The next two functions (`get_env_type` and `print_versions_and_GPU`) are used because the notebook was developed/run on different environments. They do not contribute to the actual exercise.

```python
In [ ]: def get_env_type() -> str:
            '''
            Get the environment type where the code is running.

            Returns:
            - 'kaggle' if running on Kaggle
            - 'google.colab' if running on Google Colab
            - 'local' if running on local environment
            '''
            import os, sys
            if 'KAGGLE_KERNEL_RUN_TYPE' in os.environ:
                return 'kaggle'
            elif 'google.colab' in sys.modules:
                if 'COLAB_TPU_ADDR' in os.environ:  # Google Colab w/ TPU
                    # Connect to TPU
                    import tensorflow
                    tpu = tensorflow.distribute.cluster_resolver.TPUClusterResolver()
                    tensorflow.config.experimental_connect_to_cluster(tpu)
                    tensorflow.tpu.experimental.initialize_tpu_system(tpu)
                # Connect to Drive
                from google.colab import drive
                drive.mount('/content/drive')
                return 'google.colab'
            else:   # Running on local environment
                return 'local'

        def print_versions_and_GPU() -> None:
            '''
            Prints version numbers for various modules and GPU information (if available).
            '''
            import sys, tensorflow, sklearn
            print(f'Python: {sys.version_info.major}.{sys.version_info.minor}.{sys.version_info.micro}')
            print(f'TensorFlow: {tensorflow.__version__}')
            try:
                print(f'Keras: {tensorflow.keras.version()}')
            except:
                print(f'Keras: Unknown version')
            print(f'Scikit-learn: {sklearn.__version__}')
            gpus = tensorflow.config.list_physical_devices('GPU')
            if gpus is None:
                gpus = tensorflow.test.gpu_device_name()
            print(f'GPUs: {gpus if gpus else "None"}')
```

```python
In [ ]: print_versions_and_GPU()

        match get_env_type():
            case 'kaggle':
                raise ValueError('This notebook is not designed to run on Kaggle.')
            case 'google.colab':
                data_path = '/content/drive/MyDrive/data/tourism'
            case 'local':
                data_path = './data/tourism'
                max_epochs = 3
            case _:
                raise ValueError(f'Unknown environment type: {get_env_type()}')

        print(f'\nRunning on {get_env_type()}')
```

```
Python: 3.11.5
TensorFlow: 2.16.1
Keras: 3.1.1
Scikit-learn: 1.2.2
GPUs: None

Running on local
```

```python
In [ ]: import pandas as pd
        import numpy as np
        from IPython.display import Markdown
```

```python
In [ ]: def mDisplay(what: str) -> None:
            display(Markdown(what))
```

Data Science

1. Import all the datasets and perform preliminary inspections, such as:
    A. Check for missing values and duplicates
    B. Remove any anomalies found in the data

```python
In [ ]: def check_quality(df: pd.DataFrame, name: str) -> None:
            '''
            Check the 'quality' of a DataFrame.
            '''
            mDisplay(f"> # {name} Information:")
            display(df)
            df.info()
            display(df.describe(include='all'))
            mDisplay("> ### Missing Values:")
            display(df.isnull().sum())
            mDisplay("> ### Empty Strings:")
            display(df.eq('').sum())
            mDisplay(f"> ### Duplicated rows: {df.duplicated().sum()}")
```

```python
In [ ]: df_destinations = pd.read_excel(f'{data_path}/tourism_with_id.xlsx')
```

```
check_quality(df_destinations, 'Destinations')
```

Destinations Information:

	Place_Id	Place_Name	Description	Category	City	Price	Rating	Time_Minutes	Coordinate	Lat	Long	Unnamed: 11	Unnamed: 12
0	1	Monumen Nasional	Monumen Nasional atau yang populer disingkat d...	Budaya	Jakarta	20000	4.6	15.0	{'lat': -6.1753924, 'lng': 106.8271528}	-6.175392	106.827153	NaN	1
1	2	Kota Tua	Kota tua di Jakarta, yang juga bernama Kota Tu...	Budaya	Jakarta	0	4.6	90.0	{'lat': -6.137644799999999, 'lng': 106.8171245}	-6.137645	106.817125	NaN	2
2	3	Dunia Fantasi	Dunia Fantasi atau disebut juga Dufan adalah t...	Taman Hiburan	Jakarta	270000	4.6	360.0	{'lat': -6.125312399999999, 'lng': 106.8335377}	-6.125312	106.833538	NaN	3
3	4	Taman Mini Indonesia Indah (TMII)	Taman Mini Indonesia Indah merupakan suatu kaw...	Taman Hiburan	Jakarta	10000	4.5	NaN	{'lat': -6.302445899999999, 'lng': 106.8951559}	-6.302446	106.895156	NaN	4
4	5	Atlantis Water Adventure	Atlantis Water Adventure atau dikenal dengan A...	Taman Hiburan	Jakarta	94000	4.5	60.0	{'lat': -6.12419, 'lng': 106.839134}	-6.124190	106.839134	NaN	5
...	...	...	...	...	...	...	...	...	...	...	...	...	...
432	433	Museum Mpu Tantular	Museum Negeri Mpu Tantular adalah sebuah museu...	Budaya	Surabaya	2000	4.4	45.0	{'lat': -7.4338593, 'lng': 112.7199058}	-7.433859	112.719906	NaN	433
433	434	Taman Bungkul	Taman Bungkul adalah taman wisata kota yang te...	Taman Hiburan	Surabaya	0	4.6	NaN	{'lat': -7.291346799999999, 'lng': 112.7398218}	-7.291347	112.739822	NaN	434
434	435	Taman Air Mancur Menari Kenjeran	Air mancur menari atau dancing fountain juga a...	Taman Hiburan	Surabaya	0	4.4	45.0	{'lat': -7.2752955, 'lng': 112.7549381}	-7.275296	112.754938	NaN	435
435	436	Taman Flora Bratang Surabaya	Taman Flora adalah salah satu taman kota di Su...	Taman Hiburan	Surabaya	0	4.6	NaN	{'lat': -7.294330299999999, 'lng': 112.7617534}	-7.294330	112.761753	NaN	436
436	437	Gereja Perawan Maria Tak Berdosa Surabaya	Gereja Katolik Kelahiran Santa Perawan Maria m...	Tempat Ibadah	Surabaya	10000	4.8	NaN	{'lat': -7.2420758, 'lng': 112.7368158}	-7.242076	112.736816	NaN	437

