# CA1 - LaTeX Final

March 1, 2023

## 1 Compulsory Assignment 1 - Pandas and visualizations

### 1.0.1 Imports

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

---

### 1.1 Loading and exploring the dataset

**1. Load the dataset named `airbnb.csv` and store it in a dataframe called `raw_df`. Use the column named `id` as the index column for the dataframe**

[ ]:
```
# Insert your code below
raw_df = pd.read_csv(r"assets\airbnb.csv")
raw_df = raw_df.set_index('id')

# ======================
```

**2. Print the first `five` rows of the dataframe**

[ ]:
```
# Insert your code below
# ======================

raw_df.head(5)
```

[ ]:
```
                                                  name  host_id  host_name  \
id
183319                  Panoramic Ocean View Venice Beach   867995  Barbara X
109     Amazing bright elegant condo park front *UPGRA…      521      Paolo
51307   Spanish Bungalow Guest House LA CA. 30 plus ni…   235568      David
184314                    Boho Chic Flat..Steps to Beach!   884031     Ashley
51498   Guest House With Its Own Entrance/Exit and Hot…   236758        Bay

          neighbourhood  latitude  longitude        room_type  price  \
id
```

```
183319           Venice  33.99211 -118.47600  Entire home/apt    152
109         Culver City  33.98301 -118.38607  Entire home/apt    115
51307   Atwater Village  34.12206 -118.26783  Entire home/apt     75
184314           Venice  33.97487 -118.46312  Entire home/apt    125
51498         Mar Vista  34.00389 -118.44126  Entire home/apt    189

        minimum_nights  number_of_reviews  calculated_host_listings_count  \
id
183319              30                  3                               2
109                 30                  2                               1
51307               30                138                               2
184314              30                 30                               1
51498                3                378                               1

        availability_365  number_of_reviews_ltm state         city
id
183319                 0                      0    CA  Los Angeles
109                  139                      0    CA  Los Angeles
51307                224                      0    CA  Los Angeles
184314                 0                      0    CA  Los Angeles
51498                348                     41    CA  Los Angeles
```

**3. How many unique values exist in each of the columns `state` and `city`?**

[ ]:
```
# Insert your code below
# ======================

unique_state = raw_df['state'].nunique() # .nunique() returns number of unique␣
 ↪values.
unique_city = raw_df['city'].nunique()

print("Number of unique cities:", unique_city)
print("Number of unique cities:", unique_state)
```

```
Number of unique cities: 31
Number of unique cities: 19
```

**4. Identify missing (NaN) values in each of the columns in the dataset**

[ ]:
```
# Insert your code below
# ======================

print(raw_df.isnull().sum()) # .isnull() finds all nan-values while .sum()␣
 ↪counts them.
```

```
name                           19
host_id                         0
host_name                    1144
neighbourhood                 712
```

```
latitude                            0
longitude                           0
room_type                           0
price                               0
minimum_nights                      0
number_of_reviews                   0
calculated_host_listings_count      0
availability_365                    0
number_of_reviews_ltm               0
state                               0
city                                0
dtype: int64
```

**5. Create a copy of `raw_df` named `df`. Remove any rows containing NaN values in the new dataframe. What is the shape of `df` before and after removing the NaN values?**

[ ]:
```
# Insert your code below
# ======================
df = raw_df.copy()
df = df.dropna() # drops rows if a nan value is present
print("Dataframe shape before removing NaN values:", raw_df.shape)
print("Dataframe shape after removing NaN values:", df.shape)
```

```
Dataframe shape before removing NaN values: (325858, 15)
Dataframe shape after removing NaN values: (323983, 15)
```

**6. Which `room_type`, `state` and `city` is the most popular (by number of instances)? Print the name and count of each**

Hint: The output should look something like this:

```
Column: [col], Most popular: [name], Count: [count]
Column: [col], Most popular: [name], Count: [count]
Column: [col], Most popular: [name], Count: [count]
```

