDLING       14
PASS_GEN_SVC_ADMIN       17
MAINTENANCE              17
PRCP                    145
SNOW                     51
SNWD                     20
TMAX                     77
AWND                    100
dtype: int64
```

[10]:
```
Dec_eda.isna().sum()
```

[10]:
```
DAY_OF_MONTH             0
DAY_OF_WEEK              0
OP_UNIQUE_CARRIER        0
TAIL_NUM                 0
ORIGIN_AIRPORT_ID        0
ORIGIN                   0
DEST                     0
```

```
DEP_DEL15                  0
DEP_TIME_BLK               0
ARR_TIME_BLK               0
CANCELLED                  0
CRS_ELAPSED_TIME           0
DISTANCE                   0
DISTANCE_GROUP             0
CARRIER_DELAY         443393
WEATHER_DELAY         443393
NAS_DELAY             443393
SECURITY_DELAY        443393
LATE_AIRCRAFT_DELAY   443393
MANUFACTURE_YEAR       15206
NUMBER_OF_SEATS        15206
AIRLINE_ID                 0
CARRIER_NAME               0
PILOTS_COPILOTS            0
PASSENGER_HANDLING         0
PASS_GEN_SVC_ADMIN         0
MAINTENANCE                0
PRCP                       0
SNOW                       0
SNWD                       0
TMAX                       0
AWND                       0
dtype: int64
```

[19]:
```
Dec_eda.describe()
```

[19]:

	DAY_OF_MONTH	DAY_OF_WEEK	ORIGIN_AIRPORT_ID	DEP_DEL15	\
count	558026.000000	558026.000000	558026.000000	558026.000000	
mean	15.830902	3.938745	12666.002996	0.208399	
std	8.957760	2.085336	1514.187330	0.406164	
min	1.000000	1.000000	10140.000000	0.000000	
25%	8.000000	2.000000	11292.000000	0.000000	
50%	16.000000	4.000000	12889.000000	0.000000	
75%	23.000000	6.000000	13931.000000	0.000000	
max	31.000000	7.000000	15919.000000	1.000000	

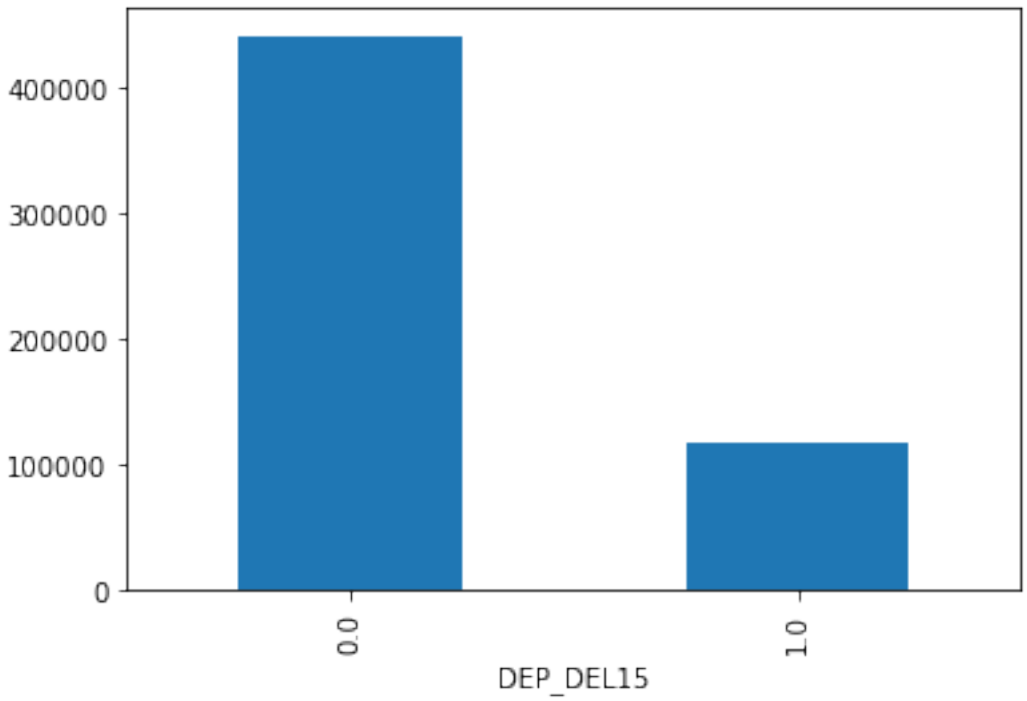
	CANCELLED	CRS_ELAPSED_TIME	DISTANCE	DISTANCE_GROUP	\
count	558026.0	558026.000000	558026.000000	558026.000000	
mean	0.0	148.552937	843.568687	3.844704	
std	0.0	74.475448	604.827406	2.372199	
min	0.0	34.000000	66.000000	1.000000	
25%	0.0	94.000000	400.000000	2.000000	
50%	0.0	130.000000	680.000000	3.000000	
75%	0.0	179.000000	1075.000000	5.000000	

```
max          0.0        705.000000    5095.000000       11.000000

       CARRIER_DELAY  WEATHER_DELAY  …     AIRLINE_ID  PILOTS_COPILOTS  \
count  114633.000000  114633.000000  …  558026.000000    558026.000000
mean       20.693221       2.556376  …   19954.738880      6132.518447
std        64.299138      28.262854  …     368.971181      3163.783165
min         0.000000       0.000000  …   19393.000000       586.000000
25%         0.000000       0.000000  …   19790.000000      2444.000000
50%         2.000000       0.000000  …   19930.000000      7637.000000
75%        19.000000       0.000000  …   20314.000000      8989.000000
max      2695.000000    1438.000000  …   20436.000000      9293.000000

       PASSENGER_HANDLING  PASS_GEN_SVC_ADMIN    MAINTENANCE           PRCP  \
count       558026.000000       558026.000000  558026.000000  558026.000000
mean          7380.776432         9991.061352    3576.673642       0.116641
std           5905.764240         6417.203879    3092.215270       0.352309
min              0.000000          154.000000      34.000000       0.000000
25%           1407.000000         3592.000000     898.000000       0.000000
50%           8586.000000        15237.000000    2482.000000       0.000000
75%           9668.000000        15502.000000    6122.000000       0.040000
max          16888.000000        15809.000000    9677.000000       7.130000

                SNOW           SNWD           TMAX           AWND
count  558026.000000  558026.000000  558026.000000  558026.000000
mean        0.048059       0.121935      56.160668       8.137934
std         0.347030       0.806783      14.612596       4.014022
min         0.000000       0.000000       8.000000       0.000000
25%         0.000000       0.000000      45.000000       4.920000
50%         0.000000       0.000000      56.000000       7.610000
75%         0.000000       0.000000      67.000000      10.510000
max        13.300000      18.100000      87.000000      25.720000