437 rows × 13 columns

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 437 entries, 0 to 436
Data columns (total 13 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   Place_Id      437 non-null    int64
 1   Place_Name    437 non-null    object
 2   Description   437 non-null    object
 3   Category      437 non-null    object
 4   City          437 non-null    object
 5   Price         437 non-null    int64
 6   Rating        437 non-null    float64
 7   Time_Minutes  205 non-null    float64
 8   Coordinate    437 non-null    object
 9   Lat           437 non-null    float64
 10  Long          437 non-null    float64
 11  Unnamed: 11   0 non-null      float64
 12  Unnamed: 12   437 non-null    int64
dtypes: float64(5), int64(3), object(5)
memory usage: 44.5+ KB
```

	Place_Id	Place_Name	Description	Category	City	Price	Rating	Time_Minutes	Coordinate	Lat	Long	Unnamed: 11	Unnamed: 12
count	437.000000	437	437	437	437	437.000000	437.000000	205.000000	437	437.000000	437.000000	0.0	437.000000
unique	NaN	437	437	6	5	NaN	NaN	NaN	437	NaN	NaN	NaN	NaN
top	NaN	Monumen Nasional	Monumen Nasional atau yang populer disingkat d...	Taman Hiburan	Yogyakarta	NaN	NaN	NaN	{'lat': -6.1753924, 'lng': 106.8271528}	NaN	NaN	NaN	NaN
freq	NaN	1	1	135	126	NaN	NaN	NaN	1	NaN	NaN	NaN	NaN
mean	219.000000	NaN	NaN	NaN	NaN	24652.173913	4.442792	82.609756	NaN	-7.095438	109.160142	NaN	219.000000
std	126.295289	NaN	NaN	NaN	NaN	66446.374709	0.208587	52.872339	NaN	0.727241	1.962848	NaN	126.295289
min	1.000000	NaN	NaN	NaN	NaN	0.000000	3.400000	10.000000	NaN	-8.197894	103.931398	NaN	1.000000
25%	110.000000	NaN	NaN	NaN	NaN	0.000000	4.300000	45.000000	NaN	-7.749590	107.578369	NaN	110.000000
50%	219.000000	NaN	NaN	NaN	NaN	5000.000000	4.500000	60.000000	NaN	-7.020524	110.237468	NaN	219.000000
75%	328.000000	NaN	NaN	NaN	NaN	20000.000000	4.600000	120.000000	NaN	-6.829411	110.431869	NaN	328.000000
max	437.000000	NaN	NaN	NaN	NaN	900000.000000	5.000000	360.000000	NaN	1.078880	112.821662	NaN	437.000000

Missing Values:

```
Place_Id         0
Place_Name       0
Description      0
Category         0
City             0
Price            0
Rating           0
Time_Minutes   232
Coordinate       0
Lat              0
Long             0
Unnamed: 11    437
Unnamed: 12      0
dtype: int64
```

Empty Strings:

```
Place_Id        0
Place_Name      0
Description     0
Category        0
City            0
Price           0
Rating          0
Time_Minutes    0
Coordinate      0
Lat             0
Long            0
Unnamed: 11     0
Unnamed: 12     0
dtype: int64
```

Duplicated rows: 0

Destinations - cleaning up:

- `Unnamed: 12` : duplicate of "Place_Id"
- `Unnamed: 11` : all `NaN`
- `Coordinate` : we've got `Lat` and `Long` already
- `Time_Minutes` : too many `NaN` s

```
In [ ]:  df_destinations.drop(columns=['Unnamed: 12', 'Unnamed: 11', 'Coordinate', 'Time_Minutes'], inplace=True)

         check_quality(df_destinations, "Destinations (after cleanup)")
```

Destinations (after cleanup) Information:

	Place_Id	Place_Name	Description	Category	City	Price	Rating	Lat	Long
0	1	Monumen Nasional	Monumen Nasional atau yang populer disingkat d...	Budaya	Jakarta	20000	4.6	-6.175392	106.827153
1	2	Kota Tua	Kota tua di Jakarta, yang juga bernama Kota Tu...	Budaya	Jakarta	0	4.6	-6.137645	106.817125
2	3	Dunia Fantasi	Dunia Fantasi atau disebut juga Dufan adalah t...	Taman Hiburan	Jakarta	270000	4.6	-6.125312	106.833538
3	4	Taman Mini Indonesia Indah (TMII)	Taman Mini Indonesia Indah merupakan suatu kaw...	Taman Hiburan	Jakarta	10000	4.5	-6.302446	106.895156
4	5	Atlantis Water Adventure	Atlantis Water Adventure atau dikenal dengan A...	Taman Hiburan	Jakarta	94000	4.5	-6.124190	106.839134
...	...	...	...	...	...	...	...	...	...
432	433	Museum Mpu Tantular	Museum Negeri Mpu Tantular adalah sebuah museu...	Budaya	Surabaya	2000	4.4	-7.433859	112.719906
433	434	Taman Bungkul	Taman Bungkul adalah taman wisata kota yang te...	Taman Hiburan	Surabaya	0	4.6	-7.291347	112.739822
434	435	Taman Air Mancur Menari Kenjeran	Air mancur menari atau dancing fountain juga a...	Taman Hiburan	Surabaya	0	4.4	-7.275296	112.754938
435	436	Taman Flora Bratang Surabaya	Taman Flora adalah salah satu taman kota di Su...	Taman Hiburan	Surabaya	0	4.6	-7.294330	112.761753
436	437	Gereja Perawan Maria Tak Berdosa Surabaya	Gereja Katolik Kelahiran Santa Perawan Maria m...	Tempat Ibadah	Surabaya	10000	4.8	-7.242076	112.736816

437 rows × 9 columns

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 437 entries, 0 to 436
Data columns (total 9 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   Place_Id     437 non-null    int64
 1   Place_Name   437 non-null    object
 2   Description  437 non-null    object
 3   Category     437 non-null    object
 4   City         437 non-null    object
 5   Price        437 non-null    int64
 6   Rating       437 non-null    float64
 7   Lat          437 non-null    float64
 8   Long         437 non-null    float64
dtypes: float64(3), int64(2), object(4)
memory usage: 30.9+ KB
```

	Place_Id	Place_Name	Description	Category	City	Price	Rating	Lat	Long
count	437.000000	437	437	437	437	437.000000	437.000000	437.000000	437.000000
unique	NaN	437	437	6	5	NaN	NaN	NaN	NaN
top	NaN	Monumen Nasional	Monumen Nasional atau yang populer disingkat d...	Taman Hiburan	Yogyakarta	NaN	NaN	NaN	NaN
freq	NaN	1	1	135	126	NaN	NaN	NaN	NaN
mean	219.000000	NaN	NaN	NaN	NaN	24652.173913	4.442792	-7.095438	109.160142
std	126.295289	NaN	NaN	NaN	NaN	66446.374709	0.208587	0.727241	1.962848
min	1.000000	NaN	NaN	NaN	NaN	0.000000	3.400000	-8.197894	103.931398
25%	110.000000	NaN	NaN	NaN	NaN	0.000000	4.300000	-7.749590	107.578369
50%	219.000000	NaN	NaN	NaN	NaN	5000.000000	4.500000	-7.020524	110.237468
75%	328.000000	NaN	NaN	NaN	NaN	20000.000000	4.600000	-6.829411	110.431869
max	437.000000	NaN	NaN	NaN	NaN	900000.000000	5.000000	1.078880	112.821662

Missing Values:

```
Place_Id        0
Place_Name      0
Description     0
Category        0
City           0
Price          0
Rating         0
Lat            0
Long           0
dtype: int64
```

Empty Strings:

```
Place_Id        0
Place_Name      0
Description     0
Category        0
City           0
Price          0
Rating         0
Lat            0
Long           0
dtype: int64
```

Duplicated rows: 0

```
In [ ]:  df_ratings = pd.read_csv(f'{data_path}/tourism_rating.csv')

         check_quality(df_ratings, "User Ratings")
```

