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April 27, 2024

1 Objective

- Use a business dataset to formulate conclusions
- Create visual representations of data collected through data wrangling and data filtration
- Interpret datasets using data retrieval techniques to collect them

2 Problem Area

When users look for a place to stay, they may look for Airbnb's or hotels. In this case, I will be looking at the dataset regarding New York City's Airbnb Options. Through data retrieval techniques, I will provide information regarding a house's rental price and its area. I will also look at the Airbnb properties of the Airbnb hosts.

By collecting this information, both customers and hosts can benefit from this. Customers can use this data to filter a location that is most cost-effective for them, providing them with informaed decisions on where to stay. They will also be able to see which host offers locations all year round and whihc do not. Hosts, on the other hand, can see which locations yield the highest return for their money.

These fings are part of Airbnb's public dataset.

3 Understanding the Dataset

The dataset I will be looking at can be found through Kaggle's collection of datasets. (https://www.kaggle.com/datasets/dgomonov/new-york-city-airbnb-open-data)

This dataset involves an official release of New York City's Airbnb open data from 2019 taken directly from the Airbnb website.

I will be looking primarily at the **price, host name, neighborhood, and availability.**

Understanding rental price trends will provide valuable information to the hosts and guests by filtering information such as cost and area to those interested in the Airbnb market.

4 Queries

By answering and plotting these equeries, I will provide an analysis of how each query can be interpreted.

1. Top 3 neighborhoods that have the highest average nightly rental price

2. Top 3 neighborhoods that have the lowest average nightly rental price
3. Top 10 hosts who have the lowest nightly rental price
4. List the name's of 10 hosts who have had at least one of their Airbnb listings available to rent all year
5. List the name's of 10 hosts who have had at least one of their Airbnb listings not available to rent all year
6. Top 10 hosts who have the highest nightly rental price

I will begin by first importing the required libraries used for retrieving and plotting data.

```
[1]: import pandas as pd
     import matplotlib.pyplot as plt
```

```
[2]: data = pd.read_csv('AB_NYC_2019.csv')
```

5 Pre-Processing/Data Cleaning

Since I only need to work with the columns pertaining to host name, neighborhouud, price, and availablility. I will only focus on those by gathering the element number correlated to their respective columns. This will provide me of a subset of the relevant data.

```
[3]: data.columns
```

```
[3]: Index(['id', 'name', 'host_id', 'host_name', 'neighbourhood_group',
            'neighbourhood', 'latitude', 'longitude', 'room_type', 'price',
            'minimum_nights', 'number_of_reviews', 'last_review',
            'reviews_per_month', 'calculated_host_listings_count',
            'availability_365'],
           dtype='object')
```

```
[4]: relevantData = data.iloc[:,[3, 5, 9, 15]].copy()
     relevantData
```

```
[4]:           host_name       neighbourhood  price  availability_365
     0              John          Kensington    149               365
     1          Jennifer             Midtown    225               355
     2         Elisabeth              Harlem    150               365
     3       LisaRoxanne        Clinton Hill     89               194
     4             Laura         East Harlem     80                 0
     …                …                   …      …                …
     48890       Sabrina  Bedford-Stuyvesant     70                 9
     48891       Marisol            Bushwick     40                36
     48892  Ilgar & Aysel             Harlem    115                27
     48893           Taz      Hell's Kitchen     55                 2
     48894    Christophe      Hell's Kitchen     90                23

     [48895 rows x 4 columns]
```

Here I check for any null values in my relevant data using .isnull() and drop any null values I find after locating which column is associated with the null values.

```
[5]: relevantData.isnull().sum()
```

```
[5]: host_name          21
     neighbourhood       0
     price               0
     availability_365    0
     dtype: int64
```

```
[6]: relevantData.dropna(how = 'all', subset = ['host_name'],inplace = True)
     relevantData.isnull().sum()
```

```
[6]: host_name          0
     neighbourhood      0
     price              0
     availability_365   0
     dtype: int64
```

After dropping null values, I also delete any duplicate rows that can provide inconsistencies in the data processing process.

```
[7]: relevantData.duplicated().sum()
```

```
[7]: 895
```

```
[8]: relevantData.drop_duplicates(inplace = True)
     relevantData.duplicated().sum()
```

```
[8]: 0
```

