Homework 2 | PSTAT134 | API's & Webscraping

Part One: Analyzing the Weather

In this section, you will gain more practice working with public APIs, this time using a public weather API, WeatherAPI. The first thing you'll need to access this is an API key which you can sign up for here.

Exercise 1

Use the http://api.weatherapi.com/v1/current.json URL to access the API and obtain real-time weather data. Note that you will want to specify three query parameters, at least: `key`, which should be set to your individual API key, `q` which should equal the latitude and longitude of a specified location - for example `q = '34.422965, -119.856978'` - and `aqi` which indicates whether you want to obtain air quality data (`"yes"` or `"no"`).

Obtain current real-time weather data for fifty randomly selected locations. Use the cities within the cities.csv file.

In [166]:
```
import requests # Allowing to call APIs
import api_key_holder #Reference to api_key so we don't publicize
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [154]:
```
#location list
locations_df = pd.read_csv("data/cities.csv")
locations = locations_df['name'].tolist()
```

```
#Free key and url for this request
base_url = "http://api.weatherapi.com/v1/current.json"
api_key = api_key_holder.weatherapi_key
```

Exercise 2

Write code in Python to extract and store the following data for each location (see only):

In [212]:
```
weather_data = [] #init

for loc in locations:
    parameters = {
        'key': api_key,
        'q': loc,
        'aqi':'yes'
    }

    response = requests.get(base_url, parameters)
    data = response.json()
    entry_current = {"City_Name": data['location']['name'],
                     "Country": data['location']['country'],
                     "Daytime": data['current']['is_day'],
                     "Temperature (F)": data['current']['temp_f'],
                     "Humidity": data['current']['humidity'],
                     "Weather_Desc": data['current']['condition']['text'],
                     "Precipitation (in)": data['current']['precip_in'],
                     "Precipitation (mm)": data['current']['precip_mm'],
                     "EU_DEFRA_AQI": data['current']['air_quality']['us-epa-index']}
    weather_data.append(entry_current)
```

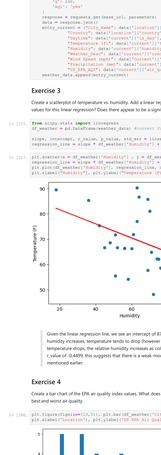
Exercise 3

Create a scatterplot of temperature vs. humidity. Add a linear regression line to the plot. What are the estimated intercept and slope values for this linear regression? Does there appear to be a significant relationship between temperature and humidity?

In [215]:
```
from scipy.stats import linregress
df_weather = pd.DataFrame(weather_data) #convert for expression

slope, intercept, r_value, p_value, std_err = linregress(df_weather['Humidity'], df_weather['Temperature (F)'])
regression_line = slope * df_weather['Humidity'] + intercept
```

In [217]:
```
plt.scatter(x = df_weather['Humidity'] , y = df_weather['Temperature (F)'])
regression_line = slope * df_weather['Humidity'] + intercept
plt.plot(df_weather['Humidity'], regression_line, color="red", label="Regression Line")
plt.xlabel('Humidity'), plt.ylabel('Temperature (F)');
```



> Given the linear regression line, we see an intercept of 87.23 degrees F, and a slope of -0.2795. This suggests that as humidity increases, temperature tends to drop (however general domain knowledge of physics would indicated that as temperature drops, the relative humidity increases as colder air is able to hold onto less moisture). Meanwhile, with an r_value of -0.4499, this suggests that there is a weak moderate negative relationship between temperature and humidity as mentioned earlier.

Exercise 4

Create a bar chart of the EPA air quality index values. What does the distribution of air quality look like? Identify the location(s) with the best and worst air quality.

In [186]:
```
plt.figure(figsize=(13,5)), plt.bar(df_weather['City_Name'], df_weather["EU_DEFRA_AQI"]);
plt.xlabel("Location"); plt.ylabel("EU EPA Air Quality Index"); plt.xticks(rotation=45, ha='right');
```

In [262]:
```
bad_aqi = df_weather[df_weather["EU_DEFRA_AQI"] > 3]
bad_aqi[["City_Name","Country", "EU_DEFRA_AQI"]]
```

Out[262]:

	City_Name	Country	EU_DEFRA_AQI
1	Chongqing	China	5
5	Tangshan	China	5
8	Zunyi	China	4
13	Pyongyang	North Korea	4
24	Busan	Pakistan	4
29	Hyderabad	India	4
33	Riyadh	Saudi Arabia	4
39	Tianjin	China	5
41	Lucknow	India	4
46	Lanzhou	China	4

In [278]:
```
good_aqi = df_weather[df_weather["EU_DEFRA_AQI"] < 2]
good_aqi[["City_Name","Country", "EU_DEFRA_AQI"]]
```

Out[278]:

	City_Name	Country	EU_DEFRA_AQI
7	Warsaw	Poland	1
11	Guayaquil	Ecuador	1
12	Daegu	South Korea	1
16	Fes-Saiss Airport	Morocco	1
22	Rome	Iran	1
23	Toronto	Canada	1
25	Porto Alegre	Brazil	1
26	Havana	Cuba	1
32	Brisbane	Australia	1
36	Auckland	New Zealand	1
37	Quito	Ecuador	1
38	Guatemala City	Guatemala	1
43	Accra	Ghana	1
48	Kyoto	Japan	1
49	Cape Town	South Africa	1

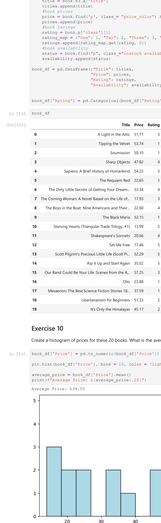
> Due to the sheer amount of locations displayed on the graph, it may be a bit difficult to interpret accurately so I've created the above dataframes as well. We see a typically sporadic distribution of air qualities with AQI values of 1-2 being the most common while AQI values of 4-5 were quite rare. We see locations in China had the worst AQI with only Chinese cities like Chongqing, Tangshan, and Tianjin reaching values of 5. India, Saudi Arabia, North Korea, and Pakistan were the only other countries that had a city/cities with AQI scores over 3. Meanwhile, for the locations with the best air quality we see Brisbane, Guatemala City, Accra, and Ibarra to name a few. Note, these current values of AQI are subject to change and the interpretations from this document are only appropriate at the given time in which this was queried (Oct 31st 9:45 PCT).

Exercise 5

Create a bar chart of the current weather description. Which conditions are the most common? Which are the least?

In [329]:
```
weather_counts = df_weather["Weather_Desc"].value_counts()

weather_counts.plot(kind = 'bar', color = 'lightblue')
plt.title("Barchart of Weather Desc. Distribution of 50 Cities")
plt.ylabel("Count"); plt.xticks(rotation = 75);
```



> Based on the chart above we see that Sunny, Clear, and Partly cloudy are the most common conditions, while Fog, Light rain shower, and moderate rain were the least common city conditions at the time of this query.

Part Two: Scraping Books

In this section, we'll practice our web scraping skills by experimenting with a fictional online bookstore located here.

Exercise 9

Scrape the first 20 results from this site. Create a data frame that stores the following for each book:

- Title
- Price (excluding tax)
- Star rating
- Whether the book is in stock

In [332]:
```
from bs4 import BeautifulSoup
```

In [328]:
```
url = "https://books.toscrape.com"

response = requests.get(url)
soup = BeautifulSoup(response.content, "html.parser")
book_pods = soup.find_all("article", class_ = "product_pod")
```

In [334]:
```
book_df = []
titles = []
prices = []
ratings = []
availability = []

for book in book_pods:
    #book = book
    title = book.h3.a["title"]
    titles.append(title)
    #text price
    price = book.find("p", class_= "price_color").text.strip().replace("£", "")
    prices.append(price)
    #star rating
    rating = book.p["class"][1]
    rating_map = {"One": 1, "Two": 2, "Three": 3, "Four": 4, "Five": 5}
    ratings.append(rating_map.get(rating, 0))
    #text availability
    status = book.find("p", class_="instock availability").text.strip()
    availability.append(status)

book_df = pd.DataFrame({"Title": titles,
                        "Price": prices,
                        "Rating": ratings,
                        "Availability": availability})

book_df['Rating'] = pd.Categorical(book_df['Rating'], categories=[1, 2, 3, 4, 5], ordered=True)
```

In [332]:
```
book_df
```

Out[332]:

	Title	Price	Rating	Availability
0	A Light in the Attic	51.77	3	In stock
1	Tipping the Velvet	53.74	1	In stock
2	Soumission	50.10	1	In stock
3	Sharp Objects	47.82	4	In stock
4	Sapiens: A Brief History of Humankind	54.23	5	In stock
5	The Requiem Red	22.65	1	In stock
6	The Dirty Little Secrets of Getting Your Dream...	33.34	4	In stock
7	The Coming Woman: A Novel Based on the Life of...	17.93	3	In stock
8	The Boys in the Boat: Nine Americans and Their...	22.60	4	In stock
9	The Black Maria	52.15	1	In stock
10	Starving Hearts (Triangular Trade Trilogy, #1)	13.99	2	In stock
11	Shakespeare's Sonnets	20.66	4	In stock
12	Set Me Free	17.46	5	In stock
13	Scott Pilgrim's Precious Little Life (Scott Pi...	52.29	5	In stock
14	Rip It Up and Start Again	35.02	5	In stock
15	Our Band Could Be Your Life: Scenes from the A...	57.25	3	In stock
16	Olio	23.88	1	In stock
17	Mesaerion: The Best Science Fiction Stories 18...	37.59	1	In stock
18	Libertarianism for Beginners	51.33	2	In stock
19	It's Only the Himalayas	45.17	2	In stock

Exercise 10

Create a histogram of prices for these 20 books. What is the average price?

In [337]:
```
book_df['Price'] = pd.to_numeric(book_df['Price'])

plt.hist(book_df['Price'], bins = 10, color = 'lightblue', edgecolor = 'black')

average_price = book_df['Price'].mean()
print("Average Price: £{:.2f}".format(average_price))
```

```
Average Price: £30.05
```

Exercise 11

Create a bar chart of star rating for these 20 books. Find the book(s) with the highest and lowest star ratings.

In [342]:
```
rating_counts = book_df['Rating'].value_counts().sort_index()
rating_counts.plot(kind = 'bar', color = 'lightblue')
plt.title("Barplot of Book Ratings"); plt.xlabel("Star Rating");
```

In [346]:
```
#Finding lowest rated books
one_star = book_df[book_df['Rating'] == 1]
one_star
```

Out[346]:

	Title	Price	Rating	Availability
1	Tipping the Velvet	53.74	1	In stock
2	Soumission	50.10	1	In stock
5	The Requiem Red	22.65	1	In stock
9	The Black Maria	52.15	1	In stock
16	Olio	23.88	1	In stock
17	Mesaerion: The Best Science Fiction Stories 18...	37.59	1	In stock

In [348]:
```
#Finding highest rated books
five_star = book_df[book_df['Rating'] == 5]
five_star
```

Out[348]:

	Title	Price	Rating	Availability
4	Sapiens: A Brief History of Humankind	54.23	5	In stock
12	Set Me Free	17.46	5	In stock
13	Scott Pilgrim's Precious Little Life (Scott Pi...	52.29	5	In stock
14	Rip It Up and Start Again	35.02	5	In stock