Week 10 In-Class Activity

In [1]:

```
from IPython.display import Image
import pandas as pd
import numpy as np

Image("pile_of_pandas.png", width = 300)
```

Out[1]:

Indexing Tips

Indexing in Pandas is confusing - especially when you have integer indices

In [2]:

```
X = pd.DataFrame(np.arange(25).reshape((5,5)),
                 index = ['First', 'Second', 'Third', 'Fourth', 'Fifth'],
                 columns = ['A', 'B', 'C', 'D', 'E'])
X
```

Out[2]:

	A	B	C	D	E
First	0	1	2	3	4
Second	5	6	7	8	9
Third	10	11	12	13	14
Fourth	15	16	17	18	19
Fifth	20	21	22	23	24

How do you get the 17?

We **strongly** recommend that you learn two indexing methods: loc and iloc.

loc uses labels, iloc uses index position. These are usually all you need.

Do not use ix, which sometimes uses labels and sometimes positions.

In [3]:

```
X.loc['Fourth','C']
```

Out[3]:

```
17
```

In [4]:

```
X.iloc[3,2]
```

Out[4]:

```
17
```

How would you get the 12, 13, and 18?

In [5]:

```
X.loc['Third','C']
```

Out[5]:

```
12
```

In [8]:

```
X.iloc[2,2]
```

```
Out[8]: 12
```

```
In [6]: X.loc['Third','D']
```

```
Out[6]: 13
```

```
In [9]: X.iloc[2,3]
```

```
Out[9]: 13
```

```
In [7]: X.loc['Fourth','D']
```

```
Out[7]: 18
```

```
In [10]: X.iloc[3,3]
```

```
Out[10]: 18
```

Pandas Cheat Sheet

Some of the most common commands you may want to use today:

Pandas

- .read_csv

Series

- .value_counts()
- .describe()
- .plot()
- .sort_values()

DataFrame

- .shape
- .index
- .columns
- .loc[row labels, column labels]
- .iloc[rows, columns]
- ['column name']
- .drop()
- .set_index()
- .sort_values(by = 'column name')
- .groupby()

Groupby

- .agg()

We're going to Vegas!

In [11]:

```
Image("welcome_vegas.jpg", width = 500)
```

Out[11]:

In [12]:

```
pd.options.display.float_format = '{:,.2f}'.format
import matplotlib.pyplot as plt
%matplotlib inline
```

The file `vegas.csv` contains data taken from trip adviser reviews in 2015. It was used in a paper,

- Moro, S., Rita, P., & Coelho, J. (2017). Stripping customers' feedback on hotels through data mining: The case of Las Vegas Strip. Tourism Management Perspectives, 23, 41-52.

You have been hired by Circus Circus - that's right! that venerable icon of tasteful luxury! - to plan the next season of promotions. In particular, the hotel is interested in questions like,

- What customer segment shows the potential for growing their market?
- What types of promotions are most likely to attract customers?
- In the longer term, what investments are likely to be most profitable for the hotel?

Here are two ways to access the data. You can download from the UC Irvine Machine Learning Repository. If you set your working directory correctly to the Google Drive folder, you can access it from there.

In [13]:

```
Vegas = pd.read_csv('https://archive.ics.uci.edu/ml/machine-learning-databases/00397/LasVegasTripAdvisor
```

In [ ]:

```
# Vegas = pd.read_csv('vegas.csv', delimiter=';')
```

Data Orientation

First, answer some very basic questions about the data:

- How many rows and how many columns are there?
- Did the variable names read from the csv correctly?
- Does the Index make sense? Are there extra indexing variables?