[8 rows x 25 columns]
```

[12]:
```
# Graph Distributions of numerical features
histlist = Dec_eda.hist(figsize = (20, 20))
```

[34]:
```
# Departure delay of 15 mins Block distribution
Dec_eda.groupby('DEP_DEL15').size().plot.bar()
```

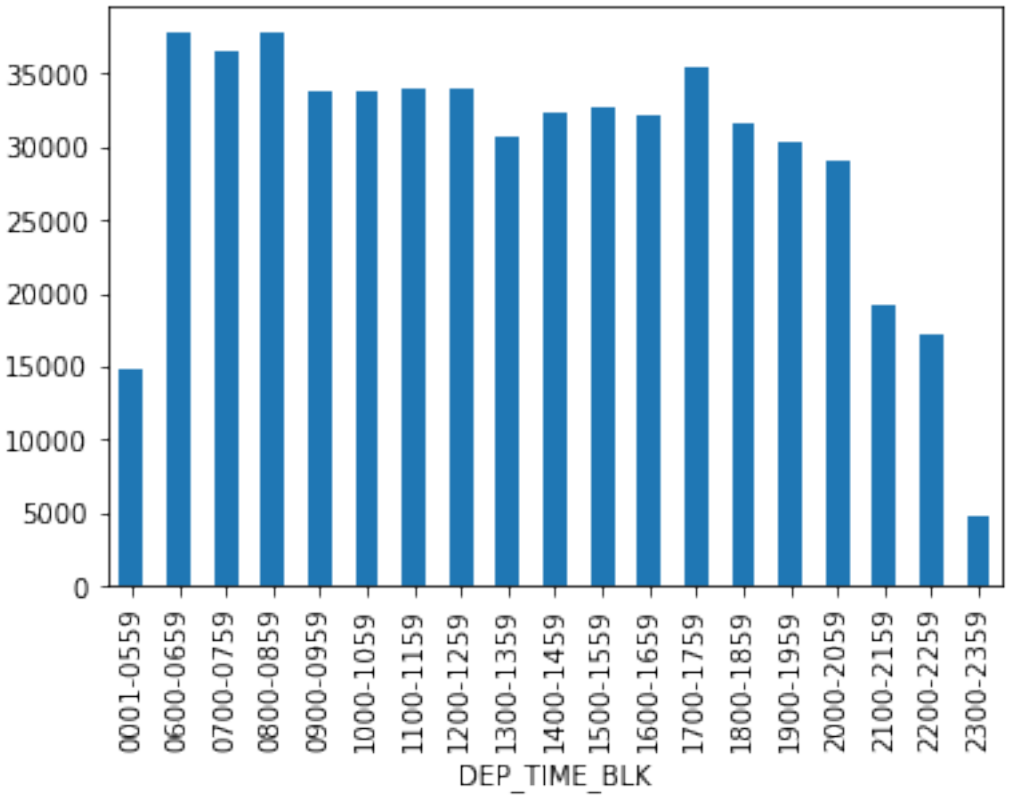
[34]: <AxesSubplot:xlabel='DEP_DEL15'>



0.0.1 Block distribution shows the imbalance in the data

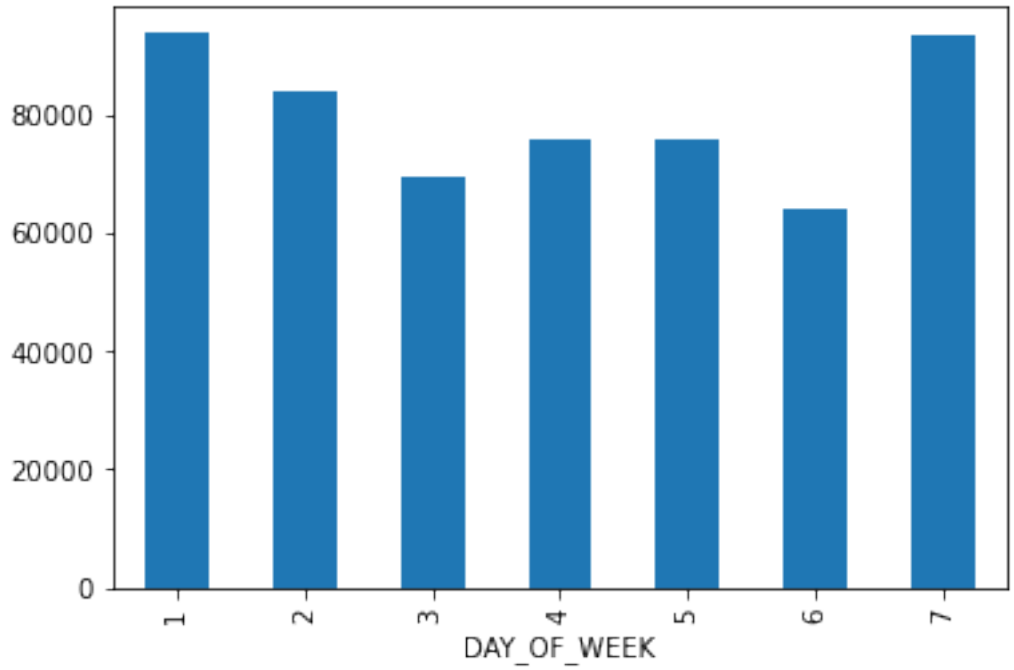
[20]:
```
# Departure Time Block distribution
Dec_eda.groupby('DEP_TIME_BLK').size().plot.bar()
```

[20]: <AxesSubplot:xlabel='DEP_TIME_BLK'>



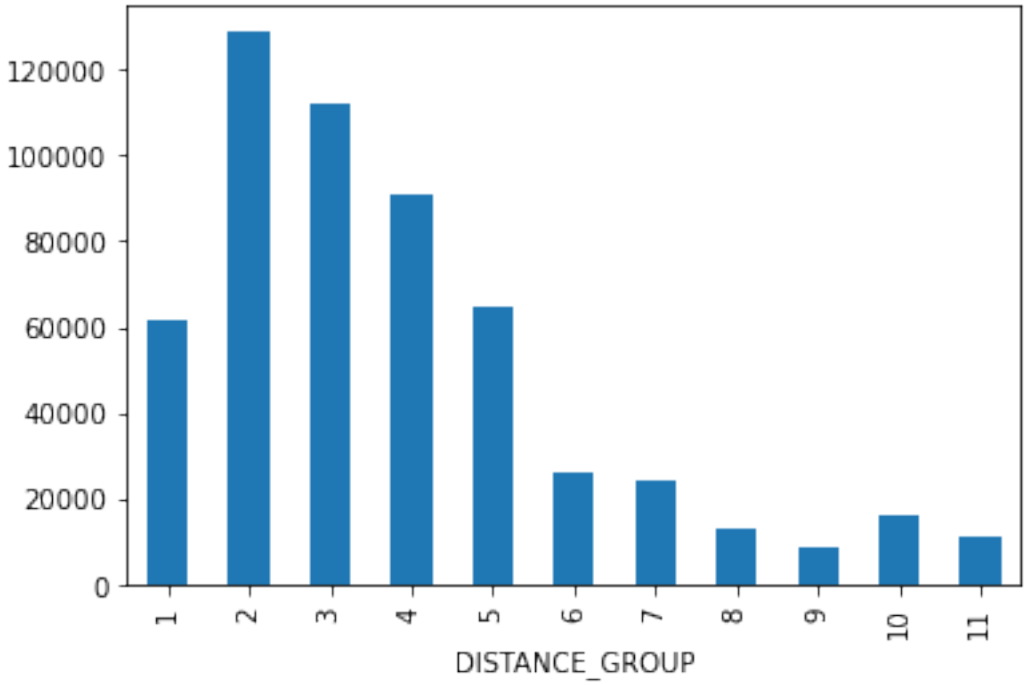
[21]:
```
# Day of the week Block distribution
Dec_eda.groupby('DAY_OF_WEEK').size().plot.bar()
```

[21]: <AxesSubplot:xlabel='DAY_OF_WEEK'>



[28]:
```
# Departure Time Block distribution
Dec_eda.groupby('DISTANCE_GROUP').size().plot.bar()
```

[28]: <AxesSubplot:xlabel='DISTANCE_GROUP'>



[22]:
```
# Explore DEPT_TIME_BULK with DEP_DEL15
time_block = pd.crosstab(Dec_eda['DEP_TIME_BLK'], Dec_eda['DEP_DEL15'])
time_block['Total'] = time_block.sum(axis=1)
time_block.loc['Total'] = time_block.sum()
time_block['Percent_Delayed'] = ((time_block.iloc[:,1])/((time_block.iloc[:
 ↪,0])+(time_block.iloc[:,1])))
time_block = time_block.sort_values('Percent_Delayed')
time_block
```

[22]:

DEP_DEL15	0.0	1.0	Total	Percent_Delayed
DEP_TIME_BLK				
0600-0659	34674	3076	37750	0.081483
0001-0559	13563	1340	14903	0.089915
0700-0759	32682	3897	36579	0.106537
0800-0859	32816	4955	37771	0.131185
0900-0959	28526	5323	33849	0.157257
1000-1059	27611	6225	33836	0.183976
1100-1159	27413	6594	34007	0.193901
Total	441734	116292	558026	0.208399
1200-1259	26896	7144	34040	0.209871
1300-1359	23795	6837	30632	0.223198
2300-2359	3639	1080	4719	0.228862
1400-1459	24786	7627	32413	0.235307
1500-1559	24500	8147	32647	0.249548
1600-1659	24084	8071	32155	0.251003
1700-1759	26217	9289	35506	0.261618
2200-2259	12400	4705	17105	0.275066
1800-1859	22724	8812	31536	0.279427
2000-2059	20651	8330	28981	0.287430
2100-2159	13509	5700	19209	0.296736
1900-1959	21248	9140	30388	0.300777

[27]:
```
# Explore DISTANCE_GROUP with DEP_DEL15
Dist = pd.crosstab(Dec_eda['DISTANCE_GROUP'], Dec_eda['DEP_DEL15'])
Dist['Total'] = Dist.sum(axis=1)
Dist.loc['Total'] = Dist.sum()
Dist['Percent_Delayed'] = ((Dist.iloc[:,1])/((Dist.iloc[:,0])+(Dist.iloc[:,1])))
Dist = Dist.sort_values('Percent_Delayed')
Dist
```

[27]:

DEP_DEL15	0.0	1.0	Total	Percent_Delayed
DISTANCE_GROUP				
1	49865	11485	61350	0.187205
3	89178	22676	111854	0.202729
4	72034	18665	90699	0.205791

```
Total           441734  116292  558026         0.208399
6                20674    5449   26123         0.208590
2               101587   27096  128683         0.210564
5                50593   14149   64742         0.218544
10               12593    3550   16143         0.219910
7                19167    5412   24579         0.220188
9                 6993    2060    9053         0.227549
11                8892    2629   11521         0.228192
8                10158    3121   13279         0.235033
```

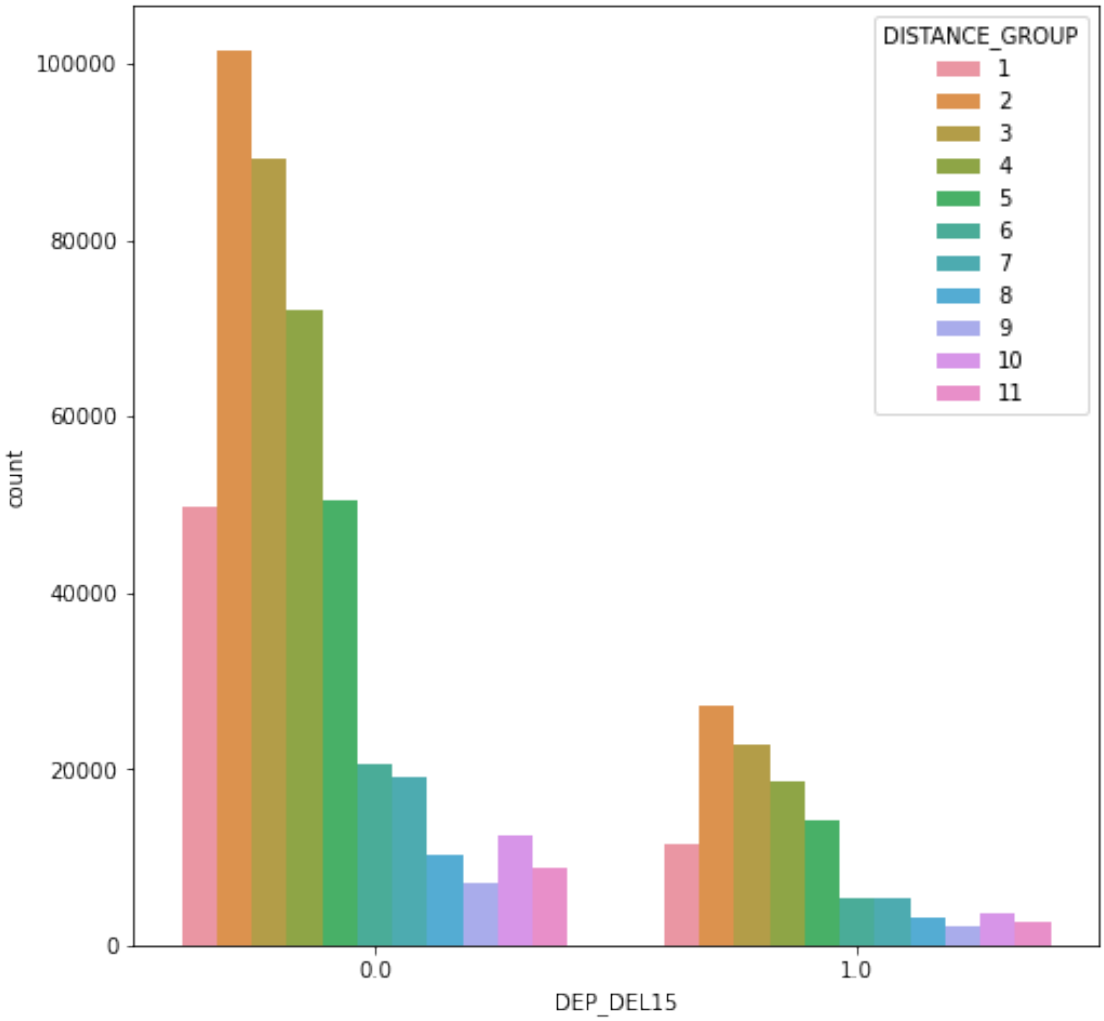
[60]:
```
# Explore DAY OF THE WEEK with DEP_DEL15
Day = pd.crosstab(Dec_eda['DAY_OF_WEEK'], Dec_eda['DEP_DEL15'])
Day['Total'] = Day.sum(axis=1)
Day.loc['Total'] = Day.sum()
Day['Percent_Delayed'] = ((Day.iloc[:,1])/((Day.iloc[:,0])+(Day.iloc[:,1])))
Day = Day.sort_values('Percent_Delayed')
Day
```

[60]:
```
DEP_DEL15        0.0     1.0   Total  Percent_Delayed
DAY_OF_WEEK
4              62341   13741   76082         0.180608
5              61721   14436   76157         0.189556
3              55918   13770   69688         0.197595
2              67384   16756   84140         0.199144
6              51445   12815   64260         0.199424
Total         441734  116292  558026         0.208399
7              72592   21109   93701         0.225280
1              70333   23665   93998         0.251761
```

0.0.2 Comparing the departure delays with the distance groups

[30]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DISTANCE_GROUP',data=Dec_eda)
```

