Role: Data Engineer

Web scraping and Extracting Data using APIs
(Webscraping The 100 Most Highly-Ranked Films)

Web scraping is used for extraction of relevant data from web pages. If you require some data from a web page in a public domain, web scraping makes the process of data extraction quite convenient. The use of web scraping, however, requires some basic knowledge of the structure of HTML pages. In this lab, you will learn the process of analyzing the HTML code of a web page and how to extract the required information from it using web scraping in Python.

Objectives

By the end of this lab, you will be able to:

- Use the requests and BeautifulSoup libraries to extract the contents of a web page
- Analyze the HTML code of a webpage to find the relevant information
- Extract the relevant information and save it in the required form

Scenario

Consider that you have been hired by a Multiplex management organization to extract the information of the top 50 movies with the best average rating from the web link shared below.

https://web.archive.org/web/20230902185655/https://en.everybodywiki.com/100_Most_Highly-Ranked_Films

The information required is Average Rank, Film, and Year.
You are required to write a Python script webscraping_movies.py that extracts the information and saves it to a CSV file top_50_films.csv. You are also required to save the same information to a database Movies.db under the table name Top_50.

Initial steps

You require the following libraries for this lab.

1. pandas library for data storage and manipulation.
2. BeautifulSoup library for interpreting the HTML document.
3. requests library to communicate with the web page.
4. sqlite3 for creating the database instance.

While requests and sqlite3 come bundled with Python3, you need to install pandas and BeautifulSoup libraries to the IDE.

For this, run the following commands in a terminal window.

python3.11 -m pip install pandas

python3.11 -m pip install bs4

Now, create a new file by the name of webscraping_movies.py in the path /home/project/.

You will write all of your code in this file.

Code setup

To create a Python script, call the relevant libraries and the initializations as a first step.

Importing Libraries

Import the following four libraries by adding lines of code noted below to your webscraping_movies.pyfile.

```
import requests
import sqlite3
import pandas as pd
from bs4 import BeautifulSoup
```

Initialization of known entities

You must declare a few entities at the beginning. For example, you know the required URL, the CSV name for saving the record, the database name, and the table name for storing the record. You also know the entities to be saved. Additionally, since you require only the top 50 results, you will require a loop counter initialized to 0. You may initialize all these by using the following code in webscraping_movies.py:

```
url = 'https://web.archive.org/web/20230902185655/https://en.everybodywiki.com/100_Most_Highly-Ranked_Films'
db_name = 'Movies.db'
table_name = 'Top_50'
csv_path = '/home/project/top_50_films.csv'
df = pd.DataFrame(columns=["Average Rank","Film","Year"])
count = 0
```

Loading the webpage for Webscraping

To access the required information from the web page, you first need to load the entire web page as an HTML document in python using the requests.get().text function and then parse the text in the HTML format using BeautifulSoup to enable extraction of relevant information.

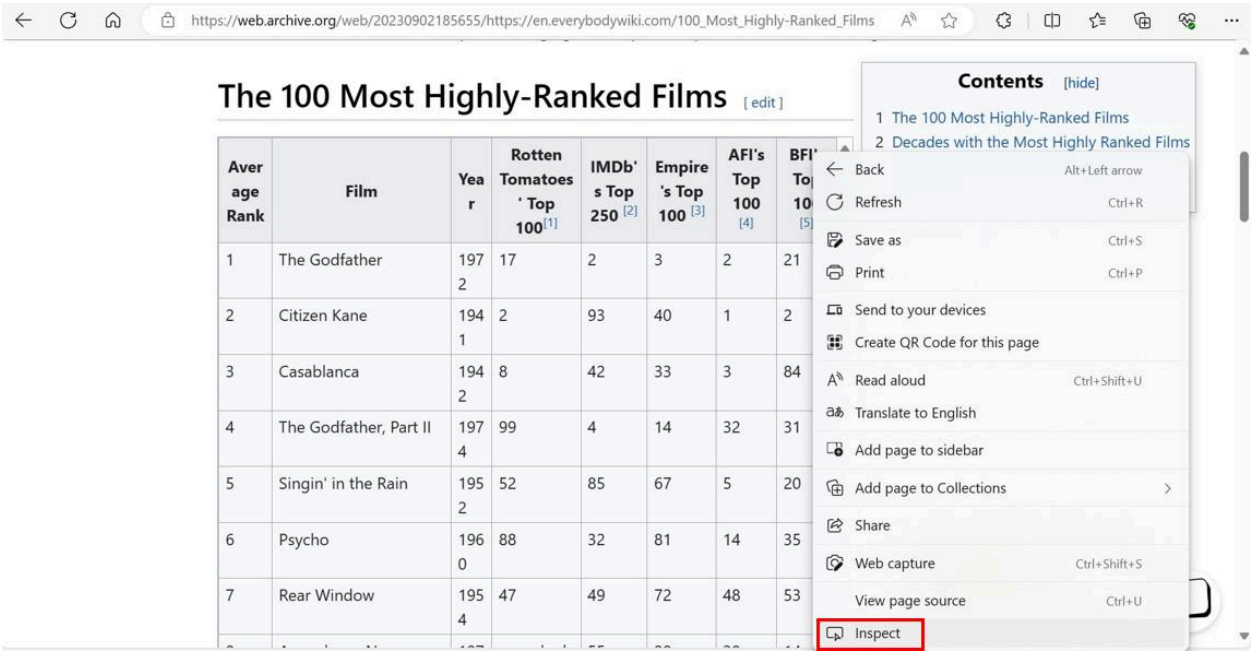
Add the following code to webscraping_movies.py:

```
html_page = requests.get(url).text
data = BeautifulSoup(html_page, 'html.parser')
```