In [14]:

```
Vegas.shape
```

Out[14]:

```
(504, 20)
```

In [15]:

```
Vegas.head()
```

Out[15]:

	User country	Nr. reviews	Nr. hotel reviews	Helpful votes	Score	Period of stay	Traveler type	Pool	Gym	Tennis court	Spa	Casino	Free internet	Hotel name	Hotel stars	Nr room
0	USA	11	4	13	5	Dec-Feb	Friends	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377
1	USA	119	21	75	3	Dec-Feb	Business	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377
2	USA	36	9	25	5	Mar-May	Families	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377
3	UK	14	7	14	4	Mar-May	Friends	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377
4	Canada	5	5	2	4	Mar-May	Solo	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377

Say you found "extra" index variables after reading in the data. That might look like this:

In [16]:

```
Vegas2 = Vegas.assign(extra_index = pd.Series(range(Vegas.shape[0])))
Vegas2.head()
```

Out[16]:

	User country	Nr. reviews	Nr. hotel reviews	Helpful votes	Score	Period of stay	Traveler type	Pool	Gym	Tennis court	...	Casino	Free internet	Hotel name	Hotel stars	Nr. rooms
0	USA	11	4	13	5	Dec-Feb	Friends	NO	YES	NO	...	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	3773
1	USA	119	21	75	3	Dec-Feb	Business	NO	YES	NO	...	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	3773
2	USA	36	9	25	5	Mar-May	Families	NO	YES	NO	...	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	3773
3	UK	14	7	14	4	Mar-May	Friends	NO	YES	NO	...	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	3773
4	Canada	5	5	2	4	Mar-May	Solo	NO	YES	NO	...	YES	YES	Circus Circus Hotel &	3	3773

Casino Las Vegas

5 rows × 21 columns

Option 1: set the index to the extra variable.

In [17]:

```
Vegas2.set_index("extra_index").head()
```

Out[17]:

extra_index	User country	Nr. reviews	Nr. hotel reviews	Helpful votes	Score	Period of stay	Traveler type	Pool	Gym	Tennis court	Spa	Casino	Free internet	Hotel name	Ho st
0	USA	11	4	13	5	Dec-Feb	Friends	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	
1	USA	119	21	75	3	Dec-Feb	Business	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	
2	USA	36	9	25	5	Mar-May	Families	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	
						Mar-								Circus Circus Hotel	

3	UK	14	7	14	4	May	Friends	NO	YES	NO	NO	YES	YES	& Casino Las Vegas
4	Canada	5	5	2	4	Mar-May	Solo	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas

Option 2: drop the extra variable.

In [18]:

```
Vegas2.drop('extra_index', axis=1).head()
```

Out[18]:

	User country	Nr. reviews	Nr. hotel reviews	Helpful votes	Score	Period of stay	Traveler type	Pool	Gym	Tennis court	Spa	Casino	Free internet	Hotel name	Hotel stars	Nr room
0	USA	11	4	13	5	Dec-Feb	Friends	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377
1	USA	119	21	75	3	Dec-Feb	Business	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377
2	USA	36	9	25	5	Mar-May	Families	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377
3	UK	14	7	14	4	Mar-May	Friends	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377
4	Canada	5	5	2	4	Mar-May	Solo	NO	YES	NO	NO	YES	YES	Circus Circus Hotel & Casino Las Vegas	3	377

Fixing Column Names

To make the code cleaner, it will be nice not to have spaces in the column names. This is probably easiest to do with some regular expressions. I'll also go all lowercase.

In [19]:

```
Vegas.columns = Vegas.columns.str.replace('\.*\s+', '_').str.strip('.').str.lower()
Vegas.head()
```

```
<ipython-input-19-43d9b2c5be60>:1: FutureWarning: The default value of regex will change from True to Fa
lse in a future version.
  Vegas.columns = Vegas.columns.str.replace('\.*\s+', '_').str.strip('.').str.lower()
```

Out[19]:

	user_country	nr_reviews	nr_hotel_reviews	helpful_votes	score	period_of_stay	traveler_type	pool	gym	tennis_court	s
0	USA	11	4	13	5	Dec-Feb	Friends	NO	YES	NO	N
1	USA	119	21	75	3	Dec-Feb	Business	NO	YES	NO	N
2	USA	36	9	25	5	Mar-May	Families	NO	YES	NO	N
3	UK	14	7	14	4	Mar-May	Friends	NO	YES	NO	N
4	Canada	5	5	2	4	Mar-May	Solo	NO	YES	NO	N

Now we can access columns as attributes with the dot notation as shown below:

In [ ]:

```
Vegas.period_of_stay.value_counts()
```

Customer Overview

Let's learn about the customers overall.

