2440016804 - Rio Pramana - LA01 - Assignment 3

Import libraries & read downloaded dataset from https://www.kaggle.com/jojoker/singapore-airbnb

In [1]:
```
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
from scipy.stats import norm
```

In [2]:
```
# Importing the dataset, downloaded file is in the same folder
csv_path = "listings.csv"
listings_df = pd.read_csv(csv_path)
```

Checking the dataset

In [3]:
```
listings_df.shape
```

Out[3]: (7907, 16)

In [4]:
```
listings_df.head(5)
```

Out[4]:

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_
0	49091	COZICOMFORT LONG TERM STAY ROOM 2	266763	Francesca	North Region	Woodlands	1.44255	103.79580	Private room	83	180	
1	50646	Pleasant Room along Bukit Timah	227796	Sujatha	Central Region	Bukit Timah	1.33235	103.78521	Private room	81	90	
2	56334	COZICOMFORT	266763	Francesca	North Region	Woodlands	1.44246	103.79667	Private room	69	6	
3	71609	Ensuite Room (Room 1 & 2) near EXPO	367042	Belinda	East Region	Tampines	1.34541	103.95712	Private room	206	1	

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_
4	71896	B&B Room 1 near Airport & EXPO	367042	Belinda	East Region	Tampines	1.34567	103.95963	Private room	94	1	

In [5]:
```
listings_new = listings_df.copy()
listings_new.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7907 entries, 0 to 7906
Data columns (total 16 columns):
 #   Column                          Non-Null Count  Dtype
---  ------                          --------------  -----
 0   id                              7907 non-null   int64
 1   name                            7905 non-null   object
 2   host_id                         7907 non-null   int64
 3   host_name                       7907 non-null   object
 4   neighbourhood_group             7907 non-null   object
 5   neighbourhood                   7907 non-null   object
 6   latitude                        7907 non-null   float64
 7   longitude                       7907 non-null   float64
 8   room_type                       7907 non-null   object
 9   price                           7907 non-null   int64
 10  minimum_nights                  7907 non-null   int64
 11  number_of_reviews               7907 non-null   int64
 12  last_review                     5149 non-null   object
 13  reviews_per_month               5149 non-null   float64
 14  calculated_host_listings_count  7907 non-null   int64
 15  availability_365                7907 non-null   int64
dtypes: float64(3), int64(7), object(6)
memory usage: 988.5+ KB
```

1. Extracting discrete and continuous random variables from Singapore Airbnb Data

In [6]:
```
listings_new.head(5)
```

Out[6]:

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_
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Menurut saya, yang termasuk discrete random variables adalah:

1. price (Walaupun biasanya price dianggap continuous, dalam dataset ini price berisi data integer saja sehingga bisa dianggap discrete)
2. minimum_nights
3. number_of_reviews
4. calculated_host_listings_count
5. availability_365

Extracting discrete random variables:

In [7]:
```
discrete = listings_df[["price","minimum_nights","number_of_reviews", "calculated_host_listings_count", "availability_365"]]
discrete
```

Out[7]:

	price	minimum_nights	number_of_reviews	calculated_host_listings_count	availability_365
0	83	180	1	2	365
1	81	90	18	1	365

	price	minimum_nights	number_of_reviews	calculated_host_listings_count	availability_365
2	69	6	20	2	365
3	206	1	14	9	353
4	94	1	22	9	355
...	...	...	...	...	...
7902	100	3	0	31	61
7903	550	6	0	34	365
7904	58	30	0	3	173
7905	56	14	0	2	30
7906	65	90	0	7	365

7907 rows × 5 columns

Menurut saya, yang termasuk continuous random variables adalah:

1. latitude
2. longitude
3. reviews_per_month

Extracting continuous random variables:

In [8]:
```
continu = listings_df[["latitude","longitude","reviews_per_month"]]
continu
```

Out[8]:

	latitude	longitude	reviews_per_month
0	1.44255	103.79580	0.01
1	1.33235	103.78521	0.28
2	1.44246	103.79667	0.20
3	1.34541	103.95712	0.15

	latitude	longitude	reviews_per_month
4	1.34567	103.95963	0.22
...	...	...	...
7902	1.27973	103.78751	NaN
7903	1.29269	103.82623	NaN
7904	1.31286	103.85996	NaN
7905	1.29543	103.83801	NaN
7906	1.29672	103.83325	NaN

7907 rows × 3 columns

2. Calculated PMF (probability mass function) for discrete random variables (only 1 variable)

Selected variable = availability_365

In [9]:
```
pmf_sample = discrete.availability_365.values
pmf_sample
```

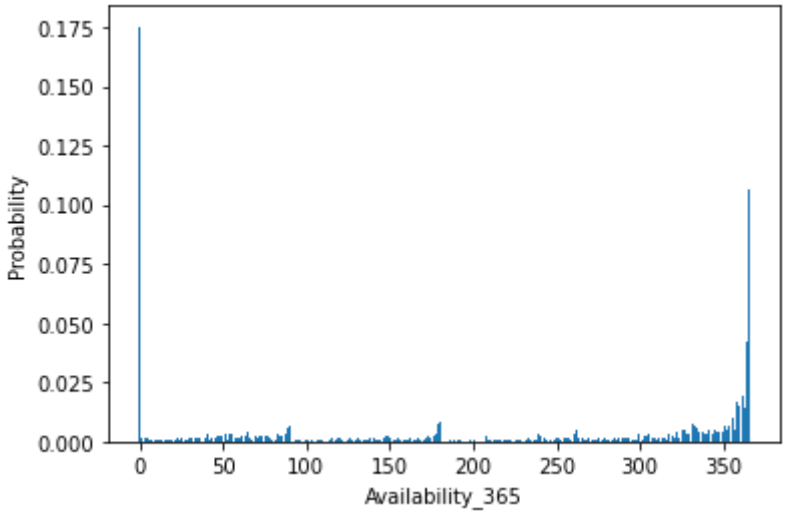
Out[9]:
```
array([365, 365, 365, ..., 173,  30, 365], dtype=int64)
```