User Ratings Information:

	User_Id	Place_Id	Place_Ratings
0	1	179	3
1	1	344	2
2	1	5	5
3	1	373	3
4	1	101	4
...	...	...	...
9995	300	425	2
9996	300	64	4
9997	300	311	3
9998	300	279	4
9999	300	163	2

10000 rows × 3 columns

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 3 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   User_Id        10000 non-null  int64
 1   Place_Id       10000 non-null  int64
 2   Place_Ratings  10000 non-null  int64
dtypes: int64(3)
memory usage: 234.5 KB
```

	User_Id	Place_Id	Place_Ratings
count	10000.000000	10000.000000	10000.000000
mean	151.292700	219.416400	3.066500
std	86.137374	126.228335	1.379952
min	1.000000	1.000000	1.000000
25%	77.000000	108.750000	2.000000
50%	151.000000	220.000000	3.000000
75%	226.000000	329.000000	4.000000
max	300.000000	437.000000	5.000000

Missing Values:

```
User_Id         0
Place_Id        0
Place_Ratings   0
dtype: int64
```

Empty Strings:

```
User_Id         0
Place_Id        0
Place_Ratings   0
dtype: int64
```

Duplicated rows: 79

Ratings - Additional checks:

- There are 79 'duplicated rows'. Let's check how often a tourist rates the same place differently. If the number is higher than 79, it would indicate the data comprises every instance where a tourist has rated a place. In this scenario, some tourists may rate a given place differently on 2 different visits. Some repeat tourists would be more consistent in their rating, which could cause the 79 'duplicated' rows.

```
In [ ]:  # create a df with all combinations of 'User_Id' and 'Place_id' values present in df_ratings
         tourist_place = df_ratings.groupby(['User_Id', 'Place_Id']).size().reset_index(name='count')
         tourist_place = tourist_place[tourist_place['count'] > 1]
         mDisplay(f"> # Tourists having rated a place more than once")
         tourist_place
```

Tourists having rated a place more than once

Out[ ]:

	User_Id	Place_Id	count
22	1	328	2
42	2	208	2
55	2	437	2
73	3	202	2
127	5	301	2
...	...	...	...
9502	297	418	2
9522	298	240	2
9560	299	290	2
9569	299	407	2
9575	300	69	3

395 rows × 3 columns

There are 395 rows with same place/same tourist as some other ID: this indicates that each visit creates a new row in the data. We won't eliminate any such row, then.

```
In [ ]:  df_tourists = pd.read_csv(f'{data_path}/user.csv')

         check_quality(df_tourists, "Tourist (User)")
```

Tourist (User) Information:

	User_Id	Location	Age
0	1	Semarang, Jawa Tengah	20
1	2	Bekasi, Jawa Barat	21
2	3	Cirebon, Jawa Barat	23
3	4	Bekasi, Jawa Barat	21
4	5	Lampung, Sumatera Selatan	20
...	...	...	...
295	296	Lampung, Sumatera Selatan	31
296	297	Palembang, Sumatera Selatan	39
297	298	Bogor, Jawa Barat	38
298	299	Sragen, Jawa Tengah	27
299	300	Ponorogo, Jawa Timur	26

300 rows × 3 columns

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 300 entries, 0 to 299
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   User_Id   300 non-null    int64
 1   Location  300 non-null    object
 2   Age       300 non-null    int64
dtypes: int64(2), object(1)
memory usage: 7.2+ KB
```

	User_Id	Location	Age
count	300.000000	300	300.000000
unique	NaN	28	NaN
top	NaN	Bekasi, Jawa Barat	NaN
freq	NaN	39	NaN
mean	150.500000	NaN	28.700000
std	86.746758	NaN	6.393716
min	1.000000	NaN	18.000000
25%	75.750000	NaN	24.000000
50%	150.500000	NaN	29.000000
75%	225.250000	NaN	34.000000
max	300.000000	NaN	40.000000

Missing Values:

```
User_Id      0
Location     0
Age          0
dtype: int64
```

Empty Strings:

```
User_Id      0
Location     0
Age          0
dtype: int64
```

Duplicated rows: 0

Tourists: nothing to clean up

2. To understand the tourism highlights better, we should explore the data in depth.
   A. Explore the user group that provides the tourism ratings by:
   - Analyzing the age distribution of users visiting the places and rating them
   - Identifying the places where most of these users (tourists) are coming from

```python
# Create a bar chart of the number of tourists by age, and a boxplot of the number of tourists by age
import matplotlib.pyplot as plt
import seaborn as sns

plt.figure(figsize=(12, 4))
plt.suptitle('Tourists by age')
plt.subplot(1, 2, 1)
sns.countplot(x='Age', data=df_tourists)
plt.subplot(1, 2, 2)
sns.boxplot(x='Age', data=df_tourists)
plt.tight_layout()
plt.show()
```
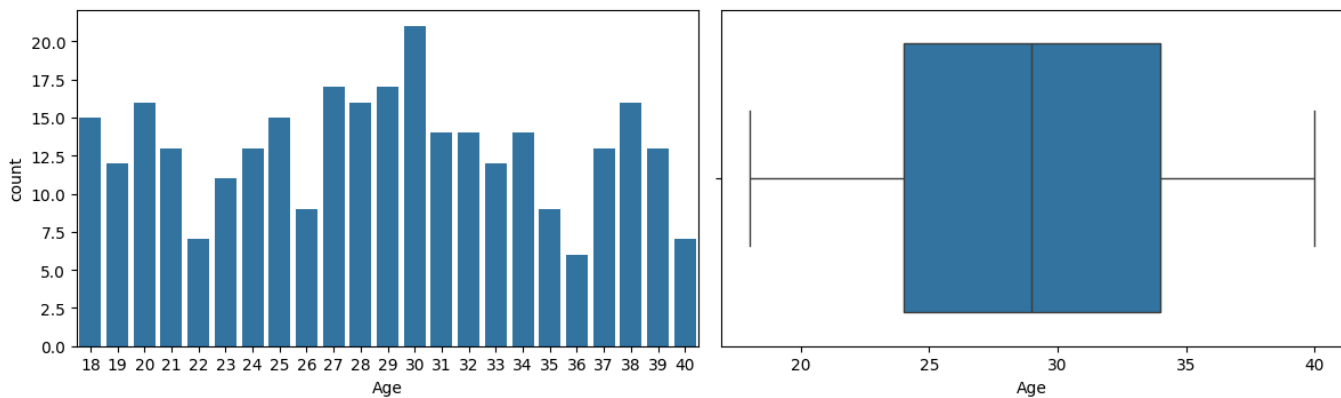


```python
# Create a pie chart of the top 10 places of origin of the tourists and 1 "other" category that counts the rest.
from matplotlib import cm

location_counts = df_tourists['Location'].value_counts()
top_locations = location_counts.head(10)
other_origins = location_counts[10:].sum()
top_locations['All Others'] = other_origins
plt.figure(figsize=(6, 6))
plt.pie(top_locations,
        labels=top_locations.index,
        autopct='%1.1f%%',
        colors=cm.tab20.colors)
plt.title('Tourists by location')
plt.show()
```

