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Outputs:

1. Request Closing Time

```
In [17]: # insert the newly created column in the dataset
csr_data1.insert(3, "Request_Closing_Time", rct, True)
```

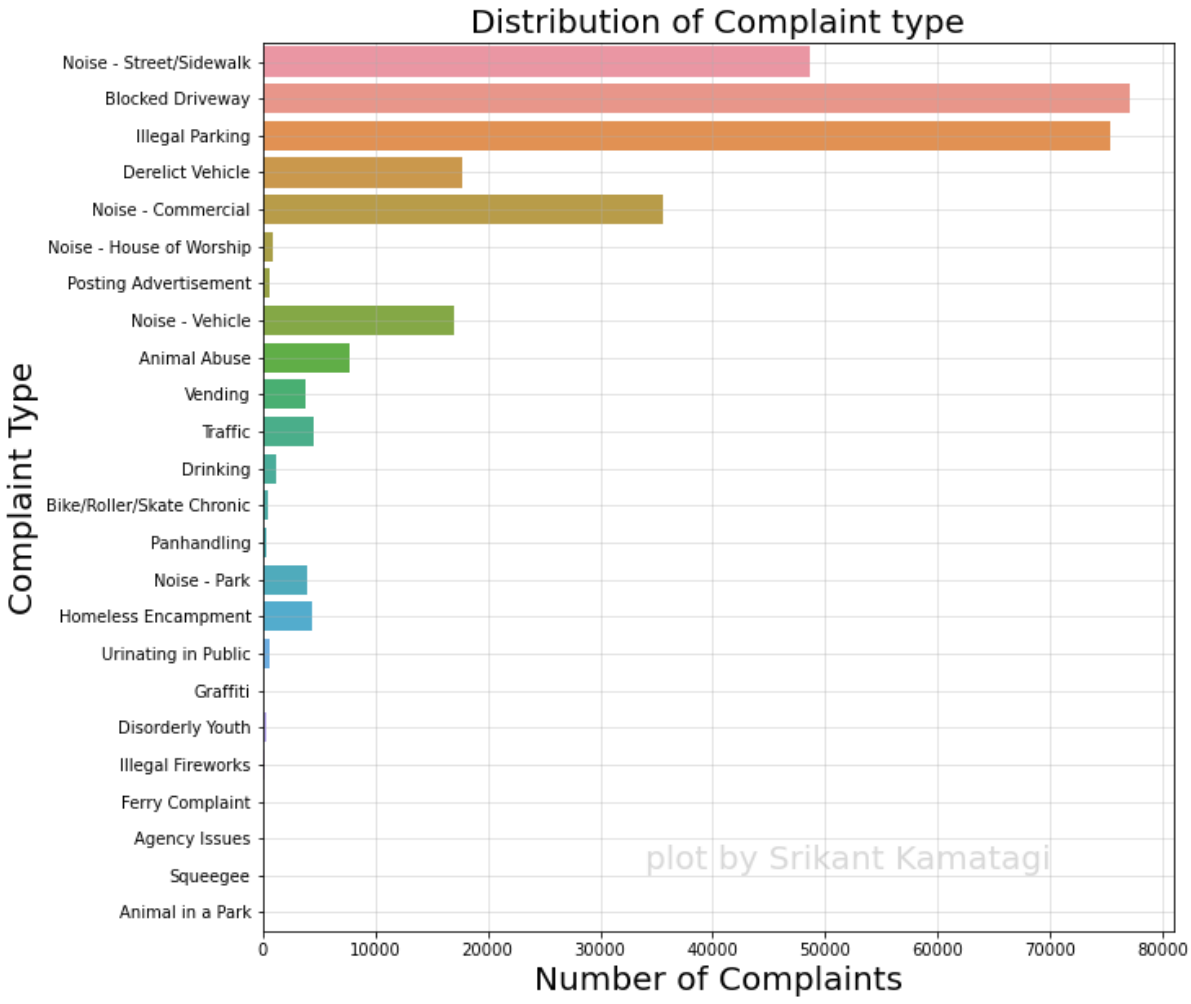
```
In [18]: # view the new wrangled dataset and verify if the column is added
csr_data1.head()
```