[ ]:
```
# Insert your code below
# ======================
for feature in ['room_type', 'state', 'city']:
    count = df[feature].value_counts()[0] # .value_counts() returns number of␣
 ↪occurences of a each unique instance.
    name = df[feature].value_counts().index[0] # .index returns the unique␣
 ↪instance variables.
    print(f"Column: {feature}, Most popular: {name}, Count: {count}")

q = df['room_type'].value_counts()
```

```
Column: room_type, Most popular: Entire home/apt, Count: 241433
Column: state, Most popular: CA, Count: 127206
Column: city, Most popular: Los Angeles, Count: 91600
```

**7. What is the average and median `price` for a listing?**

[ ]:
```
# Insert your code below
# ======================

median = df['price'].median() # compute median of th column 'price' in the␣
 ↪dataframe
average = df['price'].mean() # compute mean of th column 'price' in the␣
 ↪dataframe

print(f"The average price for an AirBnb listing is {average:.2f} USD.␣
 ↪Meanwhile, the median price for a listing is {median:.2f} USD.")
```

```
The average price for an AirBnb listing is 285.13 USD. Meanwhile, the median
price for a listing is 159.00 USD.
```

**8. What is the average price for the states `CA`, `FL` and `NY`?**

Hint: The output should look something like this:

```
State: [col], Average price: [price]
State: [col], Average price: [price]
State: [col], Average price: [price]
```

[ ]:
```
# Insert your code below
# ======================

for state in ['CA', 'FL', 'NY']:
    current_state = df[df['state'] == state] # create new dataframe with␣
 ↪entries which has the specified state name in the 'state' column.
    average_price = current_state['price'].mean()
    print(f"State: {state}, Average price: {average_price:.2f}")
```

```
State: CA, Average price: 288.40
State: FL, Average price: 241.99
State: NY, Average price: 197.22
```

**9. Create a new dataframe called `df_beach` containing all listings with "beach" in the `name`. Print out the shape of `beach_df`**

The filtering should not be case sensitive, meaning that names containing `beach`, `Beach`, `BeAcH` etc. all should be included

[ ]:
```
# Insert your code below
# ======================

df_beach = df[df['name'].str.contains('beach', case=False)] # create new␣
 ↪dataframe with entries which has the word beach in the 'name' column.
```

---

### 1.2 Visualizing the dataset

**10. Create plot with 2 vertical axes and one horizontal axes. The plot should display a barchart containing the `count` of the `10 most popular` states and cities, each in its own subplot. The bars should be sorted in descending order.**

Use `df` in all tasks in this section

Hint: It is recommended to use the `Barplot` function built into Seaborn for barcharts.