Tourists by location
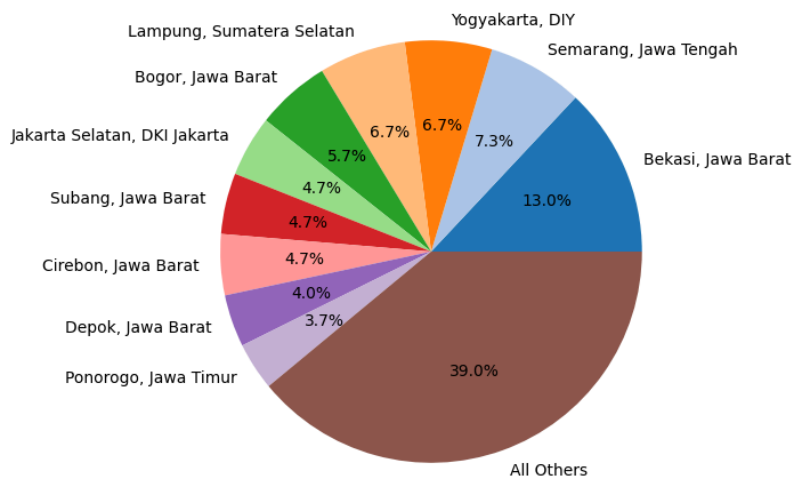
3. Next, let's explore the locations and categories of tourist spots.
   A. What are the different categories of tourist spots?

```python
# Count the instances of ratings for each category
category_counts = df_destinations['Category'].value_counts()

# Translations of the categories (from translate.google.com)
xlat = {'Taman Hiburan': 'Amusement Park',
        'Budaya': 'Culture',
        'Cagar Alam': 'Nature Reserve',
        'Bahari': 'Maritime',
        'Tempat Ibadah': 'Place of Worship',
        'Pusat Perbelanjaan': 'Shopping Center'}
xlat = {k: f"{k}\n({v})" for k, v in xlat.items()}

category_counts = category_counts.rename(index=xlat)
category_counts

# Create a pie chart of the number of places by category
plt.figure(figsize=(6, 6))
plt.pie(category_counts, labels=category_counts.index, autopct='%1.1f%%', colors=cm.tab20.colors)
plt.title('Places by category')
plt.show()

# For each location in df_destinations, count the number
```
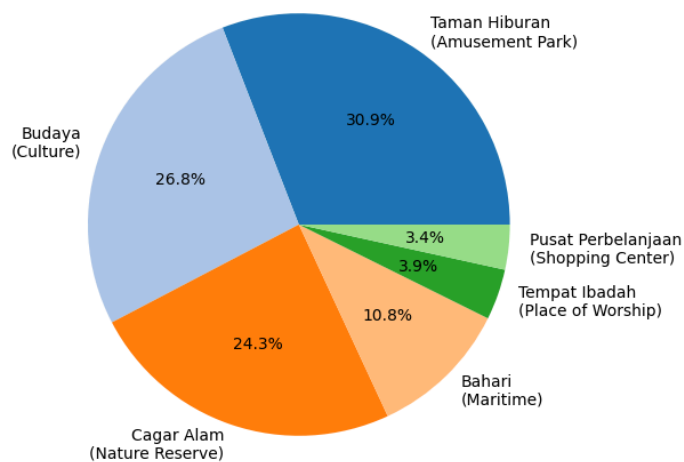
Places by category

3.
   2. What kind of tourism each location is most famous or suitable for?

```python
# For each city in df_destination, calculate the total number of attractions by category
city_cats = df_destinations.groupby('City')['Category'].value_counts().unstack().fillna(0)
city_cats = city_cats.rename(columns=xlat)

# For each city, identify the most popular category (and the corresponding percentage)
most_popular = pd.DataFrame(city_cats.idxmax(axis=1), columns=['Most Popular Category'])
most_popular['Most Popular Category'] = most_popular['Most Popular Category'].str.replace('\n', ' ')
most_popular['Percentage'] = (city_cats.max(axis=1) / city_cats.sum(axis=1)).apply(lambda x: f'{x:.1%}')

display(most_popular)
```

	Most Popular Category	Percentage
City		
Bandung	Cagar Alam (Nature Reserve)	43.5%
Jakarta	Budaya (Culture)	38.1%
Semarang	Cagar Alam (Nature Reserve)	35.1%
Surabaya	Budaya (Culture)	39.1%
Yogyakarta	Taman Hiburan (Amusement Park)	28.6%

3.

3. Which city would be best for a nature enthusiast to visit?

```python
pd.DataFrame(df_destinations[df_destinations['Category'].str.startswith('Cagar Alam')]['City'].value_counts()).rename(columns={'count': 'Nature Preserves'}).head(1)
```

Out[ ]:

	Nature Preserves
City	
Bandung	54

4. To better understand tourism, we need to create a combined data with places and their user ratings.

```python
# Merge the df_destinations and df_ratings DataFrames, matching on the 'Place_Id' column
df = pd.merge(df_ratings, df_destinations, on='Place_Id', how='left')
df = pd.merge(df, df_tourists, on='User_Id', how='left')
df.drop(columns=['Place_Id'], inplace=True) # We don't need it anymore as the Place_Name should be unique enough.

df
```

Out[ ]:

	User_Id	Place_Ratings	Place_Name	Description	Category	City	Price	Rating	Lat	Long	Location	Age
0	1	3	Candi Ratu Boko	Situs Ratu Baka atau Candi Boko (Hanacaraka:ꦱꦶ...	Budaya	Yogyakarta	75000	4.6	-7.770542	110.489416	Semarang, Jawa Tengah	20
1	1	2	Pantai Marina	Pantai Marina (bahasa Jawa: ꦱꦼꦒꦫꦩꦫꦶꦤ...	Bahari	Semarang	3000	4.1	-6.948877	110.389329	Semarang, Jawa Tengah	20
2	1	5	Atlantis Water Adventure	Atlantis Water Adventure atau dikenal dengan A...	Taman Hiburan	Jakarta	94000	4.5	-6.124190	106.839134	Semarang, Jawa Tengah	20
3	1	3	Museum Kereta Ambarawa	Museum Kereta Api Ambarawa (bahasa Inggris: In...	Budaya	Semarang	10000	4.5	-7.264599	110.404602	Semarang, Jawa Tengah	20
4	1	4	Kampung Wisata Sosro Menduran	Kampung wisata Sosromenduran merupakan kampung...	Budaya	Yogyakarta	0	4.0	-7.792190	110.362151	Semarang, Jawa Tengah	20
...	...	...	...	...	...	...	...	...	...	...	...	...
9995	300	2	Waterpark Kenjeran Surabaya	Waterpark Kenjeran Surabaya merupakan wisata k...	Taman Hiburan	Surabaya	35000	4.1	-7.247796	112.799824	Ponorogo, Jawa Timur	26
9996	300	4	Museum Sasmita Loka Ahmad Yani	Museum Sasmita Loka Ahmad Yani adalah salah sa...	Budaya	Jakarta	2000	4.7	-6.204630	106.836532	Ponorogo, Jawa Timur	26
9997	300	3	The Lodge Maribaya	The Lodge Maribaya adalah salah satu tempat wi...	Cagar Alam	Bandung	25000	4.3	-6.829411	107.687467	Ponorogo, Jawa Timur	26
9998	300	4	Masjid Agung Trans Studio Bandung	Masjid Agung Trans Studio Bandung (TSB) berdir...	Tempat Ibadah	Bandung	0	4.8	-6.925963	107.635428	Ponorogo, Jawa Timur	26
9999	300	2	Watu Mabur Mangunan	Kawasan Tebing Watu Mabur ini terbilang belum ...	Cagar Alam	Yogyakarta	2500	4.5	-7.947121	110.441000	Ponorogo, Jawa Timur	26

10000 rows × 12 columns

4.