To see what type of information the Airbnb dataset provides me with, I will print then data types for each column in the relevant data table I have created.

```
[9]: relevantData.dtypes
```

```
[9]: host_name           object
     neighbourhood       object
     price                int64
     availability_365     int64
     dtype: object
```

Since the average price corresponding to the neighborhood will be used in future queries, I will add a column of average rental prices in addition to the data I have previously sliced.

```
[10]: neighborhood_avg_price = relevantData.groupby('neighbourhood')['price'].
        ↪transform('mean')
      relevantData['avg_price'] = neighborhood_avg_price
```

```
relevantData
```

[10]:
```
            host_name        neighbourhood  price  availability_365   avg_price
0                John           Kensington    149               365   93.195402
1            Jennifer              Midtown    225               355  274.896480
2           Elisabeth               Harlem    150               365  119.500764
3         LisaRoxanne         Clinton Hill     89               194  181.391228
4               Laura          East Harlem     80                 0  133.812500
…                   …                    …      …                 …           …
48890         Sabrina   Bedford-Stuyvesant     70                 9  108.525130
48891         Marisol             Bushwick     40                36   85.446013
48892   Ilgar & Aysel               Harlem    115                27  119.500764
48893             Taz       Hell's Kitchen     55                 2  203.776596
48894      Christophe       Hell's Kitchen     90                23  203.776596

[47979 rows x 5 columns]
```

6 1. Top 3 neighborhoods that have the highest average nightly rental price

Using sort_values(), I will obtain the average price and order the dataset by descending order to gather the average prices starting from the highest to lowest.

By using drop_duplicates(), I will drop any duplicates of the same neighborhood to gather the top 3 neighborhoods instead of the top 3 average prices only since there can be multiple Airbnb's in one neighborhood.

The use of .head(3) will gather the top 3 results of the table.

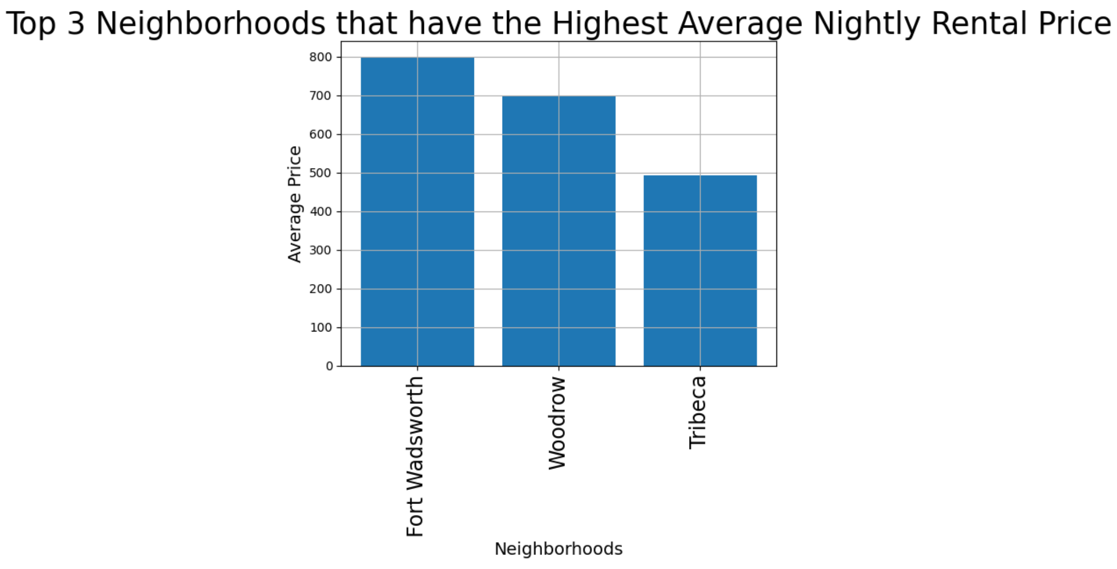
[11]:
```
top_3_neighborhoods_avg = relevantData.sort_values(by = 'avg_price', ascending␣
  ↪= False).drop_duplicates(subset = 'neighbourhood').head(3)
top_3_neighborhoods_avg
```

[11]:
```
      host_name   neighbourhood  price  availability_365   avg_price
25386      Mark  Fort Wadsworth    800               365  800.000000
3049      Donna         Woodrow    700                 0  700.000000
46252        Ej         Tribeca    600                80  493.028409
```

By creating a bar graph, we can plot the top 3 neighborhoods associated with the highest average nightly rental price and see the price associated with it.