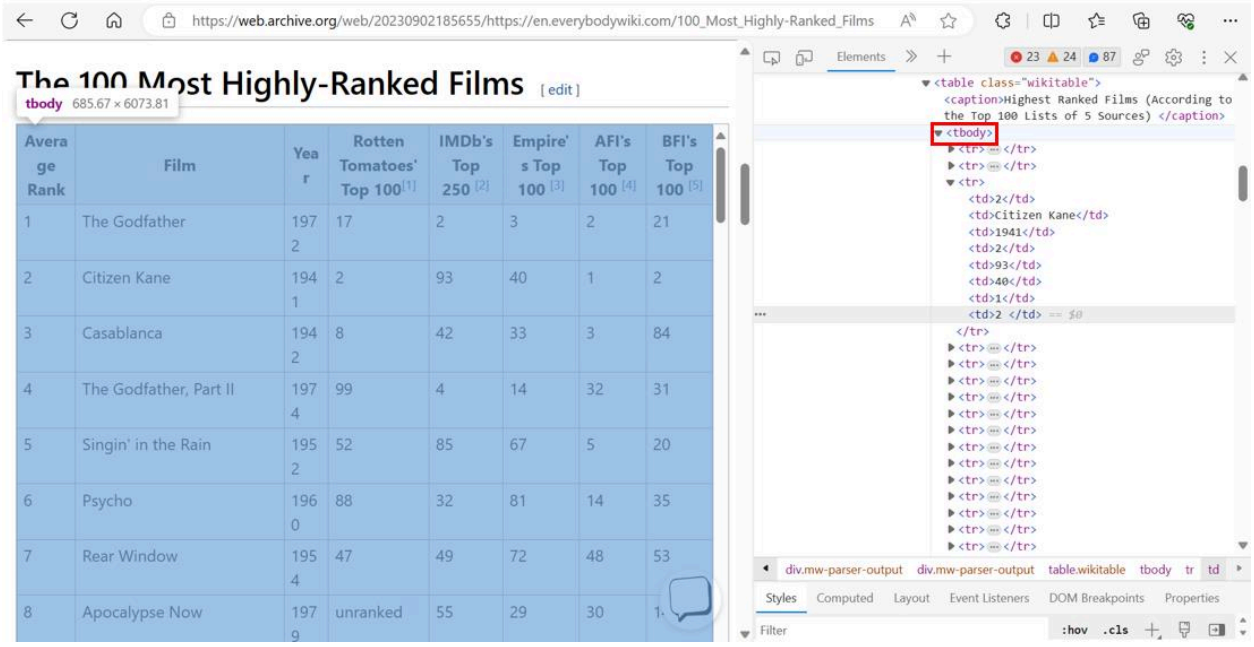
Save your file using Ctrl+S.

Analyzing the HTML code for relevant information

Open the web page in a browser and locate the required table by scrolling down to it. Right-click the table and click Inspect at the bottom of the menu, as shown in the image below.



This opens the HTML code for the page and takes you directly to the point where the definition of the table begins. To check, take your mouse pointer to the tbody tag in the HTML code and see that the table is highlighted in the page section.



Notice that all rows under this table are mentioned as `tr` objects under the table. Clicking one of them would show that the data in each row is further saved as a `td` object, as seen in the image above. You require the information under the first three headers of this stored data.

It is also important to note that this is the first table on the page. You must identify the required table when extracting information.

Scraping of required information

You now need to write the loop to extract the appropriate information from the web page. The rows of the table needed can be accessed using the `find_all()` function with the `BeautifulSoup` object using the statements below.

```
tables = data.find_all('tbody')
rows = tables[0].find_all('tr')
```

Here, the variable `tables` gets the body of all the tables in the web page and the variable `rows` gets all the rows of the first table.

You can now iterate over the rows to find the required data. Use the code shown below to extract the information.

```
for row in rows:
    if count<50:
        col = row.find_all('td')
        if len(col)!=0:
            data_dict = {"Average Rank": col[0].contents[0],
                         "Film": col[1].contents[0],
                         "Year": col[2].contents[0]}
            df1 = pd.DataFrame(data_dict, index=[0])
            df = pd.concat([df,df1], ignore_index=True)
            count+=1
    else:
        break
```

The code functions as follows.

1. Iterate over the contents of the variable `rows`.
2. Check for the loop counter to restrict to 50 entries.
3. Extract all the `td` data objects in the row and save them to `col`.
4. Check if the length of `col` is 0, that is, if there is no data in a current row. This is important since, many timesm there are merged rows that are not apparent in the web page appearance.
5. Create a dictionary `data_dict` with the keys same as the columns of the dataframe created for recording the output earlier and corresponding values from the first three headers of data.
6. Convert the dictionary to a dataframe and concatenate it with the existing one. This way, the data keeps getting appended to the dataframe with every iteration of the loop.
7. Increment the loop counter.
8. Once the counter hits 50, stop iterating over rows and break the loop.

Print the contents of the dataframe using the following:

print(df)

Save the file using `Ctrl+S`.

Storing the data

After the dataframe has been created, you can save it to a CSV file using the following command:

df.to_csv(csv_path)

Remember that you defined the variable `csv_path` earlier.

To store the required data in a database, you first need to initialize a connection to the database, save the dataframe as a table, and then close the connection. This can be done using the following code:

conn = sqlite3.connect(db_name)
df.to_sql(table_name, conn, if_exists='replace', index=False)
conn.close()

Save the file using `Ctrl+S`.

This database can now be used to retrieve the relevant information using SQL queries. You will learn how to do that later in the course.

Execute the code

Execute the code using the statement below in a terminal window. Make sure the current directory is `/home/python/`.

python3.11 webscraping_movies.py