A. Use this data to figure out the spots that are most loved by the tourists. Also, which city has the most loved tourist spots?

> We'll assume 5 'rating' levels: Loved, Favorable, Neutral, Unfavorable, Disliked

```python
# For each place in df, calculate the average rating
average_ratings = pd.DataFrame(df.groupby('Place_Name')['Place_Ratings'].mean().sort_values(ascending=False))
average_ratings.columns = ['Average Rating']

# Derive rating levels based on the range of available ratings
min_rating = np.round(average_ratings['Average Rating'].min(),1)
max_rating = np.round(average_ratings['Average Rating'].max(),1)
rating_width = (max_rating - min_rating) / 5
rating_levels = {
    k: (np.round(v,1), np.round(v+rating_width,1))
        for v,k in zip(
            np.arange(min_rating, max_rating + rating_width, rating_width),
            ["Disliked", "Unfavorable", "Neutral", "Favorable", "Loved"])}
average_ratings['Rating Level'] = average_ratings['Average Rating'].apply(
    lambda x: next(k for k,v in rating_levels.items() if v[0] <= x <= v[1]))
mDisplay("> ## Top 10 most loved places:  ")
display(average_ratings.head(10))


average_ratings = average_ratings.merge(df_destinations, on='Place_Name', how='left')
average_ratings.drop(columns=['Place_Id', 'Description'], inplace=True)
loved_by_city = pd.DataFrame(average_ratings[average_ratings['Rating Level'] == 'Loved'].groupby('City')['Place_Name'].count().sort_values(ascending=False))
loved_by_city.columns = ['Number of Loved Places']
mDisplay("> ## City with the most loved places:  ")
display(loved_by_city.head(1))
```

Top 10 most loved places:

Place_Name	Average Rating	Rating Level
Keraton Surabaya	3.967742	Loved
Puncak Gunung Api Purba - Nglanggeran	3.882353	Loved
Kampung Cina	3.842105	Loved
Teras Cikapundung BBWS	3.789474	Loved
Monumen Yogya Kembali	3.772727	Loved
Bukit Jamur	3.766667	Loved
Bukit Bintang Yogyakarta	3.764706	Loved
Monumen Nasional	3.722222	Loved
Glamping Lakeside Rancabali	3.714286	Loved
Pantai Baron	3.695652	Loved

City with the most loved places:

City	Number of Loved Places
Bandung	7

4.

2. Indonesia provides a wide range of tourist spots ranging from historical and cultural beauties to advanced amusement parks. Among these, which category of places are users liking the most?

```python
# For each category in df, calculate the average rating
average_ratings_by_category = pd.DataFrame(df.groupby('Category')['Place_Ratings'].mean().sort_values(ascending=False))
average_ratings_by_category.columns = ['Average Rating']

average_ratings_by_category['Rating Level'] = average_ratings_by_category['Average Rating'].apply(
    lambda x: next(k for k,v in rating_levels.items() if v[0] <= x <= v[1]))

mDisplay("> ## Average ratings by category:  ")
display(average_ratings_by_category)
```

Average ratings by category:

Category	Average Rating	Rating Level
Taman Hiburan	3.117917	Neutral
Cagar Alam	3.080745	Neutral
Tempat Ibadah	3.080519	Neutral
Budaya	3.034663	Neutral
Bahari	3.006487	Neutral
Pusat Perbelanjaan	2.945455	Neutral

5. Build a recommender model for the system

A. Use the above data to develop a collaborative filtering model for recommendation and use that to recommend other places to visit using the current tourist location(place name)

```python
# Compute how many ratings each user has given
ratings_by_each_user = df.groupby('User_Id')['Place_Ratings'].count().sort_values(ascending=False)
min_ratings_by_user = ratings_by_each_user.min()
max_ratings_by_user = ratings_by_each_user.max()
median_ratings_by_user = ratings_by_each_user.median()
mDisplay(f">    \n> Each user has submitted between {min_ratings_by_user} and {max_ratings_by_user} ratings, with a median of {median_ratings_by_user:.0f}.  \n>    ")
if (median_ratings_by_user > 30):
    mDisplay(">    \n> This should be sufficient to warrant Z-score normalization.  \n>    ")
```

Each user has submitted between 21 and 53 ratings, with a median of 33.

This should be sufficient to warrant Z-score normalization.

```python
# Build a pivot table with the ratings given by each user to each place, and normalize the ratings
# using Z-score normalization.  Also, track the mean and std dev for each user for later
# de-normalization to display results.
scores_mtx = df.pivot_table(index='User_Id', columns='Place_Name', values='Place_Ratings')
normalization_info_by_user = pd.DataFrame(index=scores_mtx.index)
normalization_info_by_user['Mean'] = scores_mtx.mean(axis=1)
normalization_info_by_user['Std'] = scores_mtx.std(axis=1)
#display(normalization_info_by_user)
scores_mtx = scores_mtx.apply(lambda x: (x - x.mean()) / x.std(), axis=1)
#scores_mtx
```

```python
# Build a correlation matrix of the ratings given by each user to each place
correlation_mtx = scores_mtx.T.corr()
#correlation_mtx
```

```python
In [ ]: def get_user_ratings(user_id: int):
            '''
            Get the ratings given by a user.
            '''
            user_ratings = scores_mtx.loc[user_id].dropna()
            user_ratings = pd.DataFrame(user_ratings)
            user_ratings.columns = ['Normalized Rating']
            user_ratings = user_ratings.merge(df_destinations, on='Place_Name', how='left')
            (mean, std) = normalization_info_by_user.loc[user_id]
            user_ratings['User Rating'] = user_ratings['Normalized Rating'].apply(lambda x: f'{x*std + mean:.2f}')
            user_ratings.drop(columns=['Place_Id','Rating','Normalized Rating'], inplace=True)
            user_ratings.sort_values('User Rating', ascending=False, inplace=True)
            return user_ratings

        def recommend(target_user_id: int):
            '''
            Recommend places to a user based on the ratings given by other users.
            '''
            # Get the ratings given by the target user
            target_user_ratings = scores_mtx.loc[target_user_id].dropna()
            # Get the correlation between the target user and all other users
            target_user_correlations = \
                correlation_mtx[target_user_id].dropna().sort_values(ascending=False)
            # Get the users who have rated the same places as the target user and remove the target user
            # from the list
            similar_users = correlation_mtx[target_user_id].dropna()
            similar_users.drop(index=target_user_id, inplace=True)
            similar_users = similar_users.sort_values(ascending=False)
            # Get the ratings given by the similar users to the places rated by the target user
            similar_users_ratings = \
                scores_mtx.loc[similar_users.index].dropna(axis=1, how='all')
            #display(similar_users_ratings)

            # Calculate the predicted ratings for the target user based on the ratings given by the similar
            # users. The predicted rating is the average rating given by the similar users, weighted by the
            # correlation between the target user and the similar users
            predicted_ratings = similar_users_ratings.apply(
                lambda x: x.mean() + \
                    (target_user_ratings - x).multiply(target_user_correlations).sum() / \
                        target_user_correlations.sum(), axis=0)
            predicted_ratings = predicted_ratings.sort_values(ascending=False)
            #display(predicted_ratings)

            # Get the places that the target user has not rated yet
            #unrated_places = predicted_ratings[predicted_ratings.isnull()].index
            unrated_places = \
                scores_mtx.loc[target_user_id][scores_mtx.loc[target_user_id].isnull()].index
            #display(pd.DataFrame(unrated_places))

            # Sort the places by the predicted ratings and de-normalize the ratings
            retval = pd.DataFrame(predicted_ratings[unrated_places].sort_values(ascending=False))
            retval.columns = ['Normalized Predicted Rating']
            (mean, std) = normalization_info_by_user.loc[target_user_id]
            retval['Predicted Rating'] = retval['Normalized Predicted Rating'].apply(lambda x: f'{x*std + mean:.2f}')

            # merge in info about the suggested destinations
            retval = retval.merge(df_destinations, on='Place_Name', how='left')
            retval.drop(columns=['Place_Id', 'Normalized Predicted Rating'], inplace=True)

            return retval

In [ ]: # For 5 random users, show what their top 10 ratings were and what their top 10 recommended places are
        for user_id in np.random.choice(scores_mtx.index, 5):
            mDisplay(f"> # User {user_id}  ")
            mDisplay(f"> ### Top 10 places rated by User {user_id}:  ")
            display(get_user_ratings(user_id).head(10))
            mDisplay(f"> ### Top 10 recommended places for User {user_id}:  ")
            display(recommend(user_id).head(10))
```