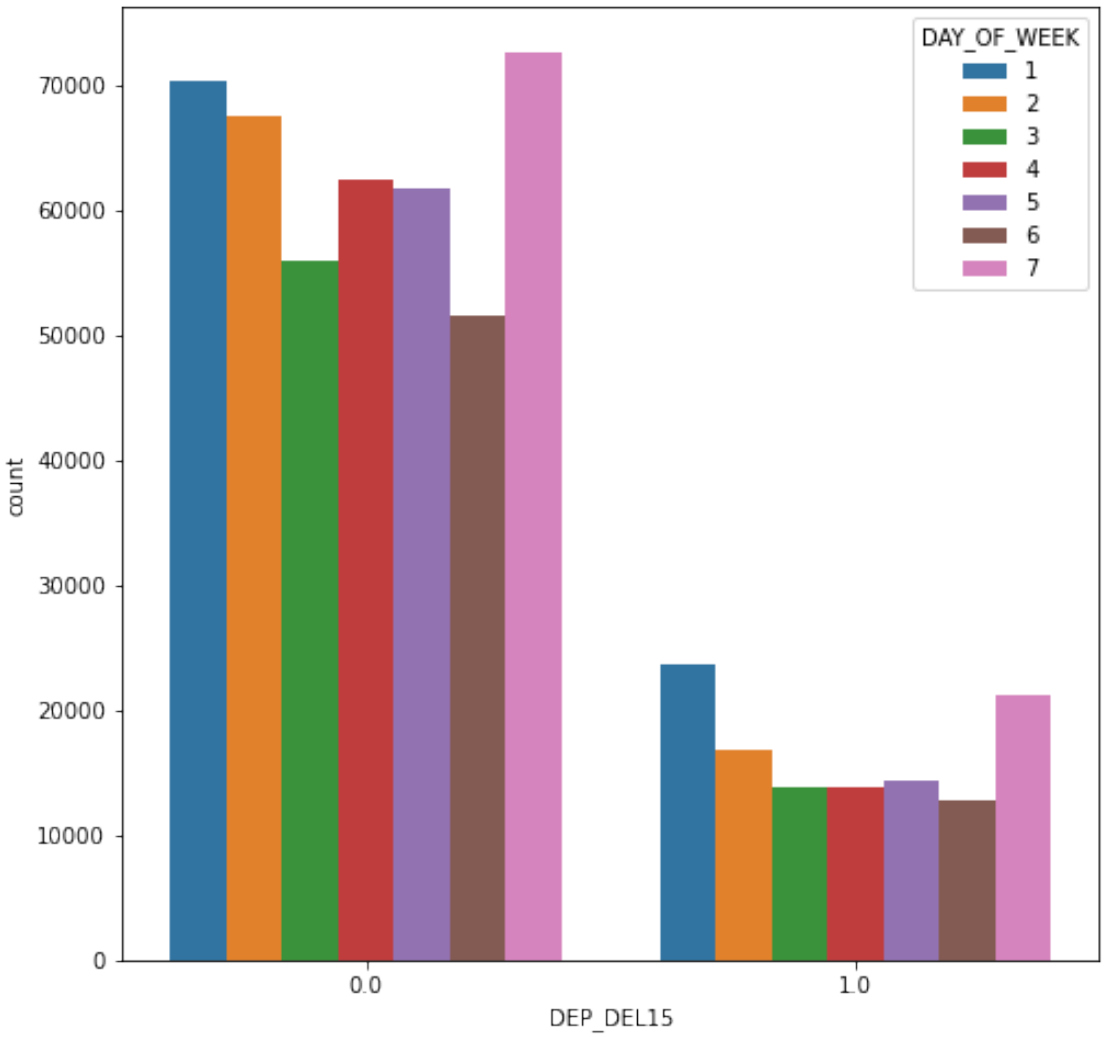
[30]:
```
<AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>
```



0.0.3 Comparing departure delays with the days of the week

[31]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DAY_OF_WEEK',data=Dec_eda)
```

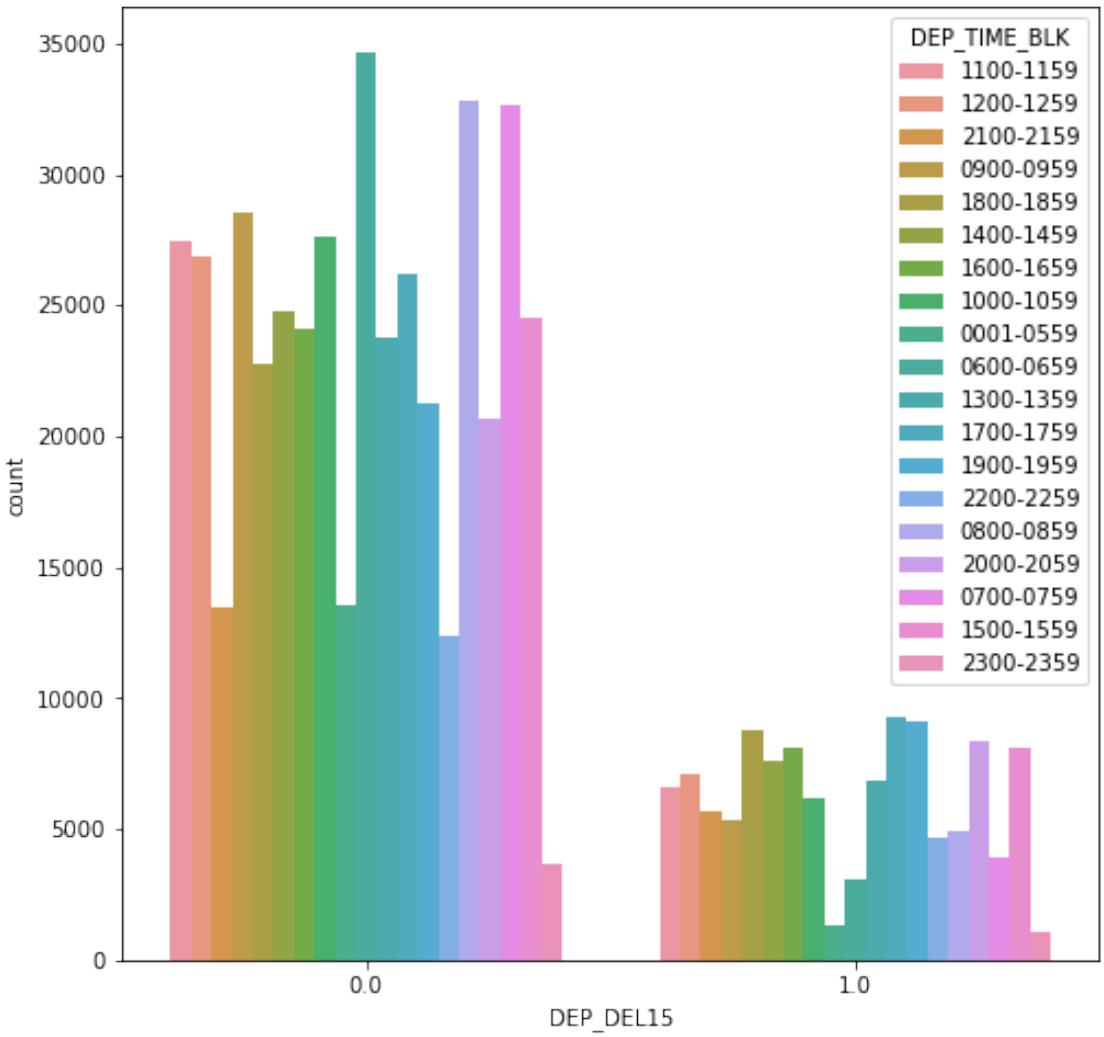
[31]:
```
<AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>
```



0.0.4 Comparing departure delays with the departure time blocks

[32]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DEP_TIME_BLK',data=Dec_eda)
```