- Where are they from? (user_country column)

In [20]:

```
Vegas.user_country.value_counts().head(20)
```

Out[20]:

```
USA            217
UK              72
Canada          65
Australia       36
Ireland         13
India           11
Mexico           8
Germany          7
Egypt            5
Brazil           5
New Zeland       5
Singapore        4
Netherlands      4
Norway           3
Israel           3
Malaysia         3
Hawaii           3
Thailand         3
Finland          3
Spain            2
Name: user_country, dtype: int64
```

- What kind of travelers are they? (traveler_type column)

In [21]:

```
Vegas.traveler_type.value_counts()
```

Out[21]:

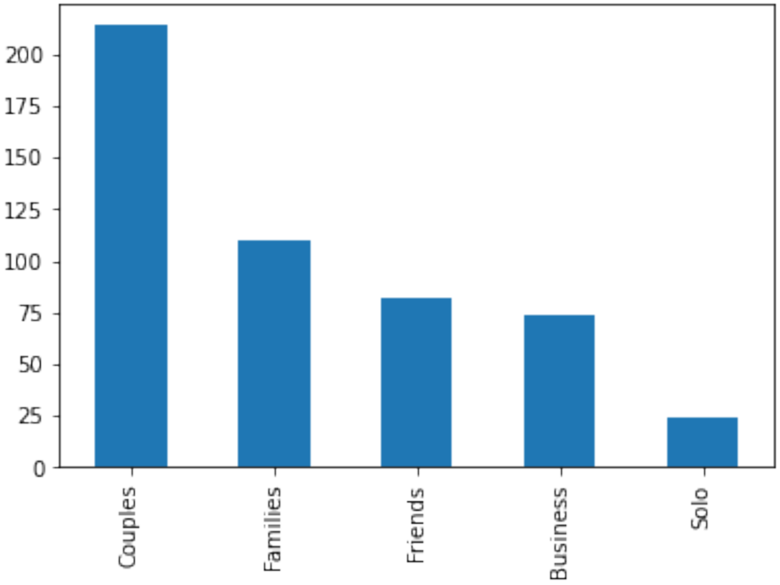
```
Couples      214
Families     110
Friends       82
Business      74
Solo          24
Name: traveler_type, dtype: int64
```

In [22]:

```
Vegas.traveler_type.value_counts().plot(kind='bar')
```

Out[22]:

```
<AxesSubplot:>
```



- When did they stay in Vegas? (? column)

In [24]:

```
Vegas.review_month.value_counts()
```

```
Out[24]: January      42
         February     42
         March        42
         April        42
         May          42
         June         42
         July         42
         August       42
         September    42
         October      42
         November     42
         December     42
         Name: review_month, dtype: int64
```

```
In [25]: Vegas.review_weekday.value_counts()
```

```
Out[25]: Wednesday    85
         Tuesday      80
         Sunday       77
         Monday       74
         Friday       65
         Thursday     62
         Saturday     61
         Name: review_weekday, dtype: int64
```

- Which hotels did they stay in? (? column)

```
In [23]: Vegas.hotel_name.value_counts()
```

Out[23]:

```
Circus Circus Hotel & Casino Las Vegas                 24
Encore at wynn Las Vegas                               24
Paris Las Vegas                                        24
Bellagio Las Vegas                                     24
The Venetian Las Vegas Hotel                           24
Wyndham Grand Desert                                   24
Hilton Grand Vacations at the Flamingo                 24
Tuscany Las Vegas Suites & Casino                      24
Marriott's Grand Chateau                               24
Hilton Grand Vacations on the Boulevard                24
The Cromwell                                           24
Excalibur Hotel & Casino                               24
Trump International Hotel Las Vegas                    24
Wynn Las Vegas                                         24
The Palazzo Resort Hotel Casino                        24
The Cosmopolitan Las Vegas                             24
Caesars Palace                                         24
Tropicana Las Vegas - A Double Tree by Hilton Hotel    24
Treasure Island- TI Hotel & Casino                     24
Monte Carlo Resort&Casino                              24
The Westin las Vegas Hotel Casino & Spa                24
Name: hotel_name, dtype: int64
```

What about the customers of Circus Circus?