Out[18]:

	Unique Key	Created Date	Closed Date	Request_Closing_Time	Agency	Agency Name	Complaint Type	Descriptor	Location Type	Incident Zip	...	Bridge Highway Name	Bridge Highway Direction	Road Ramp
0	32310363	2015-12-31 23:59:45	2016-01-01 00:55:00	-1 days +23:04:45	NYPD	New York City Police Department	Noise - Street/Sidewalk	Loud Music/Party	Street/Sidewalk	10034.0	...	NaN	NaN	NaN
1	32309934	2015-12-31 23:59:44	2016-01-01 01:26:00	-1 days +22:33:44	NYPD	New York City Police Department	Blocked Driveway	No Access	Street/Sidewalk	11105.0	...	NaN	NaN	NaN
2	32309159	2015-12-31 23:59:29	2016-01-01 04:51:00	-1 days +19:08:29	NYPD	New York City Police Department	Blocked Driveway	No Access	Street/Sidewalk	10458.0	...	NaN	NaN	NaN
3	32305098	2015-12-31 23:57:46	2016-01-01 07:43:00	-1 days +16:14:46	NYPD	New York City Police Department	Illegal Parking	Commercial Overnight Parking	Street/Sidewalk	10461.0	...	NaN	NaN	NaN
4	32306529	2015-12-31 23:56:58	2016-01-01 03:24:00	-1 days +20:32:58	NYPD	New York City Police Department	Illegal Parking	Blocked Sidewalk	Street/Sidewalk	11373.0	...	NaN	NaN	NaN

5 rows × 54 columns

2. **Provide insights for Complaint types using countplot**



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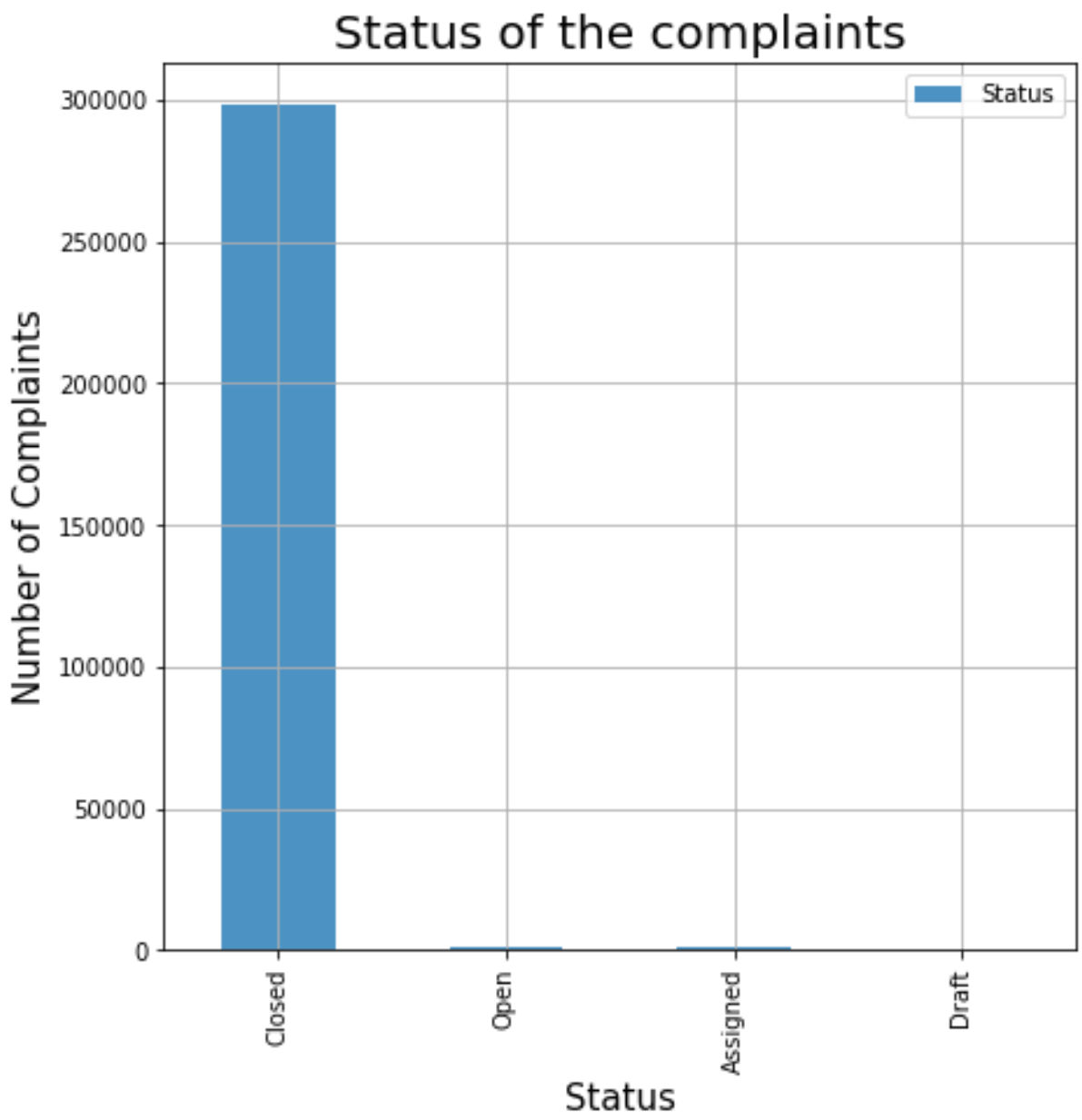
Have a look at the status of tickets