[32]:
```
<AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>
```



0.0.5 Making a table with just the delayed data to explore more

[40]:
```
Dec_delayed = Dec_eda.loc[Dec_eda['DEP_DEL15'] == 1]
Dec_delayed
```

[40]:

	DAY_OF_MONTH	DAY_OF_WEEK	OP_UNIQUE_CARRIER	TAIL_NUM	\
4	8	7	WN	N8319F	
15	8	7	WN	N484WN	
22	8	7	WN	N224WN	
24	8	7	WN	N284WN	
34	8	7	WN	N213WN	
…	…	…	…	…	
557996	31	2	B6	N198JB	
558001	31	2	B6	N603JB	

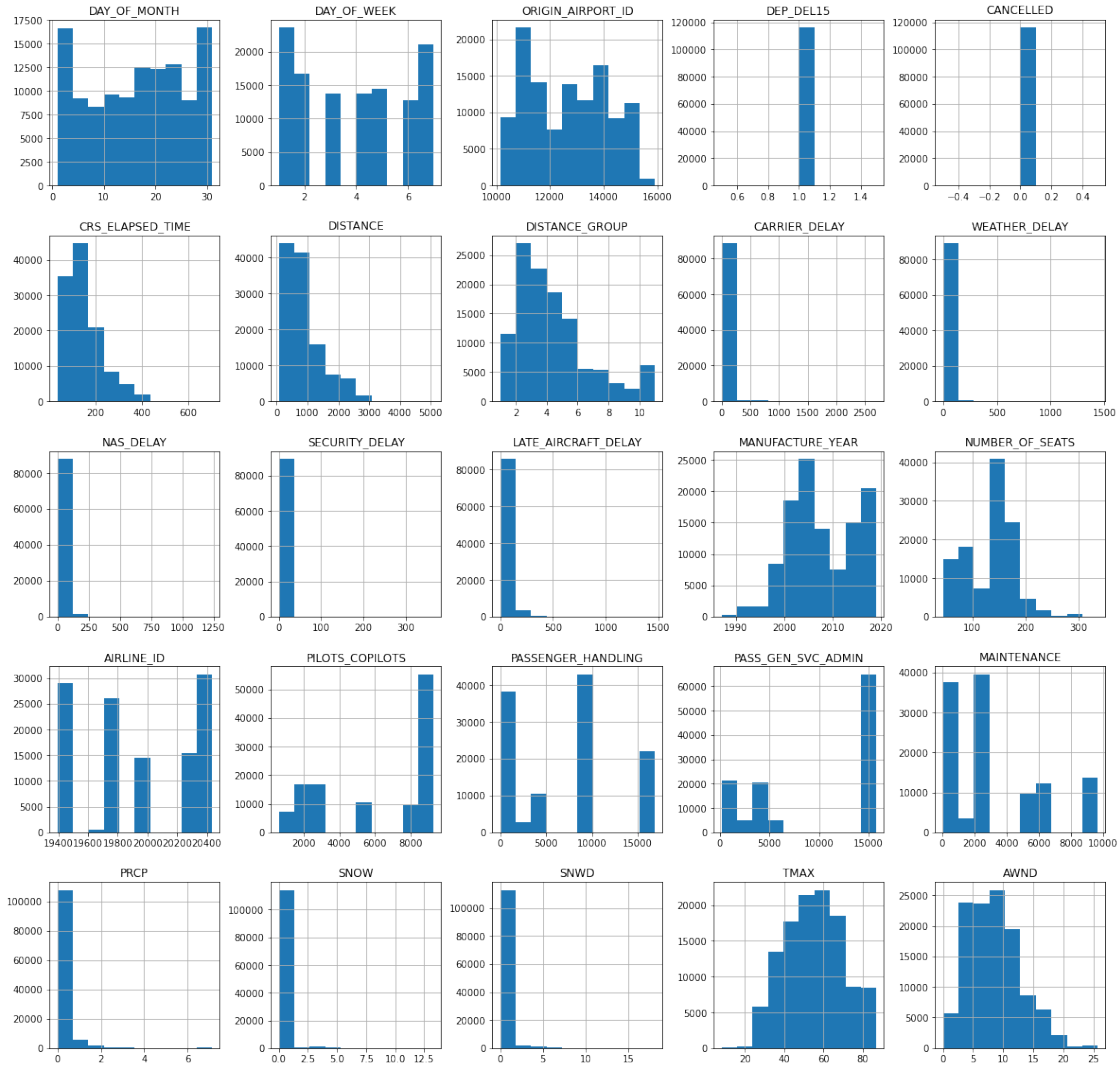
```
558003           31            2               B6   N768JB
558004           31            2               B6   N768JB
558022           31            2               B6   N193JB

        ORIGIN_AIRPORT_ID ORIGIN DEST  DEP_DEL15 DEP_TIME_BLK ARR_TIME_BLK  \
4                   15016    STL  SFO        1.0    1800-1859    2000-2059
15                  15304    TPA  ATL        1.0    1300-1359    1400-1459
22                  15304    TPA  BHM        1.0    1200-1259    1200-1259
24                  15304    TPA  BNA        1.0    1300-1359    1400-1459
34                  15304    TPA  BWI        1.0    2100-2159    2300-2359
…                   …    …  …        …           …          …
557996              10721    BOS  RDU        1.0    1500-1559    1700-1759
558001              14869    SLC  MCO        1.0    2200-2259    0001-0559
558003              11618    EWR  FLL        1.0    1300-1359    1700-1759
558004              11697    FLL  EWR        1.0    1000-1059    1300-1359
558022              13204    MCO  SWF        1.0    1300-1359    1600-1659

        …             CARRIER_NAME  PILOTS_COPILOTS  PASSENGER_HANDLING  \
4       …  Southwest Airlines Co.             8989                9668
15      …  Southwest Airlines Co.             8989                9668
22      …  Southwest Airlines Co.             8989                9668
24      …  Southwest Airlines Co.             8989                9668
34      …  Southwest Airlines Co.             8989                9668
…     …                      …              …                 …
557996  …         JetBlue Airways             2840                4905
558001  …         JetBlue Airways             2840                4905
558003  …         JetBlue Airways             2840                4905
558004  …         JetBlue Airways             2840                4905
558022  …         JetBlue Airways             2840                4905

        PASS_GEN_SVC_ADMIN  MAINTENANCE  PRCP  SNOW  SNWD  TMAX   AWND
4                    15475         2482  0.02   0.0   0.0  58.0   9.84
15                   15475         2482  0.00   0.0   0.0  80.0   5.37
22                   15475         2482  0.00   0.0   0.0  80.0   5.37
24                   15475         2482  0.00   0.0   0.0  80.0   5.37
34                   15475         2482  0.00   0.0   0.0  80.0   5.37
…                    …          …   …   …  …    …    …
557996                3888          726  0.27   0.0   0.0  44.0  13.42
558001                3888          726  0.00   0.0   0.0  33.0   4.03
558003                3888          726  0.00   0.0   0.0  46.0  10.51
558004                3888          726  0.00   0.0   0.0  80.0   5.59
558022                3888          726  0.00   0.0   0.0  71.0   8.28

[116292 rows x 32 columns]
```

0.0.6 Conforming the table only has delayed data

[42]:
```
Dec_delayed.nunique()
```

[42]:
```
DAY_OF_MONTH             31
DAY_OF_WEEK               7
OP_UNIQUE_CARRIER        17
TAIL_NUM               5379
ORIGIN_AIRPORT_ID        96
ORIGIN                   96
DEST                    338
DEP_DEL15                 1
DEP_TIME_BLK             19
ARR_TIME_BLK             19
CANCELLED                 1
CRS_ELAPSED_TIME        443
DISTANCE               1423
DISTANCE_GROUP           11
CARRIER_DELAY           804
WEATHER_DELAY           410
NAS_DELAY               418
SECURITY_DELAY           83
LATE_AIRCRAFT_DELAY     560
MANUFACTURE_YEAR         32
NUMBER_OF_SEATS          77
AIRLINE_ID               17
CARRIER_NAME             17
PILOTS_COPILOTS          17
PASSENGER_HANDLING       14
PASS_GEN_SVC_ADMIN       17
MAINTENANCE              17
PRCP                    145
SNOW                     51
SNWD                     20
TMAX                     77
AWND                    100
dtype: int64
```