[12]:
```
avgPrice = top_3_neighborhoods_avg['avg_price']
neighborhoods = list(top_3_neighborhoods_avg['neighbourhood'])

fig,ax = plt.subplots(nrows = 1, ncols = 1)

ax.bar(neighborhoods, avgPrice)
```

```
plt.xlabel('Neighborhoods', fontsize = 14)
plt.ylabel('Average Price', fontsize = 14)
plt.xticks(rotation = 'vertical', fontsize = 17)
plt.title('Top 3 Neighborhoods that have the Highest Average Nightly Rental␣
  ↪Price', fontsize = 25)

ax.grid()
plt.show()
```



For Airbnb customers, these neighborhoods may be areas that customers may want to deter from. For hosts, these neighborhoods may be areas to purchase properties to sell for rental.

7 2. Top 3 neighborhoods that have the lowest average nightly rental price

In the code snippet below, the average price is sorted this time without stating ascending to be false. This will make ascending true by default, and the drop_duplicates() is implemented to remove the same neighborhood in case another row has a duplicate. Since we want to see the top 3 neighborhoods and not lowest average nightly rental price only, it is necessary.

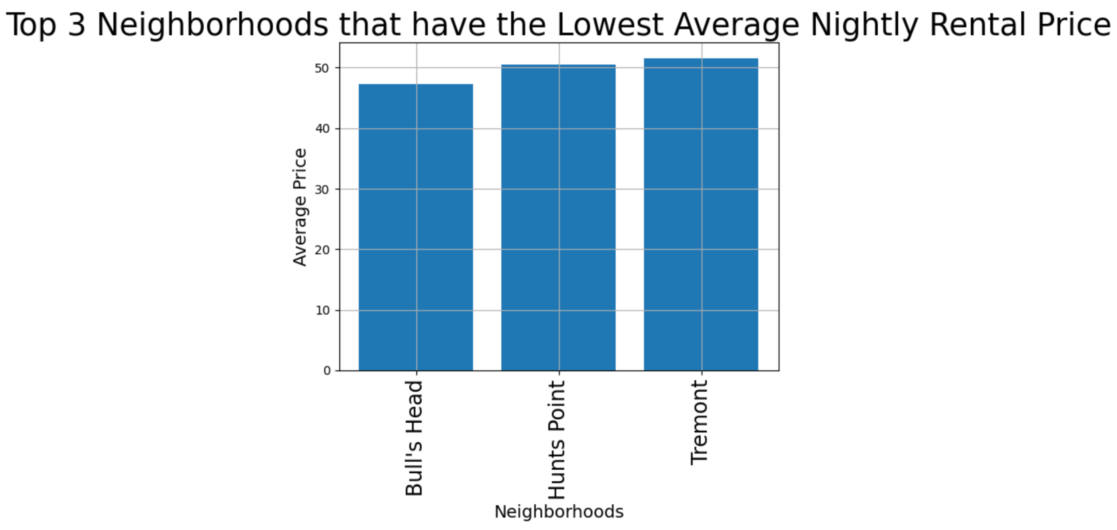
.head() is used to obtain the top 3.

```
[13]: top_3_neighborhoods_lowest_avg = relevantData.sort_values(by = 'avg_price').
        ↪drop_duplicates(subset = 'neighbourhood').head(3)
      top_3_neighborhoods_lowest_avg
```

```
[13]:        host_name neighbourhood  price  availability_365  avg_price
      37044    Xiomara    Bull's Head     80               362  47.333333
      29591  Schomberg    Hunts Point     45                 0  50.500000
      22708       Emma        Tremont     38               327  51.545455
```