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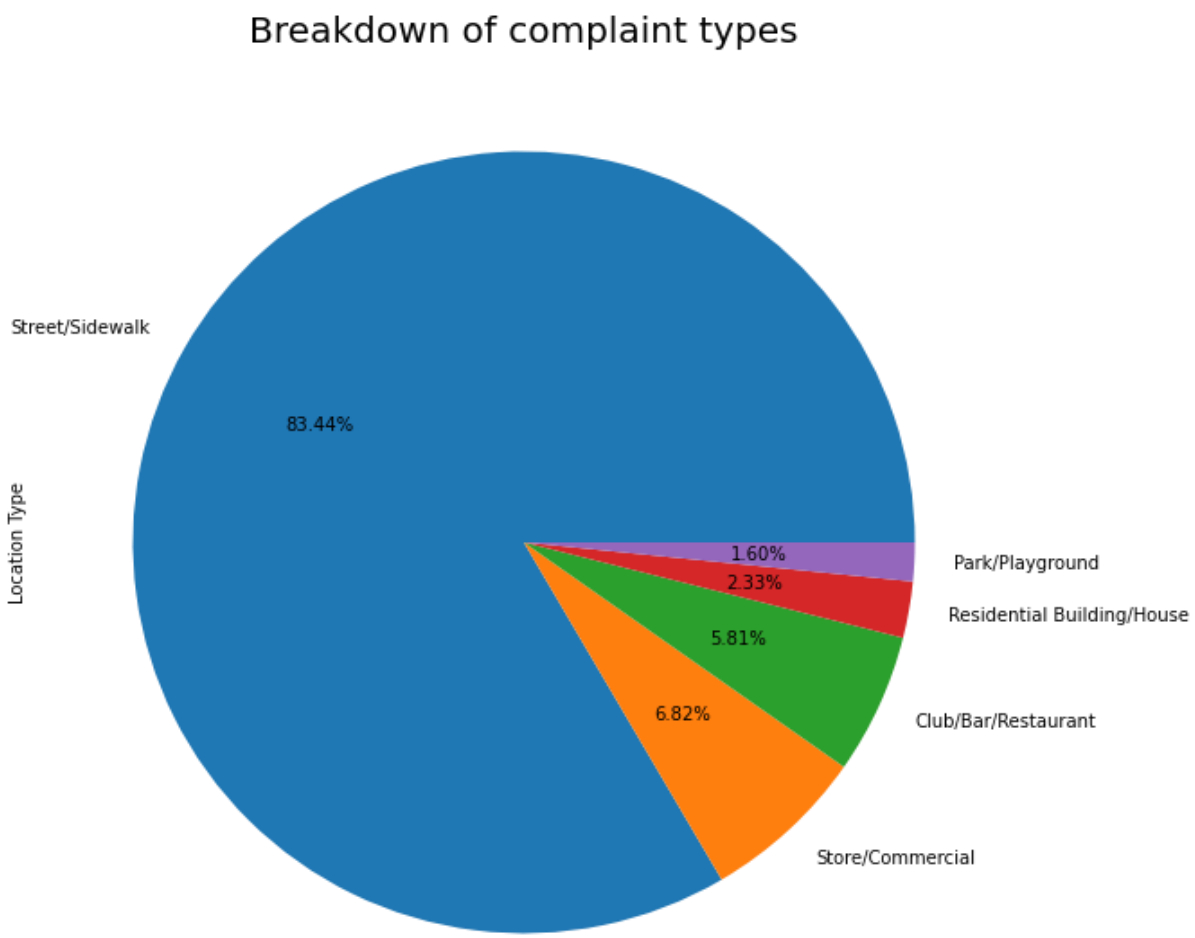
4 Location type Breakdown with pie chart to figure out majority of complaints from location types and top 5 categories



