datacleaning-1

September 18, 2024

Data Cleaning-New York City Airbnb

The purpose of this data cleaning project is to refine and enhance the New York City Airbnb Open Data to ensure it is accurate, reliable, and ready for insightful analysis.

[1]:
```
#importing libraries
```

[2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
```

[3]:
```
Airbnb_dataset=pd.read_csv('AB_NYC_2019.csv')
```

[4]:
```
Airbnb_dataset.head(10)
```

[4]:
```
     id                                              name  host_id  \
0  2539                Clean & quiet apt home by the park     2787
1  2595                             Skylit Midtown Castle     2845
2  3647               THE VILLAGE OF HARLEM…NEW YORK !     4632
3  3831                   Cozy Entire Floor of Brownstone     4869
4  5022  Entire Apt: Spacious Studio/Loft by central park     7192
5  5099         Large Cozy 1 BR Apartment In Midtown East     7322
6  5121                                   BlissArtsSpace!     7356
7  5178                  Large Furnished Room Near B'way     8967
8  5203                Cozy Clean Guest Room - Family Apt     7490
9  5238                Cute & Cozy Lower East Side 1 bdrm     7549

    host_name neighbourhood_group       neighbourhood  latitude  longitude  \
0        John            Brooklyn          Kensington  40.64749  -73.97237
1    Jennifer           Manhattan             Midtown  40.75362  -73.98377
2   Elisabeth           Manhattan              Harlem  40.80902  -73.94190
3  LisaRoxanne            Brooklyn        Clinton Hill  40.68514  -73.95976
4       Laura           Manhattan         East Harlem  40.79851  -73.94399
5       Chris           Manhattan         Murray Hill  40.74767  -73.97500
6       Garon            Brooklyn  Bedford-Stuyvesant  40.68688  -73.95596
7    Shunichi           Manhattan      Hell's Kitchen  40.76489  -73.98493
```

```
8    MaryEllen          Manhattan     Upper West Side  40.80178  -73.96723
9          Ben          Manhattan           Chinatown  40.71344  -73.99037

         room_type  price  minimum_nights  number_of_reviews last_review  \
0     Private room    149               1                  9  2018-10-19
1  Entire home/apt    225               1                 45  2019-05-21
2     Private room    150               3                  0         NaN
3  Entire home/apt     89               1                270  2019-07-05
4  Entire home/apt     80              10                  9  2018-11-19
5  Entire home/apt    200               3                 74  2019-06-22
6     Private room     60              45                 49  2017-10-05
7     Private room     79               2                430  2019-06-24
8     Private room     79               2                118  2017-07-21
9  Entire home/apt    150               1                160  2019-06-09

   reviews_per_month  calculated_host_listings_count  availability_365
0               0.21                               6               365
1               0.38                               2               355
2                NaN                               1               365
3               4.64                               1               194
4               0.10                               1                 0
5               0.59                               1               129
6               0.40                               1                 0
7               3.47                               1               220
8               0.99                               1                 0
9               1.33                               4               188
```

[5]:
```
print("Number of rows and columns",Airbnb_dataset.shape)
```