This code block plots the top 3 neighborhoods with the least average nightly rental price.

```
[14]: avgPrice = top_3_neighborhoods_lowest_avg['avg_price']
      neighborhoods = list(top_3_neighborhoods_lowest_avg['neighbourhood'])

      fig,ax = plt.subplots(nrows = 1, ncols = 1)

      ax.bar(neighborhoods, avgPrice)

      plt.xlabel('Neighborhoods', fontsize = 14)
      plt.ylabel('Average Price', fontsize = 14)
      plt.xticks(rotation = 'vertical', fontsize = 17)
      plt.title('Top 3 Neighborhoods that have the Lowest Average Nightly Rental␣
        ↪Price', fontsize = 25)

      ax.grid()
      plt.show()
```



For Airbnb customers, these neighborhoods may be areas that customers may be attracted to sinec they are more cost-effective. For hosts, these neighborhoods may be areas to deter away from since they yield lower rental prices.

8 3. Top 10 hosts who have the lowest nightly rental price

I collect the top 10 expensive nightly rental prices here by sorting the table by its price in ascending order. I then drop any duplicates of the host name in case a host has multiple properties of the cheapest prices.

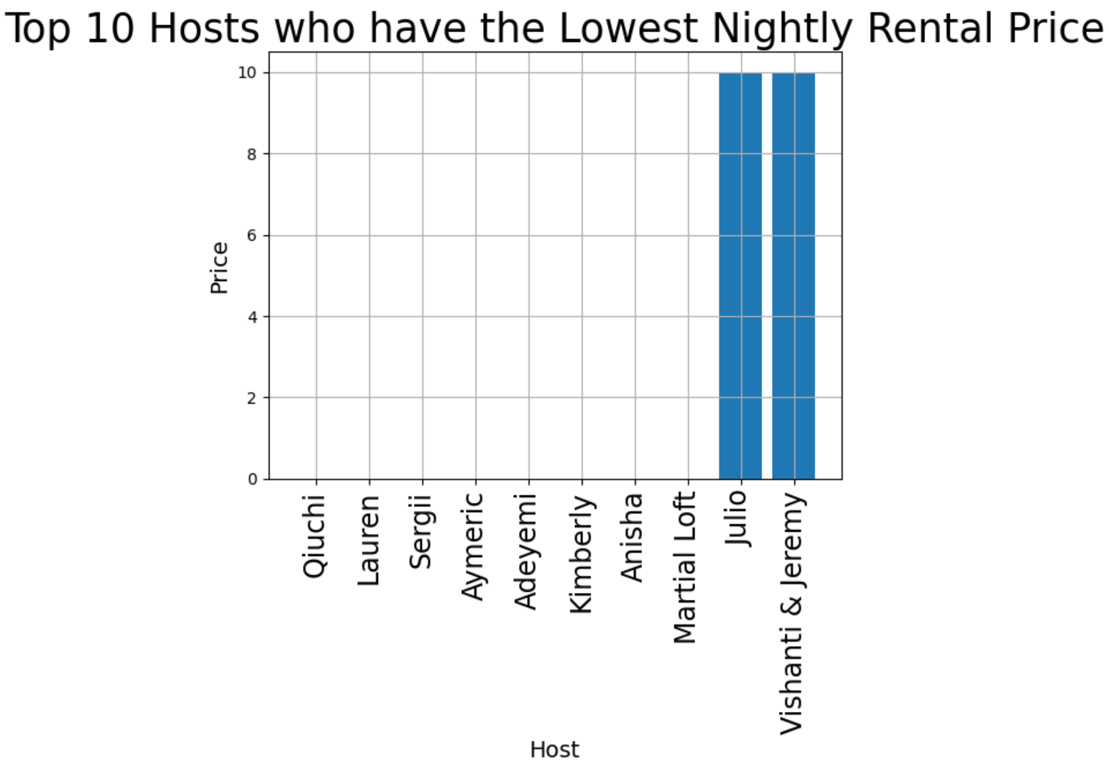
I then use .head(10) to output the top 10 hosts who have the lowest nightly rental price.

```
[15]: top_10_host = relevantData.sort_values(by='price').drop_duplicates(subset =␣
        ↪'host_name').head(10)
      top_10_host
```

```
[15]:              host_name       neighbourhood  price  availability_365  \
      26259            Qiuchi         Murray Hill      0                 0
      25753            Lauren          Greenpoint      0                 0
      26866            Sergii            Bushwick      0               139
      25778           Aymeric        Williamsburg      0                73
      25794           Adeyemi  Bedford-Stuyvesant      0               176
      23161          Kimberly  Bedford-Stuyvesant      0                28
      25433            Anisha     East Morrisania      0               127
      25634      Martial Loft            Bushwick      0                 0
      47218             Julio            Bushwick     10                 0
      27972  Vishanti & Jeremy          Greenpoint     10                32

              avg_price
      26259  224.182018
      25753  143.850788
      26866   85.446013
      25778  144.659802
      25794  108.525130
      23161  108.525130
      25433   85.000000
      25634   85.446013
      47218   85.446013
      27972  143.850788
```