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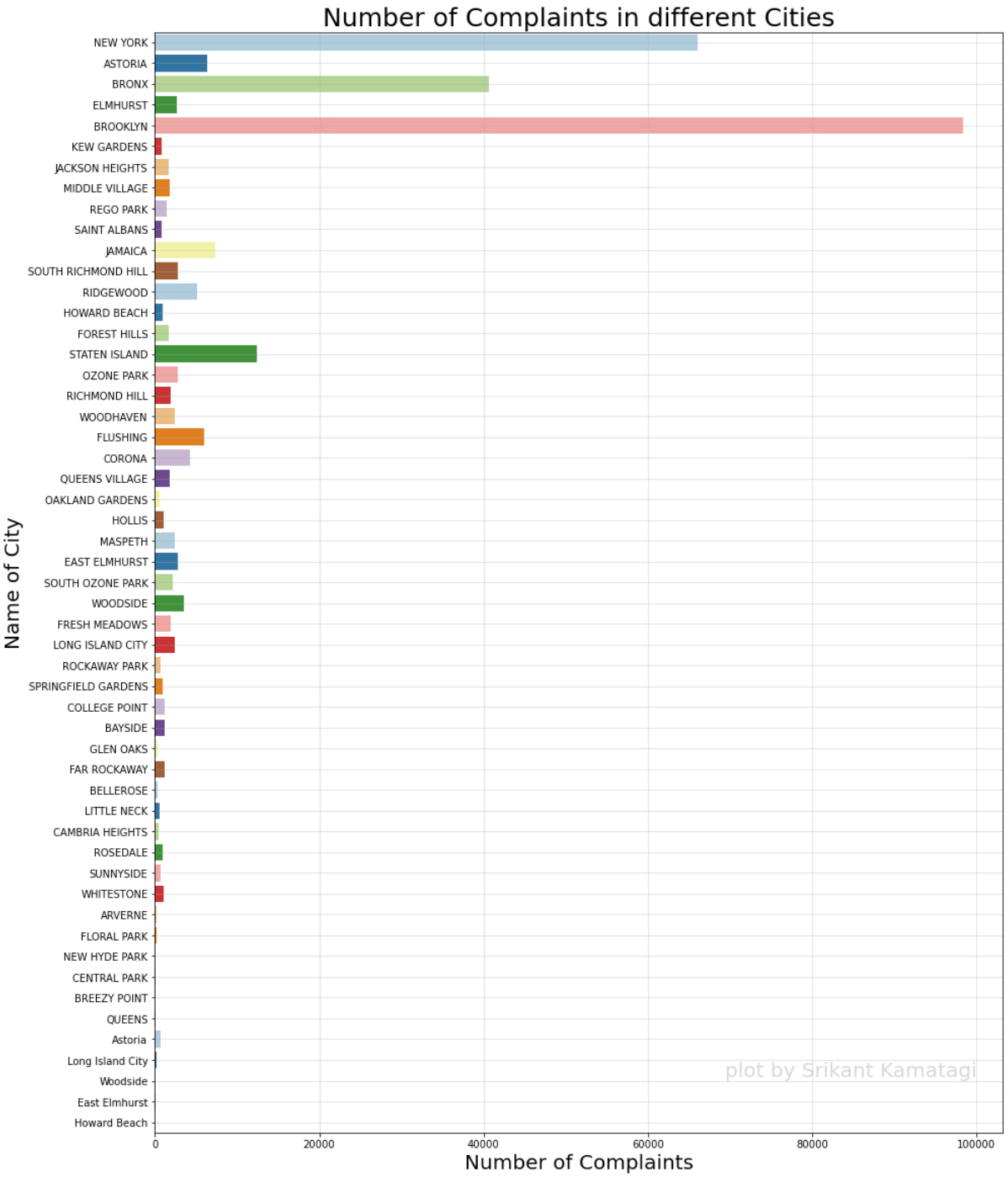
number of complaints registered from different cities