```
Number of rows and columns (48895, 16)
```

[6]:
```
Airbnb_dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 48895 entries, 0 to 48894
Data columns (total 16 columns):
 #   Column                          Non-Null Count  Dtype
---  ------                          --------------  -----
 0   id                              48895 non-null  int64
 1   name                            48879 non-null  object
 2   host_id                         48895 non-null  int64
 3   host_name                       48874 non-null  object
 4   neighbourhood_group             48895 non-null  object
 5   neighbourhood                   48895 non-null  object
 6   latitude                        48895 non-null  float64
 7   longitude                       48895 non-null  float64
 8   room_type                       48895 non-null  object
 9   price                           48895 non-null  int64
 10  minimum_nights                  48895 non-null  int64
 11  number_of_reviews               48895 non-null  int64
 12  last_review                     38843 non-null  object
 13  reviews_per_month               38843 non-null  float64
 14  calculated_host_listings_count  48895 non-null  int64
 15  availability_365                48895 non-null  int64
dtypes: float64(3), int64(7), object(6)
memory usage: 6.0+ MB
```

Data cleaning

1)checking for data types

[7]:
```
Airbnb_dataset.dtypes
```

[7]:
```
id                                  int64
name                               object
host_id                             int64
host_name                          object
neighbourhood_group                object
neighbourhood                      object
latitude                          float64
longitude                         float64
room_type                          object
price                               int64
minimum_nights                      int64
number_of_reviews                   int64
last_review                        object
reviews_per_month                 float64
calculated_host_listings_count      int64
availability_365                    int64
dtype: object
```

column “last_review” has a dataype object which needs to be converted to date

[8]:
```
# Convert 'last_review' column to datetime
Airbnb_dataset['last_review'] = pd.to_datetime(Airbnb_dataset['last_review'],␣
 ↪errors='coerce')
```

[9]:
```
Airbnb_dataset.dtypes
```

[9]:
```
id                                         int64
name                                      object
host_id                                    int64
host_name                                 object
neighbourhood_group                       object
neighbourhood                             object
latitude                                 float64
longitude                                float64
```

```
room_type                                 object
price                                      int64
minimum_nights                             int64
number_of_reviews                          int64
last_review                       datetime64[ns]
reviews_per_month                        float64
calculated_host_listings_count             int64
availability_365                           int64
dtype: object
```

2)checking for duplicate values

```
[10]: Airbnb_dataset.duplicated().sum()
```

```
[10]: 0
```

no duplicates in dataset

3)checking for consistency

The strings in the dataset are inconsistent in case, so we need to convert them all to lowercase for uniformity.

```
[11]: Airbnb_dataset = Airbnb_dataset.map(lambda x: x.lower() if isinstance(x, str)␣
       ↪else x)

      Airbnb_dataset.head()
```

```
[11]:      id                                              name  host_id  \
      0  2539                clean & quiet apt home by the park     2787
      1  2595                             skylit midtown castle     2845
      2  3647               the village of harlem…new york !     4632
      3  3831                   cozy entire floor of brownstone     4869
      4  5022  entire apt: spacious studio/loft by central park     7192

           host_name neighbourhood_group neighbourhood  latitude  longitude  \
      0         john            brooklyn    kensington  40.64749  -73.97237
      1     jennifer           manhattan       midtown  40.75362  -73.98377
      2    elisabeth           manhattan        harlem  40.80902  -73.94190
      3  lisaroxanne            brooklyn  clinton hill  40.68514  -73.95976
      4        laura           manhattan   east harlem  40.79851  -73.94399

               room_type  price  minimum_nights  number_of_reviews last_review  \
      0     private room    149               1                  9  2018-10-19
      1  entire home/apt    225               1                 45  2019-05-21
      2     private room    150               3                  0         NaT
      3  entire home/apt     89               1                270  2019-07-05
      4  entire home/apt     80              10                  9  2018-11-19
```

```
   reviews_per_month  calculated_host_listings_count  availability_365
0               0.21                               6               365
1               0.38                               2               355
2                NaN                               1               365
3               4.64                               1               194
4               0.10                               1                 0
```

4)checking for null values

[12]:
```
Airbnb_dataset.isna().sum()
```

[12]:
```
id                                    0
name                                 16
host_id                               0
host_name                            21
neighbourhood_group                   0
neighbourhood                         0
latitude                              0
longitude                             0
room_type                             0
price                                 0
minimum_nights                        0
number_of_reviews                     0
last_review                       10052
reviews_per_month                 10052
calculated_host_listings_count        0
availability_365                      0
dtype: int64
```

from above we see that columns "name","host_name","last_review","reviews_per_month" have null values. dropping critical null values can impact loss of valuable information, inconsistent results.

so we can replace it with most repeating values as it is a large data set.

[13]:
```
# correcting name column
# Calculate the mode for each room_type
mode_names = Airbnb_dataset.groupby('room_type')['name'].apply(lambda x: x.
 ↪mode()[0] if not x.mode().empty else np.nan)

print(mode_names)
```

```
room_type
entire home/apt                                  home away from home
private room                                            private room
shared room        amazing cozy and warm male room on manhattan iv
Name: name, dtype: object
```

[14]:
```
# Function to replace null values with the mode
def replace_null_with_mode(row):
    if pd.isna(row['name']):
        return mode_names[row['room_type']]
    return row['name']