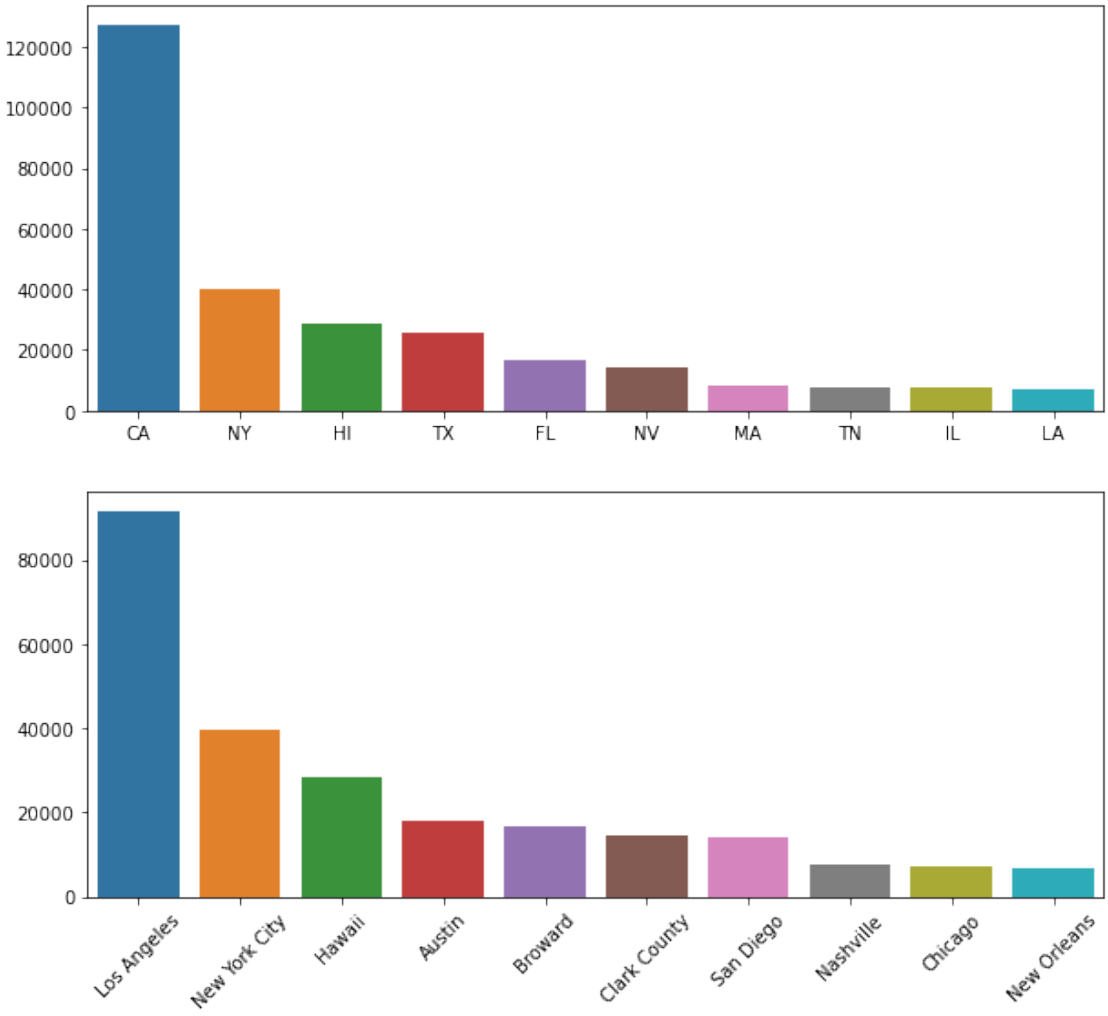
The output should look something like this:

PS: Disregard the color scheme of the example image.

[ ]:
```
# Insert your code below
# ======================
most_popular_states = df['state'].value_counts()[:10] # get the 10 most popular␣
 ↪states
most_popular_cities = df['city'].value_counts()[:10] # get the 10 most popular␣
 ↪cities

barplot, axes = plt.subplots(2, 1, figsize=(10, 9)) # Create a 2x1 subplot

sns.barplot(x=most_popular_states.index, y=most_popular_states.values,␣
 ↪ax=axes[0]) # Create a barplot where the x-labels are the state names, while␣
 ↪the bar corresponds to the number of occurences.
sns.barplot(x=most_popular_cities.index, y=most_popular_cities.values,␣
 ↪ax=axes[1])  # Create a barplot where the x-labels are the city names, while␣
 ↪the bar corresponds to the number of occurences.
axes[1].set_xticklabels(labels=most_popular_cities.index,rotation=45) # rotate␣
 ↪the x-labels
plt.show()
```