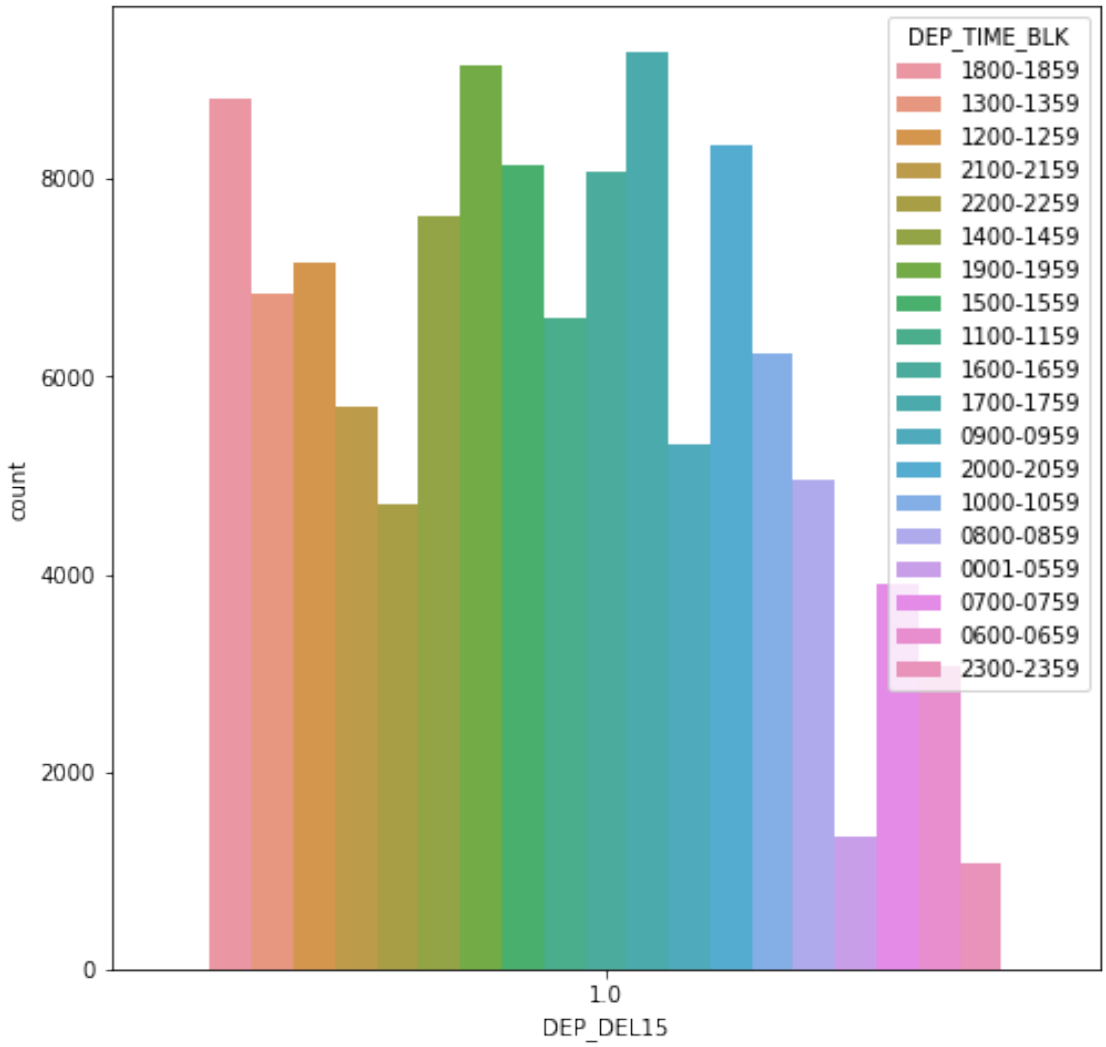
[41]:
```
# Graph Distributions of numerical features
histlist = Dec_delayed.hist(figsize = (20, 20))
```



0.0.7 Delayed flights distribution based on the departure time block

[43]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DEP_TIME_BLK',data=Dec_delayed)
```

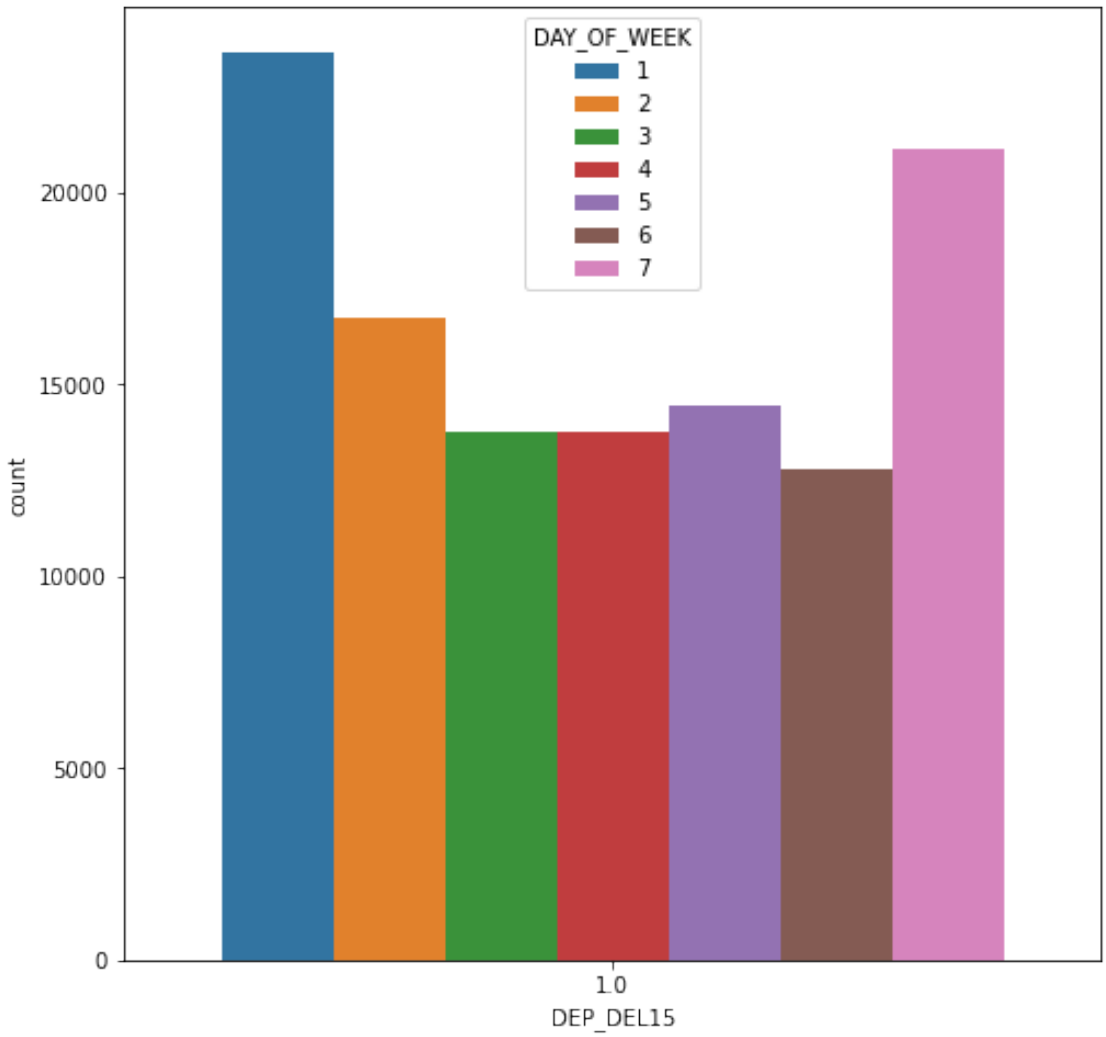
[43]: <AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>



0.0.8 Delayed flights distribution based on the days of the week

[45]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DAY_OF_WEEK',data=Dec_delayed)
```

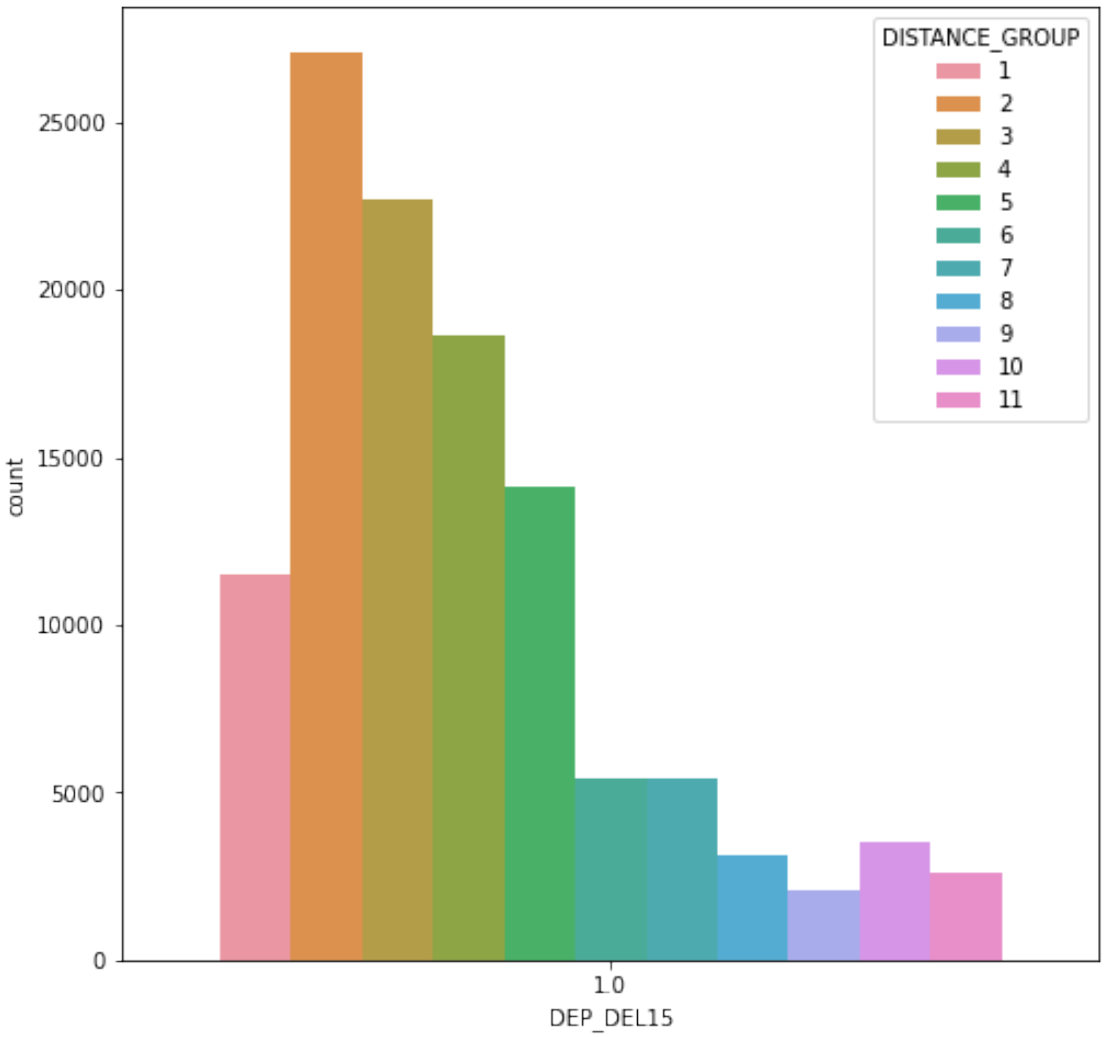
[45]:
```
<AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>
```