In the code snippet below, I output the result in a bar chart where the top 10 hosts who have the lowest nightly rental price are shown with their corresponding price.

```
[16]: price = top_10_host['price']
      host = list(top_10_host['host_name'])

      fig,ax = plt.subplots(nrows = 1, ncols = 1)

      ax.bar(host, price)

      plt.xlabel('Host', fontsize = 14)
      plt.ylabel('Price', fontsize = 14)
      plt.xticks(rotation = 'vertical', fontsize = 17)
      plt.title('Top 10 Hosts who have the Lowest Nightly Rental Price', fontsize =␣
        ↪25)

      ax.grid()
      plt.show()
```



As shown in the bar chart, the prices and hosts are given for the lowest prices. For customers, this can be used as a filter to look at any other listings the host may have since they have cost-effective prices. For hosts, this can help bring business to them since they will stand out as having cheaper properties.

9 4. List the name's of 10 hosts who have had at least one of their Airbnb listings available to rent every day of the year.

In the code snippet, I use the relevantData table I created to look for the number '365' in the availability_365 column. By setting this condition in place, the table will output only rows with that condition being met, which indicates that the Airbnb listning has been available to rent every day. I drop duplicates of the host name since every row must have a unique host name.

Since order is not relevant here, I will not be sorting by ascending or descending.

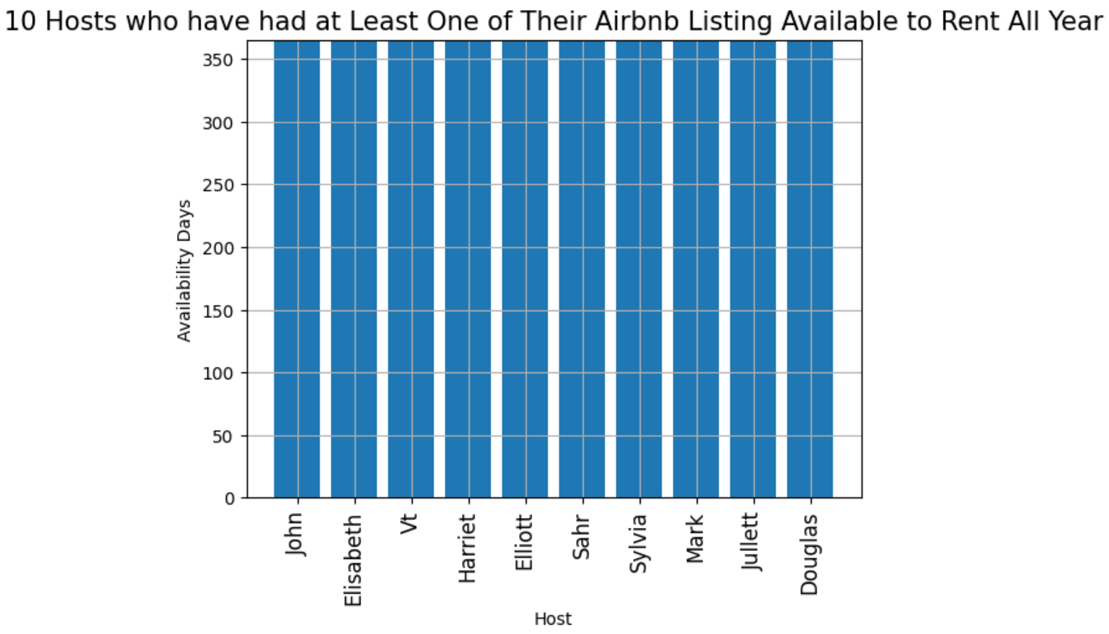
I then use .head(10) to return 10 rows the table outputted.

```
[17]: all_year_availablity = relevantData[relevantData['availability_365'] == 365].
        ↪drop_duplicates(subset = 'host_name').head(10)
      all_year_availablity
```

```
[17]:       host_name        neighbourhood  price  availability_365    avg_price
      0          John           Kensington    149               365    93.195402
      2     Elisabeth               Harlem    150               365   119.500764
      36           Vt   Bedford-Stuyvesant     35               365   108.525130
      38      Harriet             Flatbush    150               365    92.321370
      97      Elliott               Harlem     89               365   119.500764
      139        Sahr         Clinton Hill    135               365   181.391228
      164      Sylvia      Upper East Side    250               365   189.402715
      181        Mark            Ridgewood    350               365    77.654589
      196     Jullett              Jamaica     55               365    94.740909
      204     Douglas               Harlem    200               365   119.500764
```