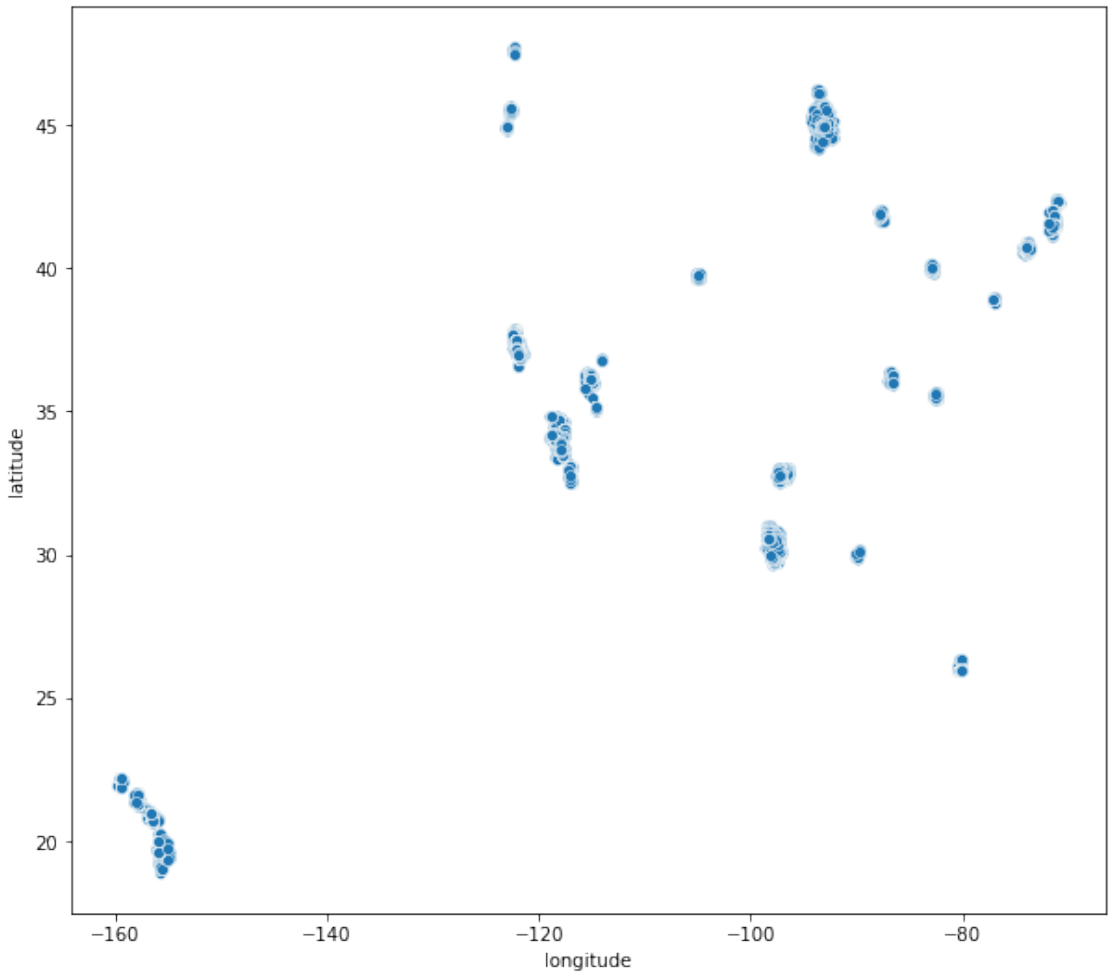



**11. Create a scatterplot with the longitude and latitude of the listings in `df`. Longitude should be on the x-axis and latitude on the y-axis.**

The output should look something like this:

PS: Disregard the color scheme of the example image.

[ ]:
```
# Insert your code below
# ======================
scatter, axes_scatter = plt.subplots(figsize=(10,9))
sns.scatterplot(x=df['longitude'], y=df['latitude'], ax=axes_scatter) # creates␣
↪the scatterplot
plt.show()
```