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Performed Groupby

In [32]:
```
# ordering groupby Location based on Average Request_closing_time
csr_data1.groupby(["Complaint Type", "Location"])["Request_Closing_Time"].mean()
```

Out[32]:
```
Complaint Type  Location
Animal Abuse    (40.50004910779944, -74.238033510764)          -1 days +20:50:48.500000
                (40.50062125381004, -74.24398645134252)        -1 days +22:34:02
                (40.50302866584165, -74.24773850760648)        -1 days +21:08:15
                (40.5031739359226, -74.24008707720584)         -1 days +21:56:18
                (40.50465099100278, -74.24253761257812)        -1 days +22:07:54
                                                                  ...
Vending         (40.894781070976705, -73.84056167467809)       -1 days +11:54:02
                (40.89586469711286, -73.89229421538577)        -1 days +20:32:00
                (40.90083595022644, -73.84671835790932)     -1 days +15:50:21.750000
                (40.90117643869534, -73.84682971124454)     -1 days +21:12:42.625000
                (40.90151966691322, -73.84693744201888)  -1 days +15:57:59.315789474
Name: Request_Closing_Time, Length: 151518, dtype: timedelta64[ns]
```

In [33]:
```
# groupby Location Type based on Average Request_closing_time
csr_data1.groupby(["Complaint Type", "Location Type"])["Request_Closing_Time"].mean()
```

Out[33]:
```
Complaint Type       Location Type
Animal Abuse         Commercial                 -1 days +18:39:26.032258065
                     House and Store            -1 days +18:59:12.258064517
                     Park/Playground            -1 days +20:17:51.024590164
                     Parking Lot                -1 days +18:27:34.563636364
                     Residential Building       -1 days +19:10:54.603524230
                                                           ...
Urinating in Public  Subway Station             -1 days +22:50:52.333333334
Vending              Park/Playground            -1 days +20:31:58.352380953
                     Residential Building/House -1 days +19:48:10.497512438
                     Store/Commercial           -1 days +20:01:34.182870371
                     Street/Sidewalk            -1 days +19:58:23.908019640
Name: Request_Closing_Time, Length: 71, dtype: timedelta64[ns]
```

In [34]:
```
# groupby City based on Average Request_closing_time
csr_data1.groupby(["Complaint Type", "City"])["Request_Closing_Time"].mean()
```