The code snippet below shwos a bar graph of the hosts who had their listing available to rent 365 days of the year.

```
[18]: availability = all_year_availablity['availability_365']
      host = list(all_year_availablity['host_name'])

      fig,ax = plt.subplots(nrows = 1, ncols = 1)

      ax.bar(host, availability)

      plt.xlabel('Host', fontsize = 10)
      plt.ylabel('Availability Days', fontsize = 10)
      plt.xticks(rotation = 'vertical', fontsize = 12)
      plt.title('10 Hosts who have had at Least One of Their Airbnb Listing Available␣
        ↪to Rent All Year', fontsize = 15)

      plt.ylim(0,365)

      ax.grid()
      plt.show()
```



From the bar graph, you can see at least 10 hosts who have had their listing available 365 days of the year. Customers can use this infromation to see which listings are not in high demand. They may also use it to filter out for available listings, so this will narrow their search and lead to a better experience. Hosts may benefit from this since it will bring attention to customers who are looking for a low demand listing, and potentionally cheaper rental price.

10 5. List the name's of 10 hosts who have had at least one of their Airbnb listings not available to rent all year.

In the code snippet, I use the relevantData table I created to look for the number '0' in the availability_365 column. By setting this condition in place, the table will output only rows with that condition being met, which indicates that the Airbnb has not been available to rent at all in one year. I drop duplicates of the host name since every row must have a unique host name.

Since order is not relevant here, I will not be sorting by ascending or descending.

I then use .head(10) to return 10 rows the table outputted.