User 67

Top 10 places rated by User 67:

	Place_Name	Description	Category	City	Price	Lat	Long	User Rating
0	Air Terjun Semirang	Terletak di lereng Gunung Ungaran bagian utara...	Cagar Alam	Semarang	9000	-7.166297	110.381068	5.00
30	Taman Balai Kota Bandung	Taman Balai Kota Bandung merupakan sebuah tama...	Taman Hiburan	Bandung	0	-6.912966	107.609603	5.00
26	Sanghyang Heuleut	Danau yang satu ini memiliki air jernih bernua...	Cagar Alam	Bandung	10000	-6.876513	107.342218	5.00
5	Bukit Wisata Pulepayung	Pule Payung Yogyakarta. Sebuah objek wisata po...	Cagar Alam	Yogyakarta	10000	-7.800111	110.123895	5.00
6	De Mata Museum Jogja	Museum De Mata merupakan salah satu museum yan...	Budaya	Yogyakarta	50000	-7.816316	110.387144	5.00
23	Perkebunan Teh Malabar	Salah satu perkebunan teh yang cukup terkenal ...	Cagar Alam	Bandung	5000	-7.227446	107.605080	5.00
22	Pasar Kebon Empring Bintaran	Pasar Kebon Empring merupakan salah satu objek...	Pusat Perbelanjaan	Yogyakarta	0	-7.836321	110.457581	5.00
15	Keraton Surabaya	Kawasan yang berjuluk Kampung Keraton ini terd...	Budaya	Surabaya	0	-7.256755	112.794220	5.00
12	Hutan Wisata Tinjomoyo Semarang	Awalnya taman wisata hutan Tinjomoyo Semarang ...	Cagar Alam	Semarang	3000	-7.029684	110.399961	4.00
29	Tafso Barn	Nama Punclut mungkin sudah cukup akrab di teli...	Cagar Alam	Bandung	0	-6.842645	107.622841	4.00

Top 10 recommended places for User 67:

	Place_Name	Predicted Rating	Description	Category	City	Price	Rating	Lat	Long
0	Puncak Gunung Api Purba - Nglanggeran	3.99	Gunung Nglanggeran adalah sebuah gunung di Dae...	Cagar Alam	Yogyakarta	10000	4.7	-7.841253	110.543056
1	Monumen Selamat Datang	3.93	Monumen Selamat Datang adalah sebuah monumen y...	Budaya	Jakarta	0	4.7	-6.194998	106.823050
2	Monumen Yogya Kembali	3.87	Museum Monumen Yogya Kembali (bahasa Jawa: ꦩꦸ©...	Budaya	Yogyakarta	15000	4.5	-7.749590	110.369607
3	Teras Cikapundung BBWS	3.87	Teras Cikapundung Bandung sebelumnya merupakan...	Taman Hiburan	Bandung	0	4.3	-6.884420	107.606834
4	Bukit Bintang Yogyakarta	3.83	Bukit Bintang merupakan salah satu lokasi nong...	Taman Hiburan	Yogyakarta	25000	4.5	-7.845841	110.479846
5	Curug Batu Templek	3.70	Curug Batu Templek Bandung adalah sebuah wisat...	Cagar Alam	Bandung	5000	4.1	-6.874363	107.684402
6	Pantai Ngrawe (Mesra)	3.70	Kabupaten Gunungkidul jadi salah satu wilayah ...	Bahari	Yogyakarta	10000	4.5	-8.133339	110.553741
7	Watu Lumbung	3.68	Letak Kampung Edukasi Watu Lumbung yang berada...	Cagar Alam	Yogyakarta	5000	4.3	-7.992438	110.317778
8	Situs Warungboto	3.66	Situs Warungboto atau Pesanggrahan Rejawinangu...	Taman Hiburan	Yogyakarta	0	4.4	-7.810269	110.393151
9	Sumur Gumuling	3.64	Sumur Gumuling adalah salah satu tempat untuk ...	Taman Hiburan	Yogyakarta	7000	4.5	-7.808791	110.359183

User 230

Top 10 places rated by User 230:

	Place_Name	Description	Category	City	Price	Lat	Long	User Rating
19	Monumen Kapal Selam	Monumen Kapal Selam, atau disingkat Monkasel, ...	Budaya	Surabaya	15000	-7.265430	112.750305	5.00
7	Desa Wisata Pulesari	Desa Wisata Pulesari semakin menambah deretan ...	Taman Hiburan	Yogyakarta	0	-7.625881	110.371698	5.00
28	Pasar Kebon Empring Bintaran	Pasar Kebon Empring merupakan salah satu objek...	Pusat Perbelanjaan	Yogyakarta	0	-7.836321	110.457581	5.00
31	Sunrise Point Cukul	Sunrise Point Cukul merupakan salah satu tempa...	Cagar Alam	Bandung	10000	-7.233689	107.534293	5.00
16	La Kana Chapel	La Kana Chapel menawarkan konsep baru standing...	Taman Hiburan	Semarang	35000	-7.215692	110.364939	5.00
8	Freedom Library	Freedom Library adalah perpustakaan buku yang ...	Budaya	Jakarta	0	-6.202248	106.845197	5.00
34	Taman Srigunting	Merupakan salah satu landmark di Kawasan Kota ...	Taman Hiburan	Semarang	0	-6.968173	110.427826	5.00
36	Trans Studio Bandung	Trans Studio Bandung adalah kawasan wisata ter...	Taman Hiburan	Bandung	280000	-6.925094	107.636494	5.00
26	Pantai Nglambor	Pantai Nglambor adalah sebuah pantai eksotis y...	Bahari	Yogyakarta	10000	-8.182703	110.679240	5.00
10	Geoforest Watu Payung Turunan	Bagi para pemburu keindahan matahari terbit ya...	Cagar Alam	Yogyakarta	0	-7.974294	110.436436	4.00