0.0.9 Delayed flights distribution based on the distance groups

[47]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DISTANCE_GROUP',data=Dec_delayed)
```

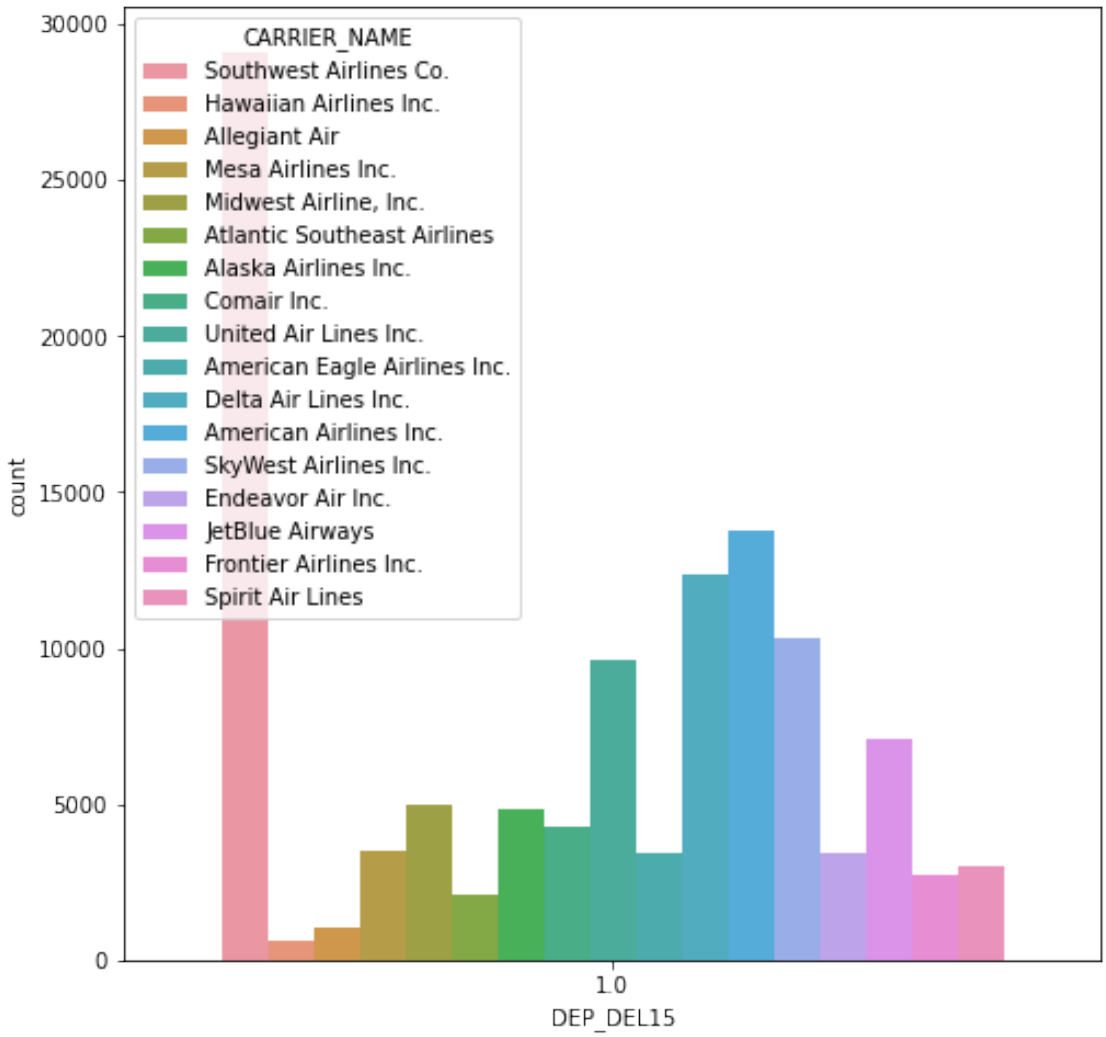
[47]:
```
<AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>
```



0.0.10 Delays based on airlines

[48]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='CARRIER_NAME',data=Dec_delayed)
```

[48]:
```
<AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>
```



[51]:
```
Dec_ontime = Dec_eda.loc[Dec_eda['DEP_DEL15'] == 0]
Dec_ontime
```

[51]:

	DAY_OF_MONTH	DAY_OF_WEEK	OP_UNIQUE_CARRIER	TAIL_NUM	\
0	8	7	WN	N8651A	
1	8	7	WN	N939WN	
2	8	7	WN	N7741C	
3	8	7	WN	N550WN	
5	8	7	WN	N726SW	
…	…	…	…	…	
558020	31	2	B6	N633JB	
558021	31	2	B6	N348JB	
558023	31	2	B6	N304JB	
558024	31	2	B6	N193JB	
558025	31	2	B6	N563JB	

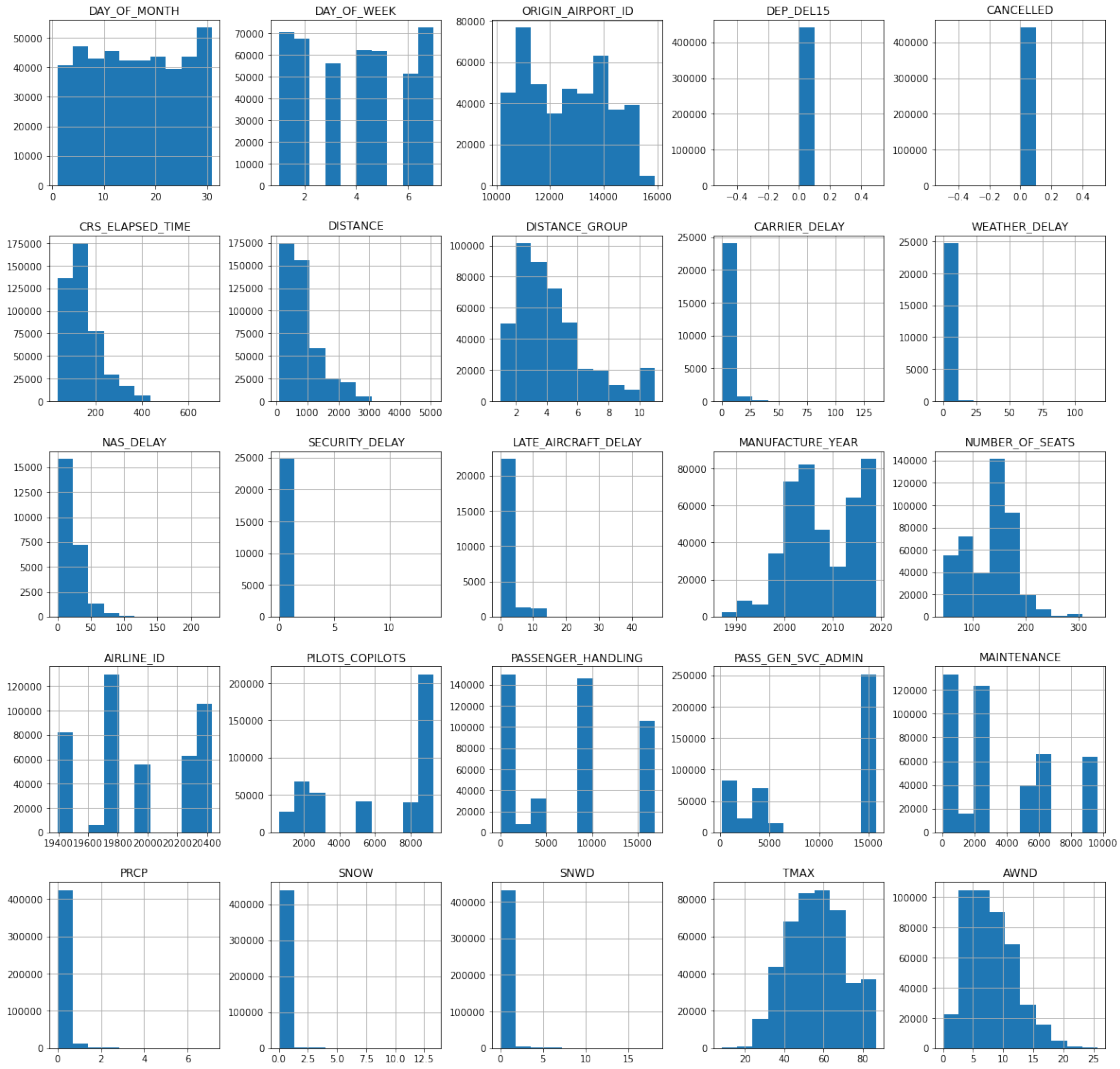
```
        ORIGIN_AIRPORT_ID ORIGIN DEST  DEP_DEL15 DEP_TIME_BLK ARR_TIME_BLK  \
0                   15016    STL  SAN        0.0    1100-1159    1300-1359
1                   15016    STL  SAT        0.0    1200-1259    1400-1459
2                   15016    STL  SAT        0.0    2100-2159    0001-0559
3                   15016    STL  SEA        0.0    0900-0959    1200-1259
5                   15016    STL  SJC        0.0    1100-1159    1300-1359
…                   …    …   …        …          …          …
558020              14685    SAV  JFK        0.0    1000-1059    1200-1259
558021              10721    BOS  SYR        0.0    2200-2259    0001-0559
558023              11278    DCA  BOS        0.0    1400-1459    1500-1559
558024              14100    PHL  BOS        0.0    0700-0759    0800-0859
558025              10721    BOS  SJU        0.0    0800-0859    1300-1359

        …             CARRIER_NAME  PILOTS_COPILOTS  PASSENGER_HANDLING  \
0       …  Southwest Airlines Co.             8989                9668
1       …  Southwest Airlines Co.             8989                9668
2       …  Southwest Airlines Co.             8989                9668
3       …  Southwest Airlines Co.             8989                9668
5       …  Southwest Airlines Co.             8989                9668
…     …                       …              …                   …
558020  …         JetBlue Airways             2840                4905
558021  …         JetBlue Airways             2840                4905
558023  …         JetBlue Airways             2840                4905
558024  …         JetBlue Airways             2840                4905
558025  …         JetBlue Airways             2840                4905

        PASS_GEN_SVC_ADMIN  MAINTENANCE  PRCP  SNOW  SNWD  TMAX   AWND
0                    15475         2482  0.02   0.0   0.0  58.0   9.84
1                    15475         2482  0.02   0.0   0.0  58.0   9.84
2                    15475         2482  0.02   0.0   0.0  58.0   9.84
3                    15475         2482  0.02   0.0   0.0  58.0   9.84
5                    15475         2482  0.02   0.0   0.0  58.0   9.84
…                    …           …   …    …   …   …    …
558020                3888          726  0.00   0.0   0.0  64.0  10.07
558021                3888          726  0.27   0.0   0.0  44.0  13.42
558023                3888          726  0.00   0.0   0.0  53.0   7.61
558024                3888          726  0.00   0.0   0.0  47.0   9.17
558025                3888          726  0.27   0.0   0.0  44.0  13.42

[441734 rows x 32 columns]
```