Out[34]:
```
Complaint Type  City
Animal Abuse    ARVERNE          -1 days +21:50:46.947368422
                ASTORIA             -1 days +18:59:59.392000
                BAYSIDE          -1 days +20:43:31.756756757
                BELLEROSE        -1 days +11:16:31.142857143
                BREEZY POINT        -1 days +21:23:11.500000
                                               ...
Vending         STATEN ISLAND       -1 days +19:43:42.640000
                SUNNYSIDE        -1 days +14:16:35.666666667
                WHITESTONE •                -1 days +21:40:00
                WOODHAVEN        -1 days +21:09:27.166666667
                WOODSIDE         -1 days +16:41:52.466666667
Name: Request_Closing_Time, Length: 764, dtype: timedelta64[ns]
```

In [35]:
```
# groupby Borough based on Average Request_closing_time
csr_data1.groupby(["Complaint Type","Borough"])["Request_Closing_Time"].mean()
```

Out[35]:
```
Complaint Type  Borough
Agency Issues   Unspecified      -1 days +18:44:22.833333334
Animal Abuse    BRONX            -1 days +16:39:52.219787986
                BROOKLYN         -1 days +19:10:02.978279031
                MANHATTAN        -1 days +20:18:53.455081968
                QUEENS           -1 days +18:35:10.003731344
                                               ...
Vending         BROOKLYN         -1 days +19:28:18.823300971
                MANHATTAN        -1 days +20:41:38.027105922
                QUEENS           -1 days +19:13:57.981132076
                STATEN ISLAND       -1 days +19:43:42.640000
                Unspecified                -1 days +18:52:58
Name: Request_Closing_Time, Length: 119, dtype: timedelta64[ns]
```

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Performed Chi square Rest

In [40]:
```
# use chi square test to analyse the relation between both the variables.
chi,pval,dof,exp=stats.chi2_contingency(data.values) # data.values
print("Chisquare", chi)
print("plvaue", pval)
print("Degrees of freedom", dof)
print("Expected", exp)
```

```
Chisquare 0.0
plvaue 1.0
Degrees of freedom 0
Expected [[6.0000e+00 7.7780e+03 1.0000e+00 4.2700e+02 7.7044e+04 1.7718e+04
  2.8600e+02 1.2800e+03 2.0000e+00 1.1300e+02 4.4160e+03 1.6800e+02
  7.5361e+04 3.5577e+04 9.3100e+02 4.0420e+03 4.8612e+04 1.7083e+04
  3.0700e+02 6.5000e+02 4.0000e+00 4.4980e+03 5.9200e+02 3.8020e+03]]
```

In [41]:
```
# provide a statistical test to accept or reject the Null Hypothesis
if pval < 0.05:
    print("Alternate hypo--- Relation exists")
else:
    print("Null hypo-- no relation exists")
```

```
Null hypo-- no relation exists
```

In [43]:
```
# use chi square test to analyse the relation between both the variables.
chi,pval,dof,exp=stats.chi2_contingency(data1.values) # data.values
print("Chisquare", chi)
print("plvaue", pval)
print("Degrees of freedom", dof)
print("Expected", exp)
```

```
Chisquare 4161473.2249932536
plvaue 0.0
Degrees of freedom 2520940
Expected [[0.02607031 0.0013932  0.25818925 ... 0.01505933 0.00199221 0.01270704]
 [0.02607031 0.0013932  0.25818925 ... 0.01505933 0.00199221 0.01270704]
 [0.02607031 0.0013932  0.25818925 ... 0.01505933 0.00199221 0.01270704]
 ...
 [0.02607031 0.0013932  0.25818925 ... 0.01505933 0.00199221 0.01270704]
 [0.02607031 0.0013932  0.25818925 ... 0.01505933 0.00199221 0.01270704]
 [0.10428122 0.00557279 1.03275698 ... 0.06023731 0.00796882 0.05082818]]
```