# Apply the function to the DataFrame
Airbnb_dataset['name'] = Airbnb_dataset.apply(replace_null_with_mode, axis=1)

Airbnb_dataset['room_type'].isna().sum()
```

[14]:
```
0
```

[15]:
```
# correcting host_name column
# Calculate the mode for each room_type
mode_names1 = Airbnb_dataset.groupby('room_type')['host_name'].apply(lambda x:␣
 ↪x.mode()[0] if not x.mode().empty else np.nan)

print(mode_names1)
```

```
room_type
entire home/apt    sonder (nyc)
private room              david
shared room              sergii
Name: host_name, dtype: object
```

[16]:
```
# Function to replace null values with the mode
def replace_null_with_mode(row):
    if pd.isna(row['host_name']):
        return mode_names1[row['room_type']]
    return row['host_name']

# Apply the function to the DataFrame
Airbnb_dataset['host_name'] = Airbnb_dataset.apply(replace_null_with_mode,␣
 ↪axis=1)

Airbnb_dataset['room_type'].isna().sum()
```

[16]:
```
0
```

[17]:
```
# Calculate the mode of the last_review column
mode_last_review = Airbnb_dataset['last_review'].mode().iloc[0] if not␣
 ↪Airbnb_dataset['last_review'].mode().empty else np.nan

# Replace NaN values in last_review column with the mode
Airbnb_dataset['last_review'] = Airbnb_dataset['last_review'].
 ↪fillna(mode_last_review)
```

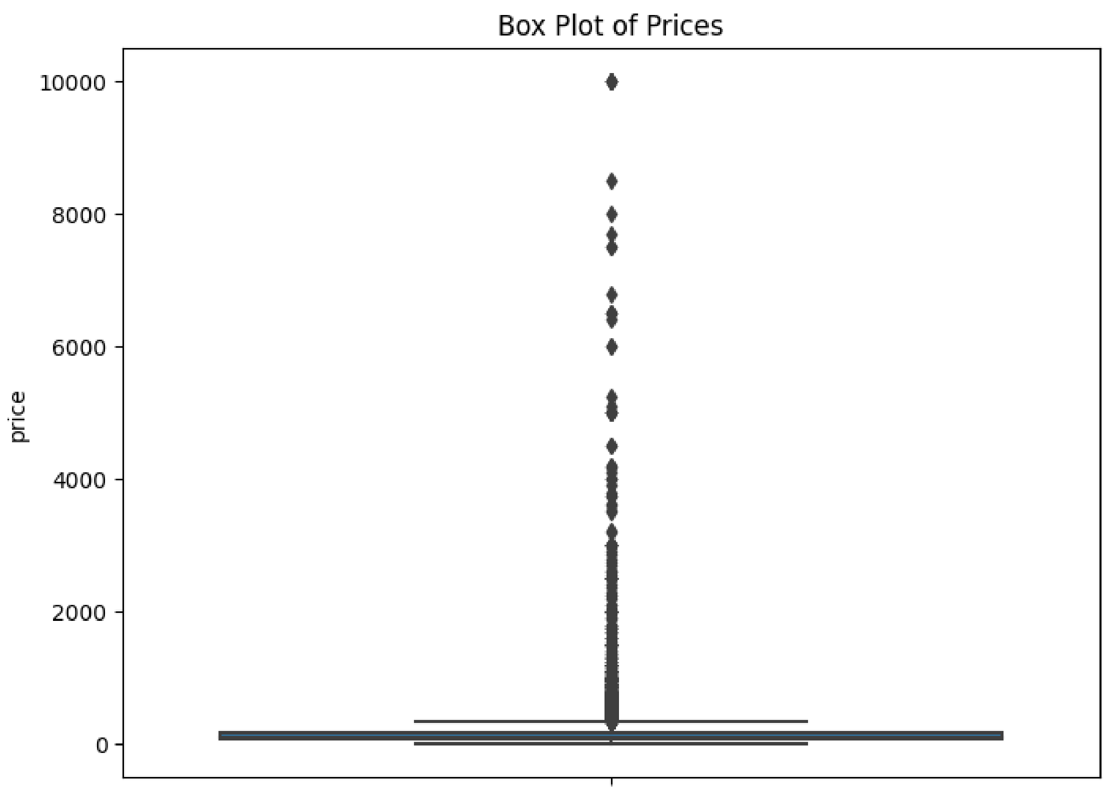
[18]:
```
# Calculate the mode of the reviews_per_month column
mode_reviews_per_month = Airbnb_dataset['reviews_per_month'].mode().iloc[0] if␣
 ↪not Airbnb_dataset['reviews_per_month'].mode().empty else np.nan