[52]:
```
Dec_delayed.nunique()
```

[52]:
```
DAY_OF_MONTH            31
DAY_OF_WEEK              7
OP_UNIQUE_CARRIER       17
```

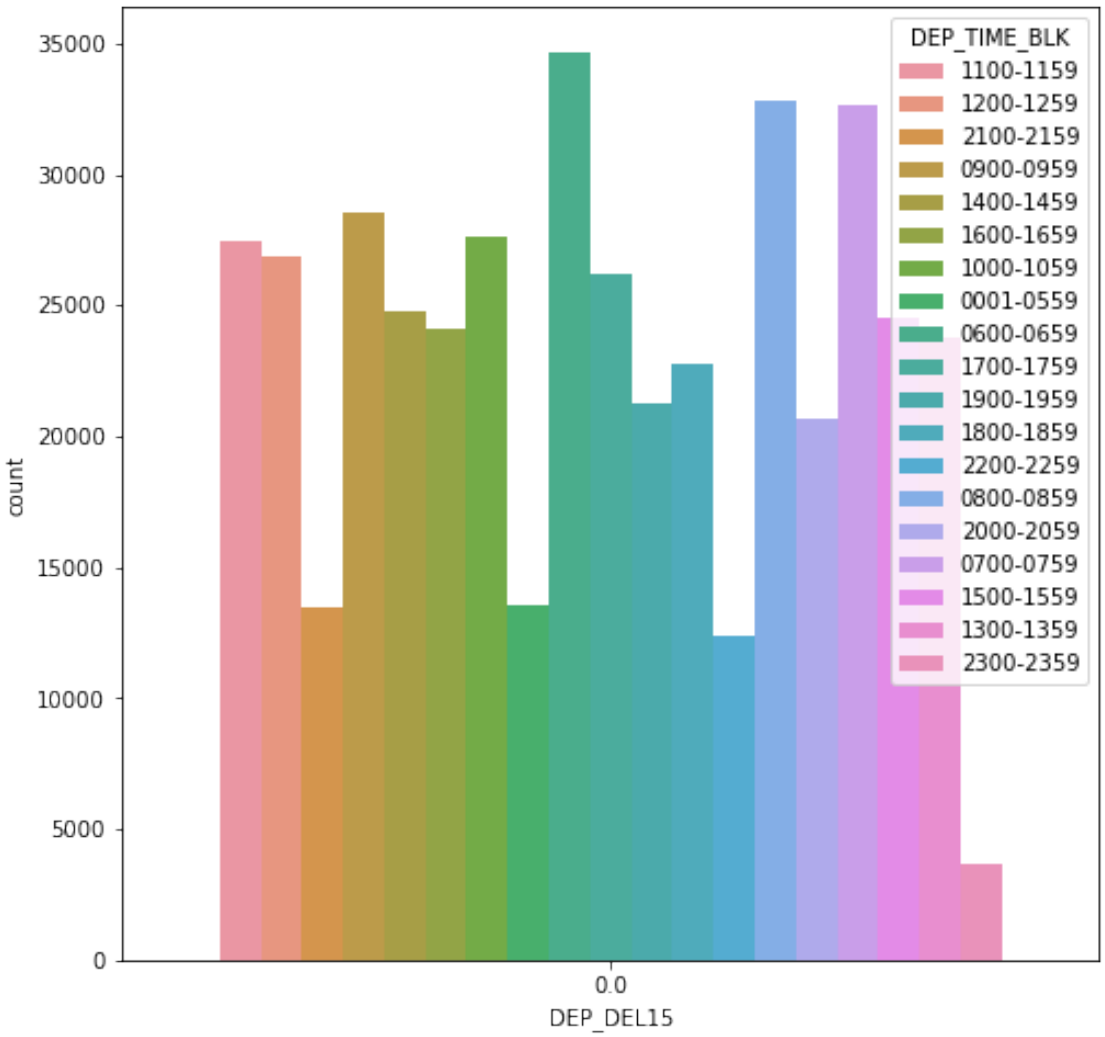
```
TAIL_NUM               5379
ORIGIN_AIRPORT_ID        96
ORIGIN                   96
DEST                    338
DEP_DEL15                 1
DEP_TIME_BLK             19
ARR_TIME_BLK             19
CANCELLED                 1
CRS_ELAPSED_TIME        443
DISTANCE               1423
DISTANCE_GROUP           11
CARRIER_DELAY           804
WEATHER_DELAY           410
NAS_DELAY               418
SECURITY_DELAY           83
LATE_AIRCRAFT_DELAY     560
MANUFACTURE_YEAR         32
NUMBER_OF_SEATS          77
AIRLINE_ID               17
CARRIER_NAME             17
PILOTS_COPILOTS          17
PASSENGER_HANDLING       14
PASS_GEN_SVC_ADMIN       17
MAINTENANCE              17
PRCP                    145
SNOW                     51
SNWD                     20
TMAX                     77
AWND                    100
dtype: int64
```

[53]:
```
# Graph Distributions of numerical features
histlist = Dec_ontime.hist(figsize = (20, 20))
```