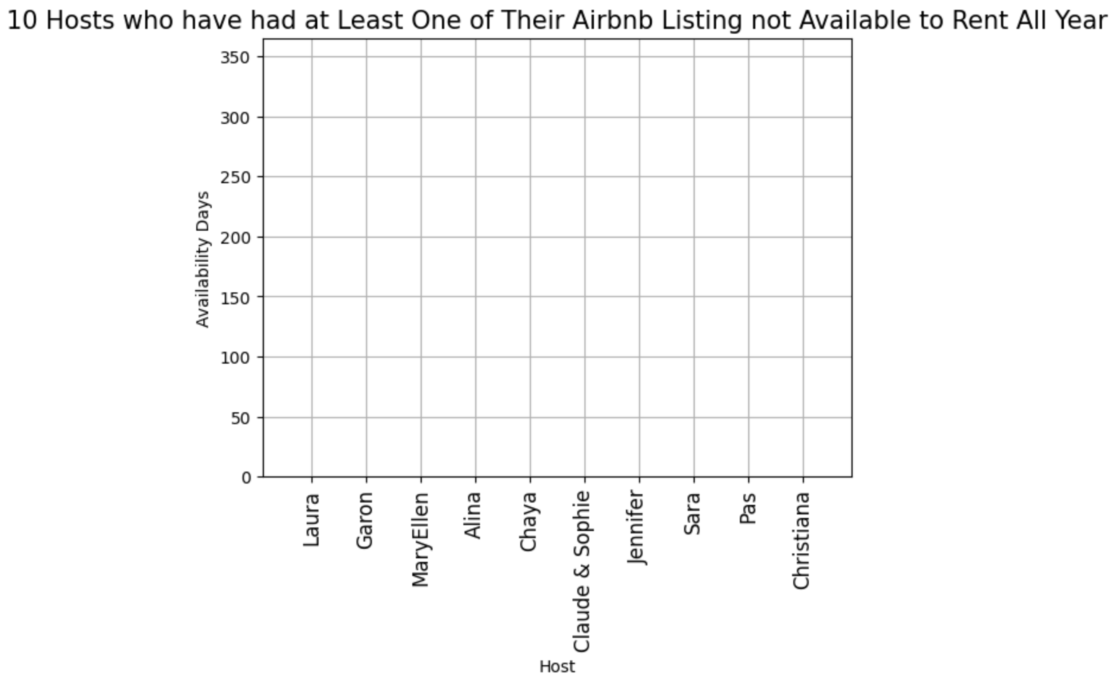
[19]:
```
no_availability = relevantData[relevantData['availability_365'] == 0].
  ↪drop_duplicates(subset = 'host_name').head(10)
no_availability
```

[19]:
```
        host_name        neighbourhood  price  availability_365   avg_price
4           Laura          East Harlem     80                 0  133.812500
6           Garon   Bedford-Stuyvesant     60                 0  108.525130
8       MaryEllen      Upper West Side     79                 0  209.478619
14          Alina         West Village    120                 0  268.448231
```

```
20              Chaya        Williamsburg    299                 0   144.659802
26    Claude & Sophie              Inwood     80                 0    88.898785
48           Jennifer  Bedford-Stuyvesant    115                 0   108.525130
66               Sara          Park Slope    225                 0   176.542574
88                Pas       East Village     50                 0   186.730811
94         Christiana        Williamsburg    100                 0   144.659802
```

The code snippet below shwos a bar graph of the hosts who had their listing available to rent 0 days of the year.

[20]:
```python
availability = no_availability['availability_365']
host = list(no_availability['host_name'])

fig,ax = plt.subplots(nrows = 1, ncols = 1)

ax.bar(host, availability)

plt.xlabel('Host', fontsize = 10)
plt.ylabel('Availability Days', fontsize = 10)
plt.xticks(rotation = 'vertical', fontsize = 12)
plt.title('10 Hosts who have had at Least One of Their Airbnb Listing not␣
↪Available to Rent All Year', fontsize = 15)

plt.ylim(0,365)

ax.grid()
plt.show()
```



From the bar graph, you can see at least 10 hosts who have had their listing available 365 days of the year. Customers can use this infromation to see which listings are in high demand. They may also use it to filter out any Airbnb's that are not available, so this will narrow their search and lead to a better experience. Customers may also take note of how high demand a certain Airbnb is, which may lead to them booking it earlier. Hosts may benefit from this since they will be able to see their competition and see what a successful Airbnb looks like.

11 6. Top 10 hosts who have the highest nightly rental price

The code sorts values by price in a descending order by setting ascending = false. It also drops duplicates since every host name should be unique.

.head(10) is used to grab the top 10 hosts.