# Replace NaN values in reviews_per_month column with the mode
Airbnb_dataset['reviews_per_month'] = Airbnb_dataset['reviews_per_month'].
 ↪fillna(mode_reviews_per_month)
```

[19]:
```
Airbnb_dataset.isna().sum()
```

[19]:
```
id                                0
name                              0
host_id                           0
host_name                         0
neighbourhood_group               0
neighbourhood                     0
latitude                          0
longitude                         0
room_type                         0
price                             0
minimum_nights                    0
number_of_reviews                 0
last_review                       0
reviews_per_month                 0
calculated_host_listings_count    0
availability_365                  0
dtype: int64
```

5) Outlier detection and handling (price column)

[20]:
```
plt.figure(figsize=(8, 6))
sns.boxplot(y=Airbnb_dataset['price'])
plt.title('Box Plot of Prices')
plt.show()
```



[21]:
```
Airbnb_dataset.shape
```

[21]:
```
(48895, 16)
```

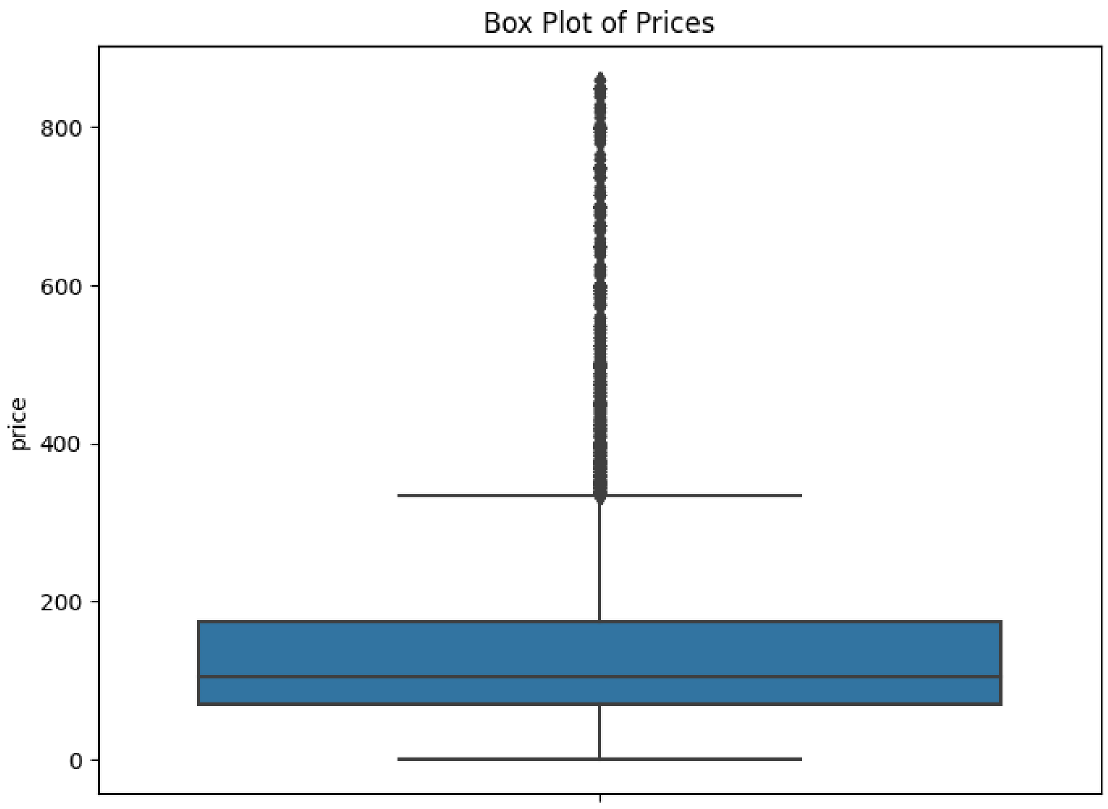
[22]:
```
# Calculate Z-scores
z_scores = stats.zscore(Airbnb_dataset['price'])
df_no_outliers = Airbnb_dataset[(z_scores < 3) & (z_scores > -3)]

