



API (Application Programming Interface)

Disclaimer: These notes and examples are an adaptation of the references listed at the end. They are compiled to fit the scope of this specific course.

Introduction

This handout introduces the concept of `API`. We will look specifically at `API` from a data acquisition point of view. So far, we have seen several ways of accessing and importing data in `pandas`. The following are some of these methods:

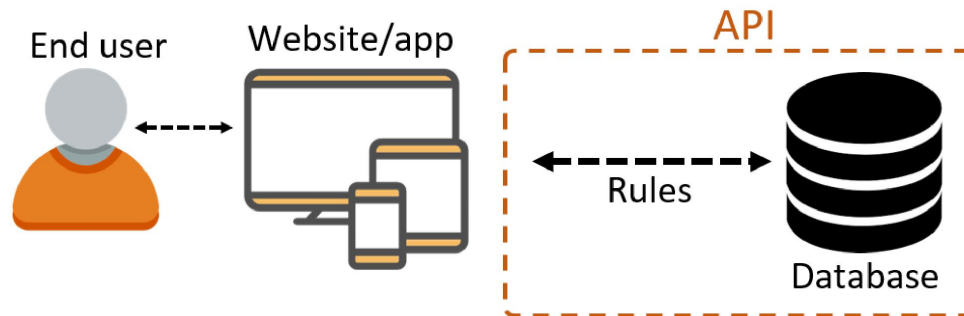
- Initially, we created data ourselves and turned it into a dataframe (frequently from a python dictionary)
- Another way of accessing data is accessing it from your computer's local hard drive.
- Reading data from an online repository such as the UCI machine learning repository (<https://archive.ics.uci.edu/ml/index.php>) is another method of accessing available datasets.

There are at least two other methods of acquiring data: **web scrapping** and using an **API**.

- **Web scrapping:** There are situations where you need to extract data from a website. Without an API, which will be discussed shortly, you may end up "*downloading*" all or parts of the contents of the website, abstracting its valuable data, and putting the data into a usable format. This practice is known as **web scrapping**. Web scrapping requires us to know *HTML* basics, which is outside the scope of this course. You may learn bits and pieces of it in other classes, such as Data Visualization.
- **API (Application Programming Interface):** Yet another way to get data from the web is by utilizing the data provider's API. To understand APIs, let's look at how a company's website, such as Expedia, operates.

API definition and application

The following is a simplified view of the operation of a web application:



A simplified view on a web application operation

- At one end of the extreme (**backend**), there is one or more massive database(s) containing up-to-date information about hotels, availability, policies, and prices. This database also includes customer information such as address, historical purchase data, username and password, and credit card information. SQL (Structured Query Language) is the language used for handling databases. As a customer, you do not see this database.
- On the other end, a customer uses Expedia's website or mobile app to interact with this database. The website/ app is designed for human interactions. This app or website is known as the **front-end**.
- When a customer logs into the Expedia's app, the app decides what information to request from the database and which hotels, in what order, and prices to show to the customer. This is known as **Rules**.

API is the combination of the Database and the Rules; it accepts requests – usually from a human — and returns information often in JSON (Java Script Object Notation) format.

What can you do with an API?

You may be able to do various tasks using APIs. For example, Robinhood's API (<https://robin-stocks.readthedocs.io/en/latest/quickstart.html>) allows you to perform trades in the financial markets. On the other hand, Yahoo finance API (<https://github.com/ranaroussi/yfinance>) allows you to download historical stock market data.

The good news is that there are pre-built python packages or libraries for popular APIs that allow you to interact with that API directly from a python environment. These libraries provide an excellent utility for the users to interact with and extract data from publically available databases.

<https://github.com/public-apis/public-apis> lists hundreds of publicly available APIs. I highly encourage you to explore these APIs.

The rest of this handout will walk you through the details of interacting with a specific API.

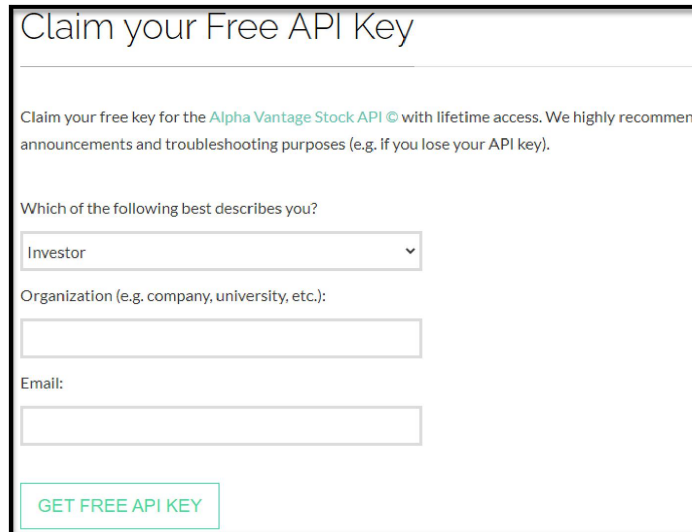
API example: Alpha Vantage

This section walks you through interacting with **Alpha Vantage** API. According to its website (<https://www.alphavantage.co/>):