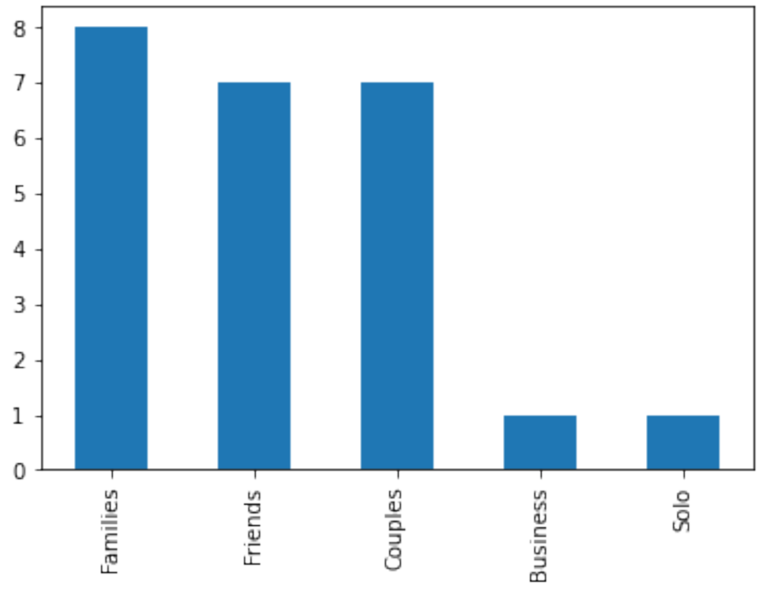
Check to see what kind of travelers stay in Circus Circus, and how they compare to travelers overall.

In [26]:

```
Vegas[Vegas.hotel_name == 'Circus Circus Hotel & Casino Las Vegas'].traveler_type.value_counts().plot(ki
```

Out[26]:

```
<AxesSubplot:>
```



Comparing Hotels

Let's get some info about how Circus Circus compares to other hotels. We'll need to use some groupby's. First, what is the average review score for each hotel?

In [27]:

```
Vegas.groupby('hotel_name').score.mean().sort_values()
```

Out[27]:

```
hotel_name
Circus Circus Hotel & Casino Las Vegas                 3.21
Monte Carlo Resort&Casino                              3.29
Excalibur Hotel & Casino                               3.71
The Westin las Vegas Hotel Casino & Spa                3.92
Hilton Grand Vacations at the Flamingo                 3.96
Treasure Island- TI Hotel & Casino                     3.96
Tropicana Las Vegas - A Double Tree by Hilton Hotel    4.04
Paris Las Vegas                                        4.04
The Cromwell                                           4.08
Caesars Palace                                         4.12
Hilton Grand Vacations on the Boulevard                4.17
Bellagio Las Vegas                                     4.21
Tuscany Las Vegas Suites & Casino                      4.21
The Cosmopolitan Las Vegas                             4.25
The Palazzo Resort Hotel Casino                        4.38
Wyndham Grand Desert                                   4.38
Trump International Hotel Las Vegas                    4.38
Marriott's Grand Chateau                               4.54
Encore at wynn Las Vegas                               4.54
The Venetian Las Vegas Hotel                           4.58
Wynn Las Vegas                                         4.62
Name: score, dtype: float64
```

Another way to do that which is pretty transparent:

In [28]:

```
Vegas.score.groupby(Vegas.hotel_name).mean()
```

Out[28]:

```
hotel_name
Bellagio Las Vegas                                    4.21
Caesars Palace                                        4.12
Circus Circus Hotel & Casino Las Vegas                3.21
Encore at wynn Las Vegas                              4.54
Excalibur Hotel & Casino                              3.71
Hilton Grand Vacations at the Flamingo                3.96
Hilton Grand Vacations on the Boulevard               4.17
Marriott's Grand Chateau                              4.54
Monte Carlo Resort&Casino                             3.29
Paris Las Vegas                                       4.04
The Cosmopolitan Las Vegas                            4.25
The Cromwell                                          4.08
The Palazzo Resort Hotel Casino                       4.38
The Venetian Las Vegas Hotel                          4.58
The Westin las Vegas Hotel Casino & Spa               3.92
Treasure Island- TI Hotel & Casino                    3.96
Tropicana Las Vegas - A Double Tree by Hilton Hotel   4.04
Trump International Hotel Las Vegas                   4.38
Tuscany Las Vegas Suites & Casino                     4.21
Wyndham Grand Desert                                  4.38
Wynn Las Vegas                                        4.62
Name: score, dtype: float64
```

Breakout Activity: What customers like Circus-Circus the most?