print("\nDataFrame After Removing Outliers:")
print(df_no_outliers)
```

```
DataFrame After Removing Outliers:
             id                                          name   host_id  \
0          2539                clean & quiet apt home by the park      2787
1          2595                             skylit midtown castle      2845
2          3647               the village of harlem…new york !    4632
3          3831                   cozy entire floor of brownstone      4869
4          5022  entire apt: spacious studio/loft by central park      7192
…           …                                               …       …
48890  36484665    charming one bedroom - newly renovated rowhouse   8232441
48891  36485057      affordable room in bushwick/east williamsburg   6570630
```

```
48892  36485431          sunny studio at historical neighborhood  23492952
48893  36485609             43rd st. time square-cozy single bed  30985759
48894  36487245  trendy duplex in the very heart of hell's kitchen  68119814

           host_name neighbourhood_group       neighbourhood  latitude  \
0               john            brooklyn          kensington  40.64749
1           jennifer           manhattan             midtown  40.75362
2          elisabeth           manhattan              harlem  40.80902
3        lisaroxanne            brooklyn        clinton hill  40.68514
4              laura           manhattan         east harlem  40.79851
…                  …                   …                   …       …
48890        sabrina            brooklyn  bedford-stuyvesant  40.67853
48891        marisol            brooklyn            bushwick  40.70184
48892  ilgar & aysel           manhattan              harlem  40.81475
48893            taz           manhattan      hell's kitchen  40.75751
48894    christophe           manhattan      hell's kitchen  40.76404

       longitude        room_type  price  minimum_nights  number_of_reviews  \
0      -73.97237     private room    149               1                  9
1      -73.98377  entire home/apt    225               1                 45
2      -73.94190     private room    150               3                  0
3      -73.95976  entire home/apt     89               1                270
4      -73.94399  entire home/apt     80              10                  9
…              …              …    …               …                  …
48890  -73.94995     private room     70               2                  0
48891  -73.93317     private room     40               4                  0
48892  -73.94867  entire home/apt    115              10                  0
48893  -73.99112      shared room     55               1                  0
48894  -73.98933     private room     90               7                  0

      last_review  reviews_per_month  calculated_host_listings_count  \
0      2018-10-19               0.21                               6
1      2019-05-21               0.38                               2
2      2019-06-23               0.02                               1
3      2019-07-05               4.64                               1
4      2018-11-19               0.10                               1
…           …                  …                              …
48890  2019-06-23               0.02                               2
48891  2019-06-23               0.02                               2
48892  2019-06-23               0.02                               1
48893  2019-06-23               0.02                               6
48894  2019-06-23               0.02                               1

       availability_365
0                   365
1                   355
2                   365
3                   194
```

```
4                       0
…                     …
48890                   9
48891                  36
48892                  27
48893                   2
48894                  23

[48507 rows x 16 columns]
```

[23]:
```
plt.figure(figsize=(8, 6))
sns.boxplot(y=df_no_outliers['price'])
plt.title('Box Plot of Prices')
plt.show()
```


Box Plot of Prices
price