In [10]:
```
# Menggunakan data yang sudah ada pada dataset
val, cnt = np.unique(pmf_sample, return_counts=True)
prop = cnt / len(pmf_sample)
```

3. Plot Histogram/Bar for No.2 Result

In [11]:
```
# plot the results
plt.bar(val, prop)
plt.ylabel("Probability")
```

```
plt.xlabel("Availability_365")
plt.show()
```



4. Calculated PDF (probability density function) for Continuous random variables (only 1 variable)

Selected variable = reviews_per_month

In [12]:
```
pdf_sample = continu.reviews_per_month
pdf_sample
```

Out[12]:
```
0       0.01
1       0.28
2       0.20
3       0.15
4       0.22
        ...
7902     NaN
7903     NaN
7904     NaN
7905     NaN
7906     NaN
Name: reviews_per_month, Length: 7907, dtype: float64
```

In [13]:
```
pdf_sample.min()
```

Out[13]:
```
0.01
```

In [14]:
```
pdf_sample.max()
```

Out[14]:
```
13.0
```

In [15]:
```
from numpy import mean
from numpy import std
# calculate parameters
pdf_sample_mean = mean(pdf_sample)
pdf_sample_std = std(pdf_sample)
print('Mean=%.3f, Standard Deviation=%.3f' % (pdf_sample_mean, pdf_sample_std))
```

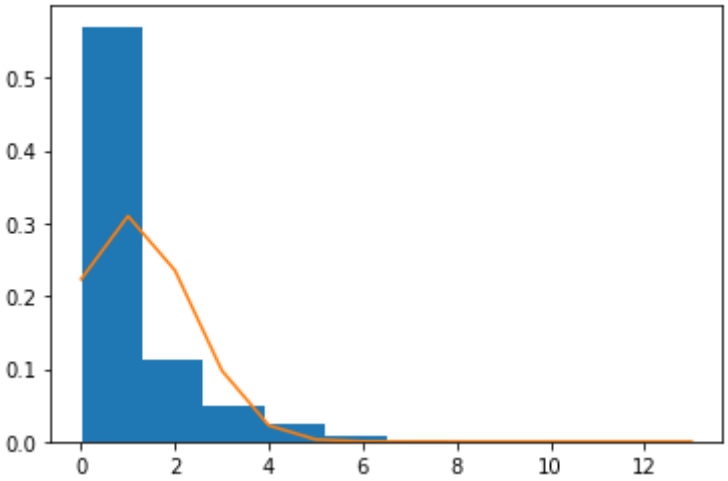
```
Mean=1.044, Standard Deviation=1.286
```

In [16]:
```
# define the distribution
dist = norm(pdf_sample_mean, pdf_sample_std)
```

In [17]:
```
# sample probabilities for a range of outcomes
values = [value for value in range(0, 14)]
probabilities = [dist.pdf(value) for value in values]
```

5. Plot Histogram for No.4 Result

In [18]:
```
# plot the histogram and pdf
plt.hist(pdf_sample, bins=10, density=True)
plt.plot(values, probabilities)
plt.show()
```



Alternative solution for number 4 and 5 (By handling missing data from reviews_per_month column)

Untuk kolom reviews_per_month, kita menghandle missing data dengan mereplace missing data tersebut menggunakan mode dari kolom reviews_per_month karena lebih optimal jika kita menggunakan reviews_per_month yang paling sering muncul untuk menghindari kemungkinan penurunan akurasi dalam jumlah yang besar

In [19]:
```
clean_pdf_sample = pdf_sample.copy()
clean_pdf_sample.fillna(clean_pdf_sample.mode()[0], inplace = True)
clean_pdf_sample.value_counts()
```

Out[19]:
```
1.00    2930
0.04     104
0.08      96
0.05      93
0.10      92
        ...
4.02       1
3.92       1
3.52       1
3.57       1
8.00       1
Name: reviews_per_month, Length: 527, dtype: int64
```

In [20]:
```
clean_pdf_sample.isnull().sum()
```

Out[20]:
```
0
```

In [21]:
```
# calculate parameters
clean_pdf_sample_mean = mean(clean_pdf_sample)
clean_pdf_sample_std = std(clean_pdf_sample)
print('Mean=%.3f, Standard Deviation=%.3f' % (clean_pdf_sample_mean, clean_pdf_sample_std))
```

```
Mean=1.028, Standard Deviation=1.038
```

In [22]:
```
# define the distribution
clean_dist = norm(clean_pdf_sample_mean, clean_pdf_sample_std)
```

In [23]:
```
# sample probabilities for a range of outcomes
clean_values = [value for value in range(0, 14)]
clean_probabilities = [clean_dist.pdf(value) for value in clean_values]
```

In [24]:
```
# plot the histogram and pdf
plt.hist(clean_pdf_sample, bins=10, density=True)
plt.plot(clean_values, clean_probabilities)
plt.show()
```