Alpha Vantage provides enterprise-grade financial market data through a set of powerful and developer-friendly data APIs and spreadsheets. From traditional asset classes (e.g., stocks, ETFs, commodities) to economic metrics, from foreign exchange rates to cryptocurrencies, from fundamental data to technical indicators, Alpha Vantage is your one-stop-shop for real-time and historical global market data delivered through REST stock APIs, Excel, and Google Sheets.

We will learn how we can use the free API offered by *Alpha Vantage*. These are usually useful steps in exploring an API:

- **Check available Libraries:** Check if there is any pre-built python library or package allows you to interact with that API from your python environment. As trivial as it may sound, www.pypi.org, www.github.com, and www.google.com are the best place to start. Please note that there may be more than one library designed by different entities for interacting with the same API.
 - In the case of **Alpha Vantage**, *Github* and *Pypi* both lead us to the package **alpha-vantage** available via https://github.com/RomelTorres/alpha_vantage and <https://pypi.org/project/alpha-vantage/>. Either of these pages provides clear instructions on installing and using this package.
- **Library Installation:** Follow installation instructions.
 - In the case of **Alpha Vantage**, this is done using `pip install alpha_vantage`
- **Acquire an API key:** You can think of an API key as both your username and password. API keys are commonly used to control the utilization of the API and track how it is used. This is often a precaution to prevent abuse or malicious use. API key is usually a long unique string that is assigned to you. You need this key to use the API and acquire the data.
 - In the case of **Alpha Vantage**, you can get a free API key by completing the form available at <https://www.alphavantage.co/support/#api-key>

The image shows a web form titled "Claim your Free API Key". Below the title, there is a paragraph: "Claim your free key for the Alpha Vantage Stock API with lifetime access. We highly recommend announcements and troubleshooting purposes (e.g. if you lose your API key)." Below this, there is a question: "Which of the following best describes you?" followed by a dropdown menu with "Investor" selected. Then, there is a text input field for "Organization (e.g. company, university, etc.):". Below that is an "Email:" label followed by another text input field. At the bottom, there is a green button labeled "GET FREE API KEY".

Claim your Free API Key

Claim your free key for the Alpha Vantage Stock API with lifetime access. We highly recommend announcements and troubleshooting purposes (e.g. if you lose your API key).

Which of the following best describes you?

Investor

Organization (e.g. company, university, etc.):

Email:

GET FREE API KEY

Note: Not all APIs require a key. As an example, Yahoo Finance API (<https://github.com/ranaroussi/yfinance>) does not require an API key.

- **Safeguard your API key:** API key is attached to your account, and it is a good practice to keep it safe. In the case of Alpha Vantage, even if it gets exposed on the internet and someone abuses/misuses it, your API key will be blocked in the worst case. However, if your API key is associated with your billing information, keeping it safe and private is strongly recommended. One common practice for safeguarding your API key is saving it in a text file and reading it from the text file when needed.
 - In the case of **Alpha Vantage**, assuming my API key is saved in the `av_api_key.txt` file, the following snippet will open the text file, read the API key, save it in the `av_api_key` variable, and close the text file.

```
with open("av_api_key.txt") as my_file:  
    av_api_key = my_file.read()
```

Now you can use `av_api_key` variable whenever needed. Usually, the library's documentation lays out how and when to use the API key.

- **Start using the API** based on the library's documentation.

Note: There is so much more about APIs that this handout does not cover. Interested readers can find more details at <https://realpython.com/python-api/>

Additional APIs

The following is a list of commonly used APIs:

- Twitter API: <https://developer.twitter.com/en/docs/twitter-api>
- Words API: <https://www.wordsapi.com/>
- Yahoo Weather API: <https://pypi.org/project/yahoo-weather/>
- Spotify API: <https://developer.spotify.com/documentation/web-api/>
- Zillow API: <https://www.zillowgroup.com/developers/>

We will end this handout with a comprehensive list of free APIs at <https://github.com/public-apis/public-apis>

References

This document is an adaption from the following references:

- 1- *Python online documentation*; available at <https://docs.python.org/3/>
- 2- *Effective Pandas: Patterns for Data Manipulation (Treading on Python)*, Matt Harrison, Independently published, 2021
- 3- <https://www.learnpython.org/>
- 4- <https://realpython.com/>
- 5- <https://www.fortinet.com/resources/cyberglossary/api-key>