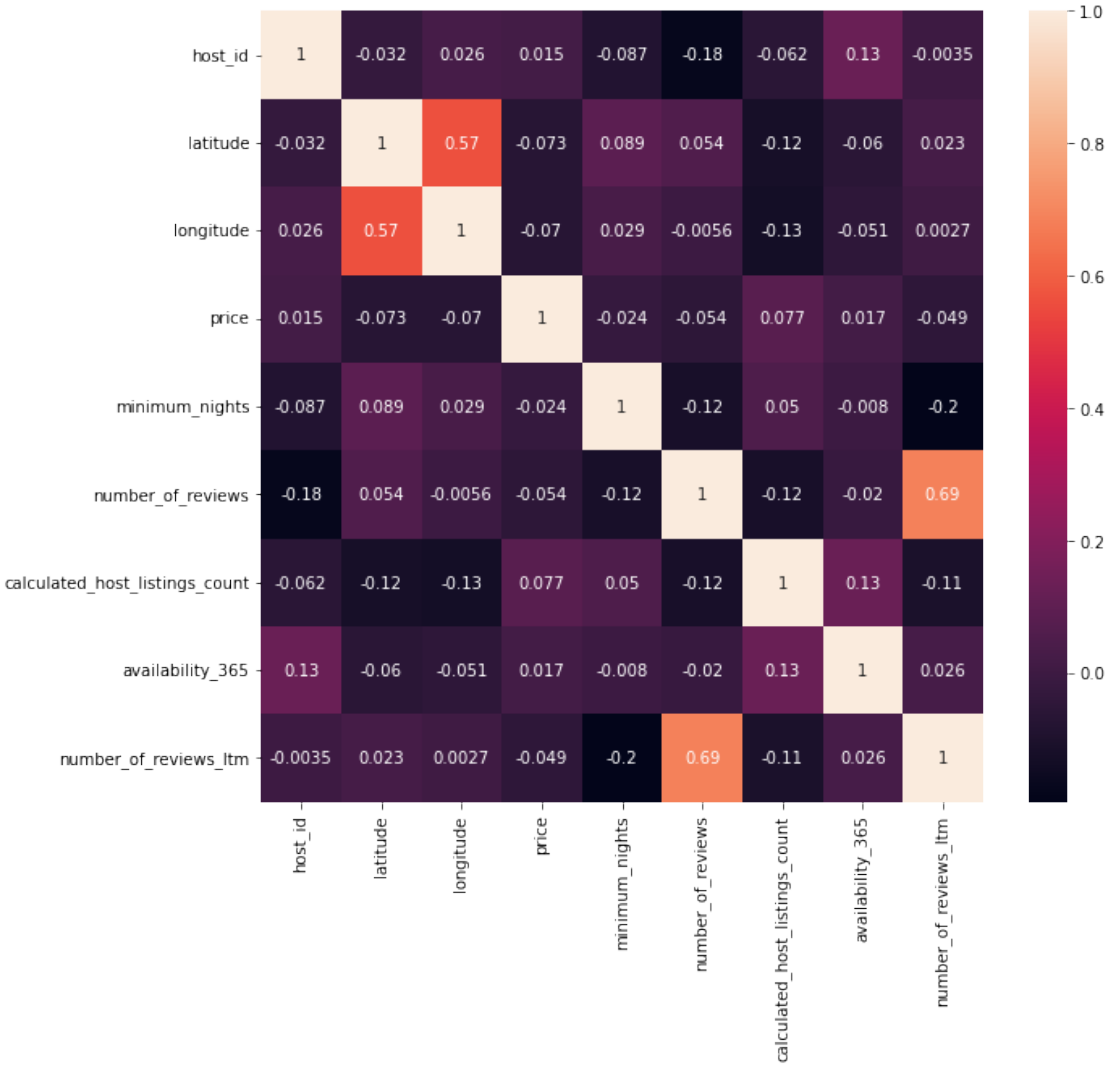



**12. Create a matrix containing the correlations between the different columns in `df`. Plot it as a heatmap using Seaborn or similar. What does the plot tell you about correlations? Which columns are the most correlated to `price`?**

[ ]:
```
# Insert your code below
# ======================

correlation_matrix = df.corr() # creates the correlation matrix for the␣
 ↪features.

heatmap, ax_heatmap = plt.subplots(figsize=(10,9))
sns.heatmap(correlation_matrix, annot=True) # creates the heatmap
plt.show()
```




The correlation heatmap shows us in which degree the different features are correlated with one another. *calculated_host_listings_count* is the most correlated column to the *price* column.