In [44]:
```
# provide a statistical test to accept or reject the Null Hypothesis
if pval < 0.05:
    print("Alternate hypo--- Relation exists")
else:
    print("Null hypo-- no relation exists")
```

```
Alternate hypo--- Relation exists
```

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In [47]:
```
# use chi square test to analyse the relation between both the variables.
chi,pval,dof,exp=stats.chi2_contingency(data2.values) # data.values
print("Chisquare", chi)
print("plvaue", pval)
print("Degrees of freedom", dof)
print("Expected", exp)
```

```
Chisquare 1638407.5805696272
plvaue 0.0
Degrees of freedom 374
Expected [[5.17355531e-02 6.65409044e-06 2.84129662e-03 5.12411542e-01
  1.17843942e-01 1.90306986e-03 8.51058167e-03 1.33081809e-05
  7.51912219e-04 2.93245766e-02 1.11788719e-03 5.01226016e-01
  2.36692651e-01 6.18165001e-03 2.68891795e-02 3.23395449e-01
  1.13651865e-01 2.04280576e-03 4.31850469e-03 2.66163617e-05
  2.98968283e-02 3.93256745e-03 2.52855437e-02]
 [4.49064601e+02 5.77575050e-02 2.46624546e+01 4.44773219e+03
  1.02288541e+03 1.65186464e+01 7.38718489e+01 1.15515010e-01
  6.52659806e+00 2.54537324e+02 9.70326084e+00 4.35064182e+03
  2.05449221e+03 5.36567221e+01 2.33398078e+02 2.80707250e+03
  9.86498185e+02 1.77315540e+01 3.74846207e+01 2.31030020e-01
  2.59504470e+02 3.41346854e+01 2.19478519e+02]
 [1.60380215e+00 2.06276804e-04 8.80801951e-02 1.58847578e+01
  3.65316219e+00 5.89951658e-02 2.63828032e-01 4.12553607e-04
  2.33092788e-02 9.09061873e-01 3.46545030e-02 1.55380065e+01
  7.33747218e+00 1.91631150e-01 8.33564563e-01 1.00252589e+01
```

In [48]:
```
# provide a statistical test to accept or reject the Null Hypothesis
if pval < 0.05:
    print("Alternate hypo--- Relation exists")
else:
    print("Null hypo-- no relation exists")
```

```
Alternate hypo--- Relation exists
```

In [50]:
```
# use chi square test to analyse the relation between both the variables.
chi,pval,dof,exp=stats.chi2_contingency(data3.values) # data.values
print("Chisquare", chi)
print("plvaue", pval)
print("Degrees of freedom", dof)
print("Expected", exp)
```

```
Chisquare 119769.34666374496
plvaue 0.0
Degrees of freedom 1092
Expected [[5.73241100e+00 7.38046993e-04 3.11455831e-01 ... 3.31752124e+00
  4.36923820e-01 2.80088834e+00]
 [1.64937098e+02 2.12356249e-02 8.96143369e+00 ... 9.54541337e+01
  1.25714899e+01 8.05891963e+01]
 [1.86824486e+01 2.40536225e-03 1.01506287e+00 ... 1.08121033e+01
  1.42397445e+00 9.12834973e+00]
 ...
 [6.42030032e+01 8.26612633e-03 3.48830531e+00 ... 3.71562378e+01
  4.89354679e+00 3.13699494e+01]
 [9.23439299e+01 1.18892661e-02 5.01727030e+00 ... 5.34422512e+01
  7.03844554e+00 4.51197649e+01]
 [3.12676964e+00 4.02571087e-04 1.69884999e-01 ... 1.80955704e+00
  2.38322084e-01 1.52775728e+00]]
```

In [51]:
```
# provide a statistical test to accept or reject the Null Hypothesis
if pval < 0.05:
    print("Alternate hypo--- Relation exists")
else:
    print("Null hypo-- no relation exists")
```

```
Alternate hypo--- Relation exists
```