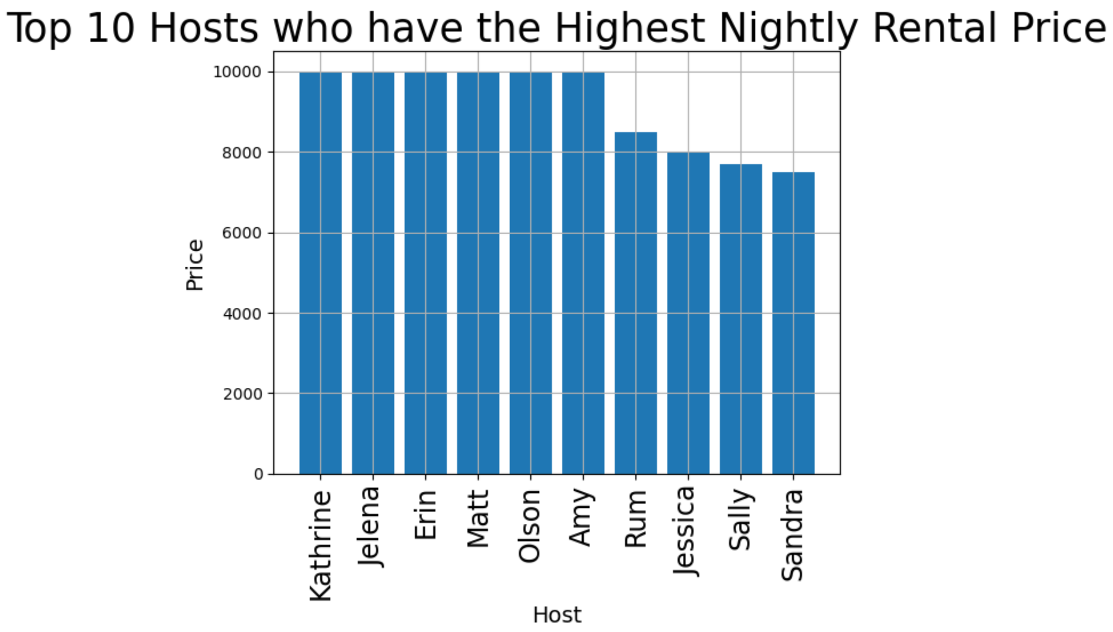
```
[21]: top_10_host = relevantData.sort_values(by='price', ascending=False).
        ↪drop_duplicates(subset = 'host_name').head(10)
      top_10_host
```

```
[21]:      host_name    neighbourhood  price  availability_365   avg_price
      9151   Kathrine          Astoria  10000                 0  117.495536
      29238    Jelena  Upper West Side  10000                83  209.478619
      17692      Erin       Greenpoint  10000                 0  143.850788
      40433      Matt  Lower East Side   9999               365  188.828090
      6530      Olson      East Harlem   9999                 0  133.812500
      12342       Amy  Lower East Side   9999                83  188.828090
      30268       Rum          Tribeca   8500               251  493.028409
      4377    Jessica     Clinton Hill   8000               365  181.391228
      29662     Sally  Upper East Side   7703               146  189.402715
      45666    Sandra    East Flatbush   7500               179  104.881391
```

The code snippet below graphs the top 10 hosts who have the highest nightly rental price in a bar chart.

```
[22]: price = top_10_host['price']
      host = list(top_10_host['host_name'])

      fig,ax = plt.subplots(nrows = 1, ncols = 1)

      ax.bar(host, price)

      plt.xlabel('Host', fontsize = 14)
      plt.ylabel('Price', fontsize = 14)
      plt.xticks(rotation = 'vertical', fontsize = 17)
      plt.title('Top 10 Hosts who have the Highest Nightly Rental Price', fontsize =␣
        ↪25)
```

```
ax.grid()
plt.show()
```



Customers can use this bar chart to see which hosts to potenionally avoid or look at if they seek a potentionally luxurious place to rent. Hosts can benefit from this because they can see what an expensive Airbnb entails and see their competition in that price area.

12 Conclusion

Overall, by analyzing the New York City's Airbnb dataset, we can provide valuable insights on how customers and benefits can benefit from them. Customers can use the information as a way to filter their needs such as sorting by cheaper or expensive rentals. They will be able to filter which neighborhoods yield a higher price on average, and which yield a smaller price. They will also be able to see which Airbnb's are usually more readily available, which may affect their booking date.

Hosts on the Airbnb website hosting rental properties in New York City may also benefit because they also gain valuable insights. Hosts can see which locations yield high-return results when it comes to money. By seeing which locations are more expensive or cheaper on average, they may adjust their pricing accordingly to stay competitive with their fellow hosts.

By plotting these results, I was able to provide the results visually to make it easier to understand the results and identify any trends.