Top 10 recommended places for User 230:

	Place_Name	Predicted Rating	Description	Category	City	Price	Rating	Lat	Long
0	Teras Cikapundung BBWS	4.41	Teras Cikapundung Bandung sebelumnya merupakan...	Taman Hiburan	Bandung	0	4.3	-6.884420	107.606834
1	Taman Pelangi	4.36	Kalau pelangi biasanya ada di siang hari pasca...	Taman Hiburan	Surabaya	0	4.5	-7.327560	112.731224
2	Kampung Cina	4.26	KAMPUNG China adalah hunian dan kawasan perdag...	Budaya	Jakarta	15000	4.5	-6.365136	106.761798
3	Sumur Gumuling	4.12	Sumur Gumuling adalah salah satu tempat untuk ...	Taman Hiburan	Yogyakarta	7000	4.5	-7.808791	110.359183
4	Bukit Bintang Yogyakarta	4.00	Bukit Bintang merupakan salah satu lokasi nong...	Taman Hiburan	Yogyakarta	25000	4.5	-7.845841	110.479846
5	Monumen Yogya Kembali	3.96	Museum Monumen Yogya Kembali (bahasa Jawa: ꦩꦸ©...	Budaya	Yogyakarta	15000	4.5	-7.749590	110.369607
6	Pantai Nguluran	3.95	Di pantai Nguluran anda hanya bisa melihat ham...	Bahari	Yogyakarta	10000	4.1	-8.106006	110.461866
7	Museum Bank Indonesia	3.94	Museum Bank Indonesia adalah sebuah museum di ...	Budaya	Jakarta	2000	4.7	-6.137127	106.813005
8	Puncak Gunung Api Purba - Nglanggeran	3.88	Gunung Nglanggeran adalah sebuah gunung di Dae...	Cagar Alam	Yogyakarta	10000	4.7	-7.841253	110.543056
9	Keraton Surabaya	3.88	Kawasan yang berjuluk Kampung Keraton ini terd...	Budaya	Surabaya	0	4.4	-7.256755	112.794220

User 34

Top 10 places rated by User 34:

	Place_Name	Description	Category	City	Price	Lat	Long	User Rating
5	Jembatan Kota Intan	Jembatan Kota Intan adalah jembatan tertua di ...	Budaya	Jakarta	0	-6.131457	106.810617	5.00
16	Pulau Semak Daun	Pulau Semak Daun merupakan salah satu pulau ya...	Bahari	Jakarta	40000	-5.729672	106.571416	5.00
10	Museum Mpu Tantular	Museum Negeri Mpu Tantular adalah sebuah museu...	Budaya	Surabaya	2000	-7.433859	112.719906	4.00
3	Desa Wisata Pulesari	Desa Wisata Pulesari semakin menambah deretan ...	Taman Hiburan	Yogyakarta	0	-7.625881	110.371698	4.00
18	Taman Kasmaran	Taman Kasmaran terletak di sebelah kiri Pasar ...	Taman Hiburan	Semarang	3000	-6.990940	110.406593	4.00
17	Stone Garden Citatah	Stone Garden, adalah sebutan nama untuk hampa...	Taman Hiburan	Bandung	30000	-6.828153	107.435018	4.00
7	Kiara Artha Park	Kiara Artha Park merupakan sebuah kawasan terp...	Taman Hiburan	Bandung	15000	-6.915946	107.642146	4.00
9	Museum Gunung Merapi	Museum Gunung Merapi (bahasa Jawa: ꦩꦸ©ꦼꦤꦸ...	Budaya	Yogyakarta	10000	-7.615927	110.424333	4.00
11	Museum Nasional	Museum Nasional Republik Indonesia atau Museum...	Budaya	Jakarta	5000	-6.176402	106.821590	4.00
13	Pantai Samas	Pantai Samas (bahasa Jawa: ꦥꦤ꧀ꦠꦻ±ꦱ±ꦩꦱ꧀,...	Bahari	Yogyakarta	4000	-8.004554	110.270376	3.50

Top 10 recommended places for User 34:

	Place_Name	Predicted Rating	Description	Category	City	Price	Rating	Lat	Long
0	Watu Goyang	4.40	Watu Goyang ini berasal dari Bahasa Jawa yang ...	Budaya	Yogyakarta	2500	4.4	-7.927409	110.412059
1	Monumen Nasional	4.37	Monumen Nasional atau yang populer disingkat d...	Budaya	Jakarta	20000	4.6	-6.175392	106.827153
2	Puncak Gunung Api Purba - Nglanggeran	4.35	Gunung Nglanggeran adalah sebuah gunung di Dae...	Cagar Alam	Yogyakarta	10000	4.7	-7.841253	110.543056
3	Obyek Wisata Goa Kreo	4.32	Goa Kreo Semarang yang berada di ibukota Jawa ...	Cagar Alam	Semarang	5500	4.3	-7.037211	110.347616
4	Museum Ullen Sentalu	4.26	Museum Ullen Sentalu, (bahasa Jawa: ͡͡͡͡...	Budaya	Yogyakarta	100000	4.7	-7.597866	110.423396
5	Puspa Iptek Sundial	4.22	Puspa Iptek Sundial adalah wahana pendidikan y...	Taman Hiburan	Bandung	25000	4.4	-6.852208	107.493882
6	Monumen Perjuangan Rakyat Jawa Barat	4.20	Monumen Perjuangan Rakyat Jawa Barat (Monju) a...	Budaya	Bandung	0	4.5	-6.893433	107.618551
7	Jogja Exotarium	4.14	Di Yogyakarta, tepatnya di Sleman, ada satu te...	Taman Hiburan	Yogyakarta	20000	4.4	-7.728036	110.359171
8	Bukit Jamur	4.11	Bukit Jamur Ciwidey adalah satu dari sekian ba...	Cagar Alam	Bandung	0	4.2	-7.195110	107.431281
9	Keraton Surabaya	4.09	Kawasan yang berjuluk Kampung Keraton ini terd...	Budaya	Surabaya	0	4.4	-7.256755	112.794220

User 49

Top 10 places rated by User 49:

	Place_Name	Description	Category	City	Price	Lat	Long	User Rating
43	Wisata Mangrove Tapak	Wisata hutan mangrove Semarang hampir tak pern...	Cagar Alam	Semarang	5000	-6.968562	110.345970	5.00
6	Goa Pindul	Gua Pindul adalah objek wisata berupa gua yang...	Cagar Alam	Yogyakarta	40000	-7.933972	110.651966	5.00
26	Plaza Indonesia	Plaza Indonesia diresmikan pada awal tahun 199...	Pusat Perbelanjaan	Jakarta	0	-6.193926	106.822216	5.00
28	Sam Poo Kong Temple	Sam Poo Kong (Hanzi: ; Pinyin: SƒÅnb«éo D√≤ng)...	Budaya	Semarang	35000	-6.996237	110.398122	5.00
31	Sunrise Point Cukul	Sunrise Point Cukul merupakan salah satu tempa...	Cagar Alam	Bandung	10000	-7.233689	107.534293	5.00
36	Taman Menteng	Taman Menteng adalah sebuah taman yang berloka...	Taman Hiburan	Jakarta	0	-6.196409	106.829311	5.00
33	Taman Balai Kota Bandung	Taman Balai Kota Bandung merupakan sebuah tama...	Taman Hiburan	Bandung	0	-6.912966	107.609603	5.00
5	Desa Wisata Gamplong	Desa Wisata Gamplong adalah desa wisata keraji...	Taman Hiburan	Yogyakarta	10000	-7.805523	110.237468	5.00
3	Candi Ratu Boko	Situs Ratu Baka atau Candi Boko (Hanacaraka:͡...	Budaya	Yogyakarta	75000	-7.770542	110.489416	5.00
39	Water Park Bandung Indah	Bandung Indah Waterpark merupakan salah satu k...	Taman Hiburan	Bandung	50000	-6.980581	107.585657	4.00

Top 10 recommended places for User 49:

	Place_Name	Predicted Rating	Description	Category	City	Price	Rating	Lat	Long
0	Keraton Surabaya	4.14	Kawasan yang berjuluk Kampung Keraton ini terd...	Budaya	Surabaya	0	4.4	-7.256755	112.794220
1	Sanghyang Heuleut	3.93	Danau yang satu ini memiliki air jernih bernua...	Cagar Alam	Bandung	10000	4.4	-6.876513	107.342218
2	Sumur Gumuling	3.93	Sumur Gumuling adalah salah satu tempat untuk ...	Taman Hiburan	Yogyakarta	7000	4.5	-7.808791	110.359183
3	Monumen Yogya Kembali	3.92	Museum Monumen Yogya Kembali (bahasa Jawa: ͡©...	Budaya	Yogyakarta	15000	4.5	-7.749590	110.369607
4	Monumen Selamat Datang	3.86	Monumen Selamat Datang adalah sebuah monumen y...	Budaya	Jakarta	0	4.7	-6.194998	106.823050
5	Obyek Wisata Goa Kreo	3.84	Goa Kreo Semarang yang berada di ibukota Jawa ...	Cagar Alam	Semarang	5500	4.3	-7.037211	110.347616
6	Curug Batu Templek	3.82	Curug Batu Templek Bandung adalah sebuah wisat...	Cagar Alam	Bandung	5000	4.1	-6.874363	107.684402
7	Bukit Jamur	3.80	Bukit Jamur Ciwidey adalah satu dari sekian ba...	Cagar Alam	Bandung	0	4.2	-7.195110	107.431281
8	Teras Cikapundung BBWS	3.79	Teras Cikapundung Bandung sebelumnya merupakan...	Taman Hiburan	Bandung	0	4.3	-6.884420	107.606834
9	Puncak Gunung Api Purba - Nglanggeran	3.76	Gunung Nglanggeran adalah sebuah gunung di Dae...	Cagar Alam	Yogyakarta	10000	4.7	-7.841253	110.543056

User 168

Top 10 places rated by User 168:

	Place_Name	Description	Category	City	Price	Lat	Long	User Rating
15	Kawah Putih	Kawah Putih adalah sebuah tempat wisata di Jaw...	Cagar Alam	Bandung	81000	-7.166204	107.402126	5.00
33	Situ Cileunca	Situ Cileunca yang berlokasi di Warnasari, Pan...	Cagar Alam	Bandung	2500	-7.192328	107.551001	5.00
32	Sea World	Seaworld Indonesia adalah sebuah miniatur peso...	Taman Hiburan	Jakarta	115000	-6.126478	106.842963	5.00
30	Saloka Theme Park	SALOKA hadir sebagai taman rekreasi terbesar d...	Taman Hiburan	Semarang	150000	-7.280726	110.459554	5.00
28	Pulau Pramuka	Pulau Pramuka merupakan salah satu pulau yang ...	Bahari	Jakarta	5000	-5.745962	106.613658	5.00
26	Pasar Kebon Empring Bintaran	Pasar Kebon Empring merupakan salah satu objek...	Pusat Perbelanjaan	Yogyakarta	0	-7.836321	110.457581	5.00
9	Gunung Lalakon	Gunung Lalakon merupakan sebuah gunung yang te...	Cagar Alam	Bandung	0	-6.958056	107.520556	5.00
11	Indonesia Kaya Park	Lokasi Taman Indonesia Kaya yang berada di pus...	Taman Hiburan	Semarang	0	-6.992351	110.420116	5.00
18	Museum Fatahillah	Museum Fatahillah memiliki nama resmi Museum S...	Budaya	Jakarta	5000	-6.136449	106.813066	5.00
16	Monumen Bambu Runcing Surabaya	Monumen Bambu Runcing adalah ikon pariwisata S...	Budaya	Surabaya	0	-7.267775	112.744390	4.50

Top 10 recommended places for User 168:

	Place_Name	Predicted Rating	Description	Category	City	Price	Rating	Lat	Long
0	Taman Budaya Yogyakarta	4.26	Taman Budaya Yogyakarta (TBY) (Hanacaraka:ꦠ...	Budaya	Yogyakarta	0	4.5	-7.800104	110.367658
1	Sumur Gumuling	4.21	Sumur Gumuling adalah salah satu tempat untuk ...	Taman Hiburan	Yogyakarta	7000	4.5	-7.808791	110.359183
2	Teras Cikapundung BBWS	4.21	Teras Cikapundung Bandung sebelumnya merupakan...	Taman Hiburan	Bandung	0	4.3	-6.884420	107.606834
3	Keraton Surabaya	4.21	Kawasan yang berjuluk Kampung Keraton ini terd...	Budaya	Surabaya	0	4.4	-7.256755	112.794220
4	Bukit Bintang Yogyakarta	4.18	Bukit Bintang merupakan salah satu lokasi nong...	Taman Hiburan	Yogyakarta	25000	4.5	-7.845841	110.479846
5	Pantai Baron	4.11	Pantai Baron adalah salah satu objek wisata be...	Bahari	Yogyakarta	10000	4.4	-8.128825	110.548776
6	Kampung Korea Bandung	4.10	Kampung Korea adalah sebuah kawasan di kota Ba...	Budaya	Bandung	15000	4.1	-6.915455	107.640769
7	Bukit Wisata Pulepayung	4.08	Pule Payung Yogyakarta. Sebuah objek wisata po...	Cagar Alam	Yogyakarta	10000	4.5	-7.800111	110.123895
8	Tafso Barn	4.08	Nama Punclut mungkin sudah cukup akrab di teli...	Cagar Alam	Bandung	0	4.2	-6.842645	107.622841
9	Selasar Sunaryo Art Space	4.04	Selasar Sunaryo Art Space (SSAS) adalah sebuah...	Taman Hiburan	Bandung	25000	4.6	-6.858541	107.636549