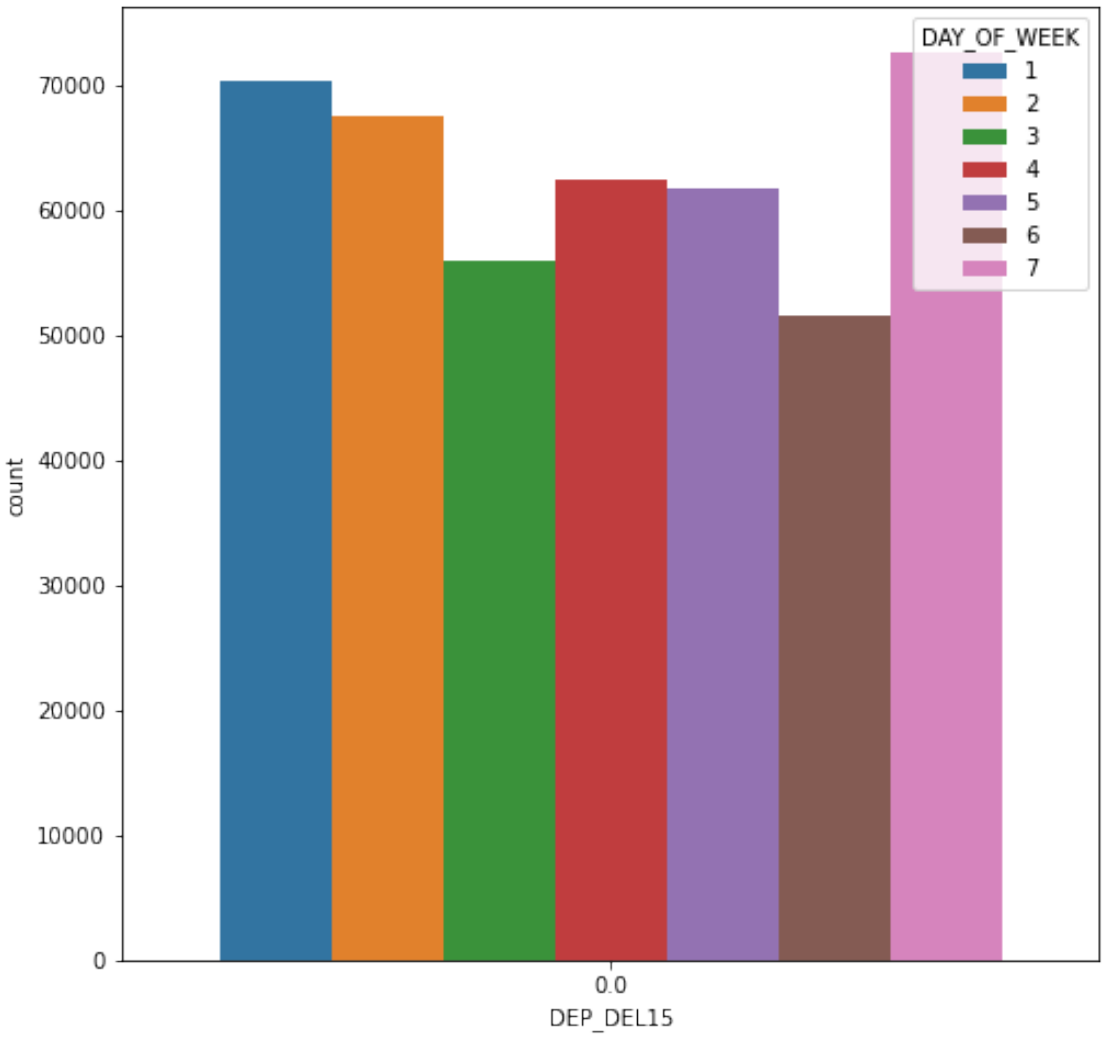
[54]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DEP_TIME_BLK',data=Dec_ontime)
```

[54]: <AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>



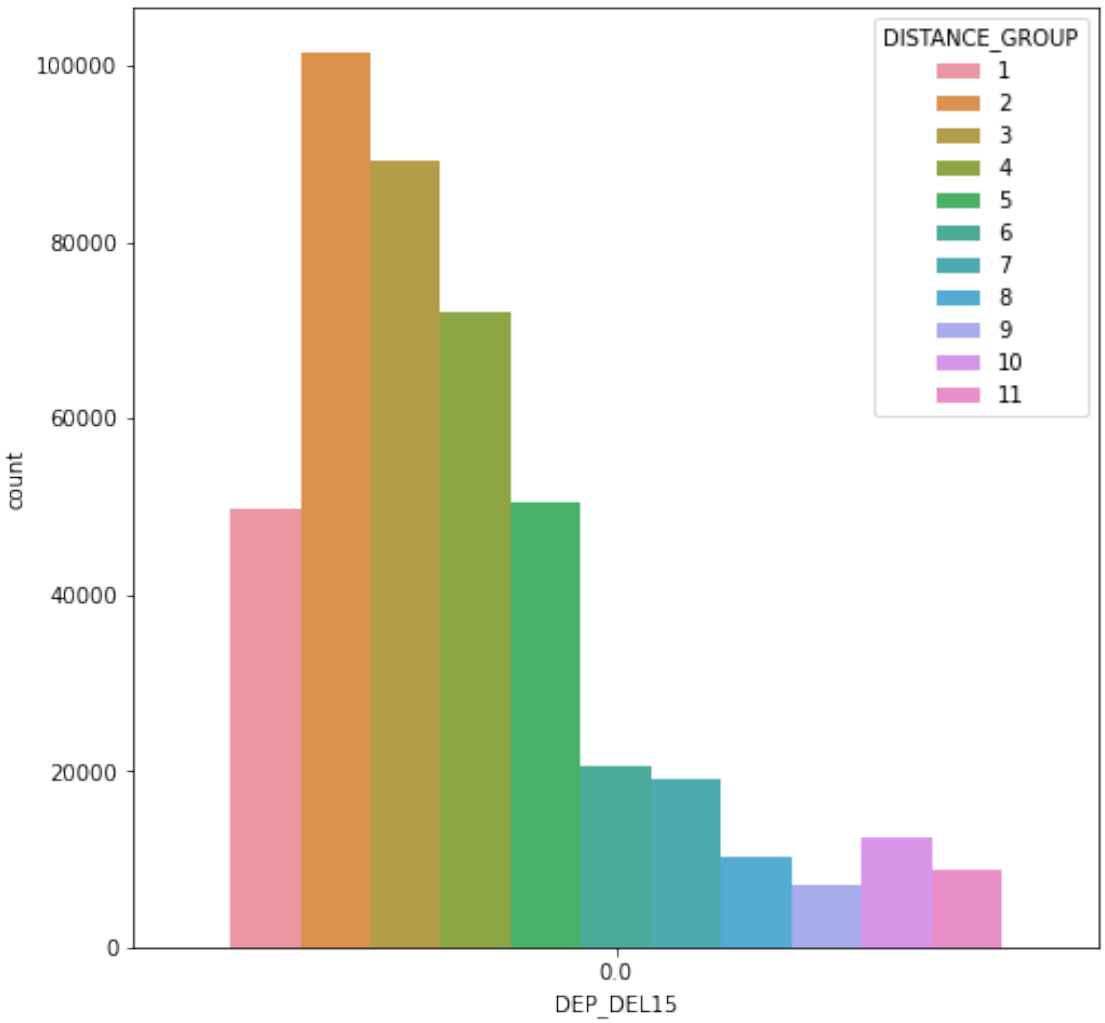
[55]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DAY_OF_WEEK',data=Dec_ontime)
```

[55]: <AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>



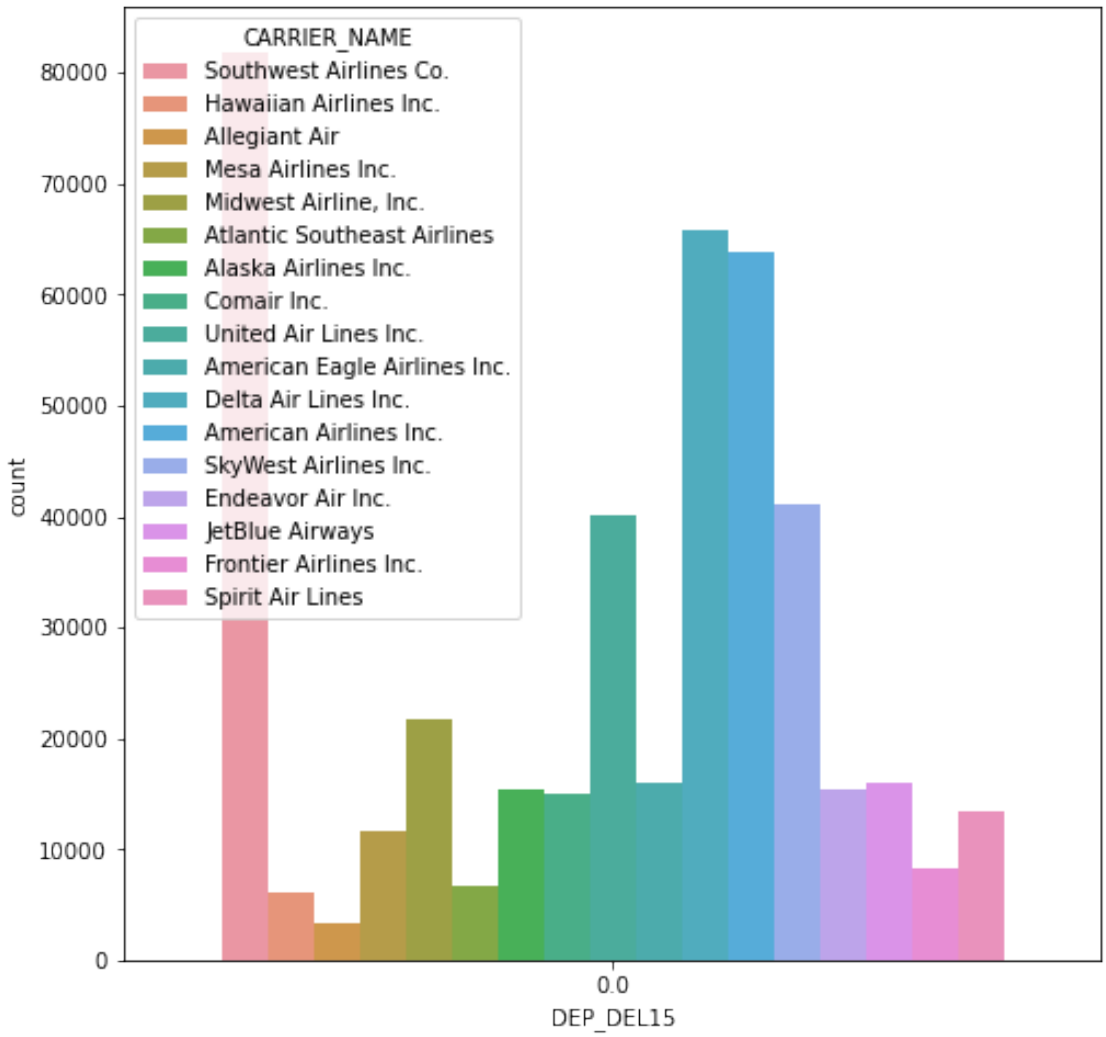
[56]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='DISTANCE_GROUP',data=Dec_ontime)
```

[56]: <AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>



[57]:
```
plt.figure(figsize=(8,8))
sns.countplot(x='DEP_DEL15',hue='CARRIER_NAME',data=Dec_ontime)
```

[57]: <AxesSubplot:xlabel='DEP_DEL15', ylabel='count'>



[58]:
```
Dec_ontime['CARRIER_NAME'].value_counts()
```

[58]:
```
Southwest Airlines Co.          81892
Delta Air Lines Inc.            65757
American Airlines Inc.          63842
SkyWest Airlines Inc.           41116
United Air Lines Inc.           40100
Midwest Airline, Inc.           21739
JetBlue Airways                 16004
American Eagle Airlines Inc.    15925
Endeavor Air Inc.               15418
Alaska Airlines Inc.            15380
Comair Inc.                     14932
Spirit Air Lines                13377
Mesa Airlines Inc.              11562
```

```
Frontier Airlines Inc.           8339
Atlantic Southeast Airlines      6776
Hawaiian Airlines Inc.           6149
Allegiant Air                    3426
Name: CARRIER_NAME, dtype: int64
```

[59]:
```
Dec_delayed['CARRIER_NAME'].value_counts()
```

[59]:
```
Southwest Airlines Co.          29112
American Airlines Inc.          13740
Delta Air Lines Inc.            12336
SkyWest Airlines Inc.           10360
United Air Lines Inc.            9640
JetBlue Airways                  7099
Midwest Airline, Inc.            4968
Alaska Airlines Inc.             4811
Comair Inc.                      4284
Mesa Airlines Inc.               3524
American Eagle Airlines Inc.     3452
Endeavor Air Inc.                3435
Spirit Air Lines                 2980
Frontier Airlines Inc.           2741
Atlantic Southeast Airlines      2134
Allegiant Air                    1064
Hawaiian Airlines Inc.            612
Name: CARRIER_NAME, dtype: int64
```

[ ]:
```

```