Use groupby operations to figure out what types of travelers give circus-circus the highest score.

In [29]:

```
Vegas[Vegas.hotel_name == "Circus Circus Hotel & Casino Las Vegas"].groupby('traveler_type').score.mean(
```

Out[29]:

```
traveler_type
Business   3.00
Couples    2.71
Families   3.38
Friends    3.43
Solo       4.00
Name: score, dtype: float64
```

What country gives Circus-Circus the highest score?

In [30]:

```
Vegas[Vegas.hotel_name == "Circus Circus Hotel & Casino Las Vegas"].groupby('user_country').score.mean()
```

Out[30]:

```
user_country
Australia     3.00
Canada        2.80
India         4.00
New Zeland    2.50
UK            3.80
USA           3.20
Name: score, dtype: float64
```

What's driving the scores of Circus-Circus?

We want a hotel-level dataframe to hold the attributes of each hotel. We can do this with a groupby, followed by an aggregate. However, we need to apply different functions to different columns. We can do this by passing in a dictionary.

In [31]:

```
first_f = lambda x: x.iloc[0]
f = {'score': np.mean,
    'pool': first_f,
    'gym': first_f,
    'tennis_court': first_f,
    'spa': first_f,
    'casino': first_f,
    'free_internet': first_f}
```

In [32]:

```
hotel_df = Vegas.groupby(Vegas.hotel_name).agg(f)
hotel_df
```

Out[32]:

	score	pool	gym	tennis_court	spa	casino	free_internet
hotel_name							
Bellagio Las Vegas	4.21	YES	YES	NO	YES	YES	YES
Caesars Palace	4.12	YES	YES	NO	YES	YES	YES
Circus Circus Hotel & Casino Las Vegas	3.21	NO	YES	NO	NO	YES	YES
Encore at wynn Las Vegas	4.54	YES	YES	NO	YES	YES	YES
Excalibur Hotel & Casino	3.71	YES	YES	NO	YES	YES	YES
Hilton Grand Vacations at the Flamingo	3.96	YES	YES	NO	NO	NO	YES
Hilton Grand Vacations on the Boulevard	4.17	YES	YES	NO	YES	YES	YES
Marriott's Grand Chateau	4.54	YES	YES	NO	NO	YES	YES
Monte Carlo Resort&Casino	3.29	YES	YES	NO	YES	YES	NO
Paris Las Vegas	4.04	YES	YES	NO	YES	YES	YES
The Cosmopolitan Las Vegas	4.25	YES	YES	NO	YES	YES	YES
The Cromwell	4.08	YES	NO	NO	NO	YES	YES
The Palazzo Resort Hotel Casino	4.38	YES	YES	NO	YES	YES	YES
The Venetian Las Vegas Hotel	4.58	YES	YES	NO	YES	YES	YES
The Westin las Vegas Hotel Casino & Spa	3.92	YES	YES	NO	YES	YES	YES
Treasure Island- TI Hotel & Casino	3.96	YES	YES	YES	YES	YES	YES
Tropicana Las Vegas - A Double Tree by Hilton Hotel	4.04	YES	YES	YES	YES	YES	YES
Trump International Hotel Las Vegas	4.38	YES	YES	NO	YES	YES	YES
Tuscany Las Vegas Suites & Casino	4.21	YES	YES	YES	YES	YES	YES
Wyndham Grand Desert	4.38	YES	YES	YES	NO	NO	YES
Wynn Las Vegas	4.62	YES	YES	YES	YES	YES	YES

Optional Activity: What do Couples care about?

In your group, choose some upgrade that Circus-Circus could consider (for example, adding a pool). Then look at travelers that are couples specifically, and see if there's evidence that they value that attribute.

If you succeed and have time, you could try to generate a table that indicates how much different types of travelers value different hotel attributes.

In [ ]: