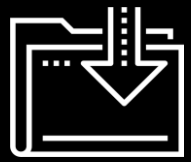
Python APIs: Day 2

Data Boot Camp

Lesson 6.2



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Class Objectives

By the end of today's class, you will be able to:

Load JSON from API responses into Pandas DataFrames

Use `'try'` and `'except'` to resolve missing key values without terminating the code

Use linear regression to predict the temperature at certain latitudes

Activity: JSON Traversal

In this activity, you will be traversing a JSON file using your knowledge of Python.

(Instructions sent via Slack.)

Suggested Time:

10 minutes

Activity: JSON Traversal

Instructions

- Load the provided JSON.
- Retrieve the video's title.
- Retrieve the video's rating.
- Retrieve the link to the video's thumbnail.
- Retrieve the number of views for the video.


```
{"apiVersion":"2.0",
 "data":{
    "updated":"2010-01-07T19:58:42.949Z",
    "totalItems":800,
    "startIndex":1,
    "itemsPerPage":1,
    "items":[
       {"id":"hYB0mn5zh2c",
        "uploaded":"2007-06-05T22:07:03.000Z",
        "updated":"2010-01-07T13:26:50.000Z",
        "uploader":"GoogleDeveloperDay",
        "category":"News",
        "title":"Google Developers Day US - Maps API Introduction",
        "description":"Google Maps API Introduction ...",
        "tags":[
           "GDD07","GDD07US","Maps"
        ],
        "thumbnail":{
           "default":"http://i.ytimg.com/vi/hYB0mn5zh2c/default.jpg",
           "hqDefault":"http://i.ytimg.com/vi/hYB0mn5zh2c/hqdefault.jpg"
        },
        "player":{
           "default":"http://www.youtube.com/watch?vu003dhYB0mn5zh2c"
        },
```

Time’s Up! Let’s Review.

Activity: Requests Review

In this activity, you will make a request to remote JSON data and then print out data from the response.

(Instructions sent via Slack.)

Suggested Time:

15 minutes

Activity: Requests Review

Instructions	
	Make a request to the following endpoint (`https://static.bc-edx.com/data/dl-1-2/m6/lessons/2/request_review.json`), and store the response.
	JSON-ify the response.
	Print the JSON representations of the first and last posts.
	Print the number of posts received.

Time's Up! Let's Review.

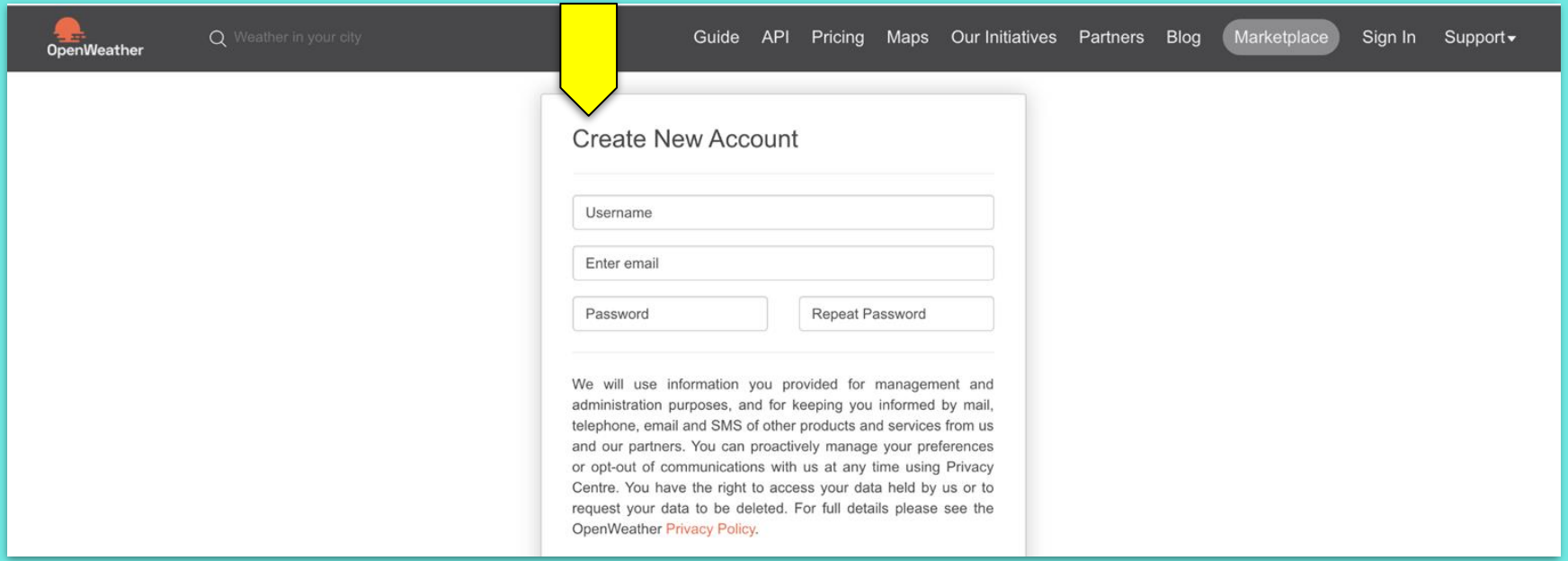
Instructor Demonstration

OpenWeatherMap API

OpenWeatherMap API

OpenWeatherMap API Provides various sorts of meteorological data

Sign up for a key at https://home.openweathermap.org/users/sign_up



OpenWeatherMap API

- Remember to store keys in a `config.py` file
- Similar patterns to previous API calls

```
The weather API responded with: {'coord': {'lon': -0.13, 'lat': 51.51}, 'weather': [{'id': 500, 'main': 'Rain', 'desc
ription': 'light rain', 'icon': '10n'}], 'base': 'stations', 'main': {'temp': 280.25, 'pressure': 994, 'humidity': 6
6, 'temp_min': 279.15, 'temp_max': 282.15}, 'visibility': 10000, 'wind': {'speed': 7.7, 'deg': 260}, 'rain': {'3h':
1.235}, 'clouds': {'all': 92}, 'dt': 1516042200, 'sys': {'type': 1, 'id': 5091, 'message': 0.0047, 'country': 'GB',
'sunrise': 1516003129, 'sunset': 1516033320}, 'id': 2643743, 'name': 'London', 'cod': 200}.
```

Activity: Weather in Burundi

In this activity, you will work with the OpenWeatherMap API to create an application that provides the user with the current temperature in Burundi's largest city.

(Instructions sent via Slack.)

Suggested Time:

15 minutes

Activity: Weather in Burundi

Instructions	Save all of your `"config"` information—i.e., your API key, the base URL, etc.—before getting started.
	Make your request, and save the API response.
	Retrieve the current temperature in Bujumbura from the JSON response.
	Print the temperature to the console.
Bonus	Augment your code to report the temperature in both Fahrenheit *and* Celsius.
Hints	Check the documentation to figure out how to request temperatures in Celsius.
	Don't forget to change the API key in `config.py`!

```
The temperature in Bujumbura is 75.2 C.
```

Time’s Up! Let’s Review.

Instructor Demonstration

OpenWeatherMap DataFrame

OpenWeatherMap DataFrame

- We'll use our previous OpenWeatherMap API requests.
- The API response contains fields such as temperature and latitude.
- A `for` loop is used to loop through the cities list, make a request, and append to a list.
- What would be an easy way to analyze the different metrics?

OpenWeatherMap DataFrame

```
cities = ["Paris", "London", "Oslo", "Beijing"]

# set up lists to hold response info
lat = []
temp = []

# Loop through a list of cities and perform a request for data on each
for city in cities:
    response = requests.get(query_url + city).json()
    lat.append(response['coord']['lat'])
    temp.append(response['main']['temp'])

print(f"The latitude information received is: {lat}")
print(f"The temperature information received is: {temp}")
```

```
The latitude information received is: [48.86, 51.51, 59.91, 39.91]
The temperature information received is: [8.59, 6, 0, 1]
```

OpenWeatherMap DataFrame, continued

Once all the data has been collected, the list can be stored in a dictionary and then in a DataFrame.

With the data now in a DataFrame, it can be plotted with Matplotlib.

```
# create a data frame from cities, lat, and temp
weather_dict = {
    "city": cities,
    "lat": lat,
    "temp": temp
    }
weather_data = pd.DataFrame(weather_dict)
weather_data.head()
```

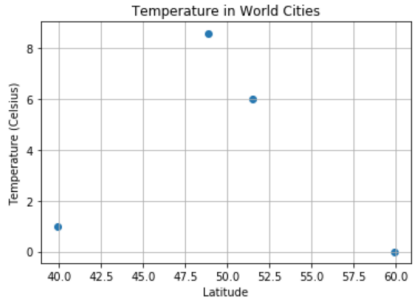
	city	lat	temp
0	Paris	48.86	8.59
1	London	51.51	6.00
2	Oslo	59.91	0.00
3	Beijing	39.91	1.00

```
# Build a scatter plot for each data type
plt.scatter(weather_data["lat"], weather_data["temp"], marker="o")

# Incorporate the other graph properties
plt.title("Temperature in World Cities")
plt.ylabel("Temperature (Celsius)")
plt.xlabel("Latitude")
plt.grid(True)

# Save the figure
plt.savefig("TemperatureInWorldCities.png")

# Show plot
plt.show()
```



Activity: TV Ratings

In this activity, you'll create an application that reads in a list of TV shows, makes multiple requests from an API to retrieve rating information, creates a Pandas Dataframe, and then visually displays the data.

(Instructions sent via Slack.)

Suggested Time:

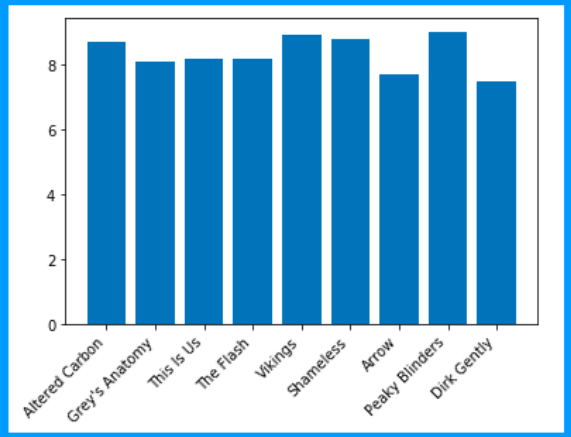
15 minutes

Activity: TV Ratings

Instructions

- You may use the list of TV shows provided in the starter file or create your own.
- Request information on each TV show from https://www.tvmaze.com/api#show-search.
- Store the name and rating information in lists.
- Store this data in a dictionary, and use it to create a Pandas DataFrame.
- Use Matplotlib to create a bar chart comparing the ratings of each show.

	rating	title
0	8.7	Altered Carbon
1	8.1	Grey's Anatomy
2	8.2	This Is Us
3	8.2	The Flash
4	8.9	Vikings
5	8.8	Shameless
6	7.7	Arrow
7	9.0	Peaky Blinders
8	7.5	Dirk Gently



Time’s Up! Let’s Review.

Activity: Weather Statistics

In this activity, you will predict the temperature of a city using a regression model on a dataset from the OpenWeatherMap API.

(Instructions sent via Slack.)

Suggested Time:

15 minutes

Activity: Weather Statistics

Instructions	Using the starter file as a guide, complete the following: • Create a scatter plot of Temperature vs. Latitude. • Perform linear regression. • Create a line equation for the regression. • Create a scatter plot with the linear regression line. • Predict the temperature of Florence at latitude 43.77° • Use the API to determine the actual temperature in Florence.
	If you finish early, feel free to try to predict the temperature in other cities.
Hint	if you need help, revisit the material on statistics from Unit 5.3.

Time’s Up! Let’s Review.

Break

Instructor Demonstration

Exception Handling

What would happen if an application tried to look up a key that doesn't exist within a given dictionary?

Errors

So far, our API requests have had the values we're looking for.

When a value is not found, Python returns an error, as it does in our notebook when we look up `"Mary"`

```
students = {
    # Name  : Age
    "James": 27,
    "Sarah": 19,
    "Jocelyn": 28
}

print(students["Mary"])

print("This line will never print.")
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
/var/folders/1n/50wf_pbs5bsb8__bwdkxwvq86mm3js/T/ipykernel_69817/95543560.py in
<module>
      6 }
      7
----> 8 print(students["Mary"])
      9
     10 print("This line will never print.")

KeyError: 'Mary'
```

Try-Except

The `try-except` code will let an application recover from errors like our Mary example

- `"try"` and `except` are statements like `for` and `if`.
- Python will `"try"` to run the code.
- If the code throws an error or exception, the code in the `except` block is executed.

```
students = {
    # Name  : Age
    "James": 27,
    "Sarah": 19,
    "Jocelyn": 28
}

# Try to access key that doesn't exist
try:
    students["Mary"]
except KeyError:
    print("Oops, that key doesn't exist.")

# "Catching" the error lets the rest of our code execute
print("...But the program doesn't die early!")
```

```
Oops, that key doesn't exist.
...But the program doesn't die early!
```

Activity: Making Exceptions

In this activity, you will create an application that uses `try` and `except` to resolve a number of errors.

(Instructions sent via Slack.)

Suggested Time:

5 minutes

Activity: Making Exceptions

Instructions	
	Without removing any of the lines from the provided starter code, create `try-except` blocks that will allow the application to run without terminating.
	Each `'except'` block should handle the specific error that will occur.
	Add a `'print'` statement under the `'except'` block to log the error.

Time’s Up! Let’s Review.

Activity: API Call Exceptions

In this activity, you will implement `try-except` blocks as you make API calls to narrow down a list of fictional characters to include only characters from Star Wars.

(Instructions sent via Slack.)

Suggested Time:

15 minutes

Activity: API Call Exceptions

Instructions	
	Loop through the characters in the list, and send a request to the Star Wars API.
	Create a `'try'` clause and an `'except'` clause. In the `'try'` clause, append the height, mass, and character name that is available in the Star Wars API to their respective lists.
	If the character is not available in the Star Wars API, create an `'except'` clause to print a message and `'pass'`.
	Create a DataFrame from the results.

Time's Up! Let's Review.

Instructor Demonstration

World Bank API

World Bank API

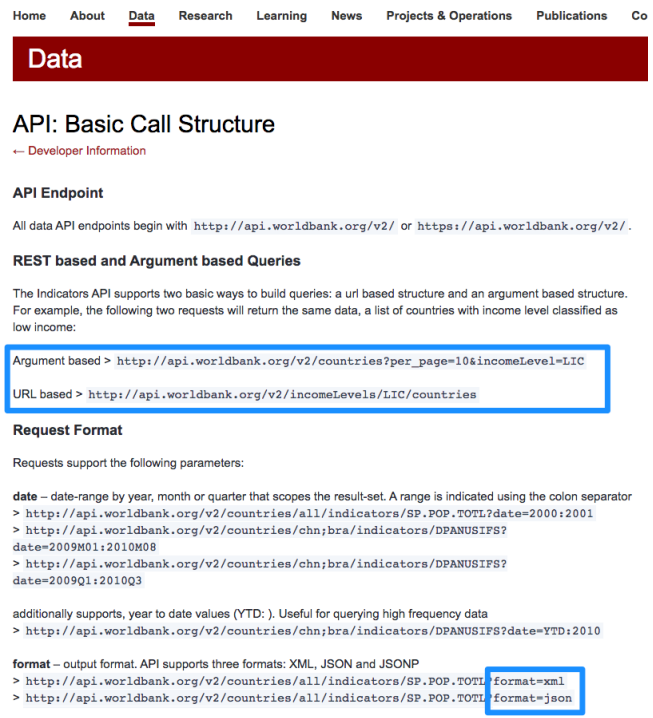
Up until now, we have been working with straightforward API queries.

Of course, more complicated API frameworks exist.

For the remainder of class, we will practice working with more complicated APIs.

```
url = "http://api.worldbank.org/v2/"
format = "json"

# Get country information in JSON format
countries_response = requests.get(f"{url}countries?format={format}").json()
```



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Data

API: Basic Call Structure

← Developer Information

API Endpoint

All data API endpoints begin with `http://api.worldbank.org/v2/` or `https://api.worldbank.org/v2/`.

REST based and Argument based Queries

The Indicators API supports two basic ways to build queries: a url based structure and an argument based structure. For example, the following two requests will return the same data, a list of countries with income level classified as low income:

Argument based > `http://api.worldbank.org/v2/countries?per_page=10&incomeLevel=LIC`

URL based > `http://api.worldbank.org/v2/incomeLevels/LIC/countries`

Request Format

Requests support the following parameters:

date -- date-range by year, month or quarter that scopes the result-set. A range is indicated using the colon separator
> `http://api.worldbank.org/v2/countries/all/indicators/SP.POP.TOTL?date=2000:2001`
> `http://api.worldbank.org/v2/countries/chn;bra/indicators/DPANUSIFS?date=2009M01:2010M08`
> `http://api.worldbank.org/v2/countries/chn;bra/indicators/DPANUSIFS?date=2009Q1:2010Q3`

additionally supports, year to date values (YTD:). Useful for querying high frequency data
> `http://api.worldbank.org/v2/countries/chn;bra/indicators/DPANUSIFS?date=YTD:2010`

format -- output format. API supports three formats: XML, JSON and JSONP
> `http://api.worldbank.org/v2/countries/all/indicators/SP.POP.TOTL?format=xml`
> `http://api.worldbank.org/v2/countries/all/indicators/SP.POP.TOTL?format=json`

Activity: Two Calls

In this activity, you will use the World Bank API to make two API calls in sequence. The second API call depends on the response from the first.

(Instructions sent via Slack.)

Suggested Time:

10 minutes

Activity: Two Calls

Instructions

Retrieve a list of the lending types that the World Bank keeps track of, and extract the ID key from each lending types or list.

Next, determine how many countries are categorized under each lending type. Use a `dict` to store this information.

- This data is stored as the first element of the response array.

Finally, print the number of countries for each lending type.

```
The number of countries with lending type IBD is 140.
The number of countries with lending type IBD is 30.
The number of countries with lending type IDX is 118.
The number of countries with lending type LNX is 74.
```

Time's Up! Let's Review.