

# ADS 509 Module 1: APIs and Web Scraping

This notebook has two parts. In the first part, you will scrape lyrics from AZLyrics.com. In the second part, you'll run code that verifies the completeness of your data pull.

For this assignment you have chosen two musical artists who have at least 20 songs with lyrics on AZLyrics.com. We start with pulling some information and analyzing them.

## General Assignment Instructions

These instructions are included in every assignment, to remind you of the coding standards for the class. Feel free to delete this cell after reading it.

One sign of mature code is conforming to a style guide. We recommend the [Google Python Style Guide](#). If you use a different style guide, please include a cell with a link.

Your code should be relatively easy-to-read, sensibly commented, and clean. Writing code is a messy process, so please be sure to edit your final submission. Remove any cells that are not needed or parts of cells that contain unnecessary code. Remove inessential `import` statements and make sure that all such statements are moved into the designated cell.

Make use of non-code cells for written commentary. These cells should be grammatical and clearly written. In some of these cells you will have questions to answer. The questions will be marked by a "Q:" and will have a corresponding "A:" spot for you. *Make sure to answer every question marked with a Q: for full credit.*

## Importing Libraries

```
In [1]: import os
import datetime
import re

# for the lyrics scrape section
import requests
import time
from bs4 import BeautifulSoup
from collections import defaultdict, Counter
import random
```

```
In [2]: # Use this cell for any import statements you add
```

```
import shutil  
from pathlib import Path
```

---

## Lyrics Scrape

This section asks you to pull data by scraping [www.AZLyrics.com](http://www.AZLyrics.com). In the notebooks where you do that work you are asked to store the data in specific ways.

```
In [3]: artists = {'taylorswift': "https://www.azlyrics.com/t/taylorswift.html",  
                  'eminem': "https://www.azlyrics.com/e/eminem.html"}  
# we'll use this dictionary to hold both the artist name and the link on AZLyrics
```

```
In [4]: artists
```

```
Out[4]: {'taylorswift': 'https://www.azlyrics.com/t/taylorswift.html',  
         'eminem': 'https://www.azlyrics.com/e/eminem.html'}
```

## A Note on Rate Limiting

The lyrics site, [www.azlyrics.com](http://www.azlyrics.com), does not have an explicit maximum on number of requests in any one time, but in our testing it appears that too many requests in too short a time will cause the site to stop returning lyrics pages. (Entertainingly, the page that gets returned seems to only have the song title to [a Tom Jones song](#).)

Whenever you call `requests.get` to retrieve a page, put a `time.sleep(5 + 10*random.random())` on the next line. This will help you not to get blocked. If you *do* get blocked, which you can identify if the returned pages are not correct, just request a lyrics page through your browser. You'll be asked to perform a CAPTCHA and then your requests should start working again.

## Part 1: Finding Links to Songs Lyrics

That general artist page has a list of all songs for that artist with links to the individual song pages.

Q: Take a look at the `robots.txt` page on [www.azlyrics.com](http://www.azlyrics.com). (You can read more about these pages [here](#).) Is the scraping we are about to do allowed or disallowed by this page? How do you know?

A: Per user 008, used for web crawlers, all content is allowed. Web crawlers can freely scrape from the site.

```
In [5]: # Let's set up a dictionary of lists to hold our links
lyrics_pages = defaultdict(list)
urls = []

for artist, artist_page in artists.items() :
    # request the page and sleep
    r = requests.get(artist_page)
    time.sleep(5 + 10*random.random())

    soup = BeautifulSoup(r.text, 'html.parser')
    links = soup.find_all('a', href=True)
    for link in links:
        if '/lyrics/' in link['href']:
            urls.append(link.get('href'))
            lyrics_pages[artist].append(link.get('href'))

    # now extract the links to lyrics pages from this page
    # store the links `lyrics_pages` where the key is the artist and the
    # value is a list of links.
```

Let's make sure we have enough lyrics pages to scrape.

```
In [6]: for artist, lp in lyrics_pages.items() :
        assert(len(set(lp)) > 20)
```

```
In [7]: # Let's see how long it's going to take to pull these lyrics
# if we're waiting `5 + 10*random.random()` seconds
for artist, links in lyrics_pages.items() :
    print(f"For {artist} we have {len(links)}.")
    print(f"The full pull will take for this artist will take {round(len(links)*10/3600,2)} hours.")
```

For taylorswift we have 435.  
 The full pull will take for this artist will take 1.21 hours.  
 For eminem we have 413.  
 The full pull will take for this artist will take 1.15 hours.

## Part 2: Pulling Lyrics

Now that we have the links to our lyrics pages, let's go scrape them! Here are the steps for this part.

1. Create an empty folder in our repo called "lyrics".
2. Iterate over the artists in `lyrics_pages`.
3. Create a subfolder in lyrics with the artist's name. For instance, if the artist was Cher you'd have `lyrics/cher/` in your repo.
4. Iterate over the pages.

5. Request the page and extract the lyrics from the returned HTML file using BeautifulSoup.
6. Use the function below, `generate_filename_from_url`, to create a filename based on the lyrics page, then write the lyrics to a text file with that name.

```
In [8]: def generate_filename_from_link(link) :  
  
    if not link :  
        return None  
  
    # drop the http or https and the html  
    name = link.replace("https", "").replace("http", "")  
    name = link.replace(".html", "")  
  
    name = name.replace("/lyrics/", "")  
  
    # Replace useless chareacters with UNDERSCORE  
    name = name.replace(":/", "").replace(".", "_").replace("/", "_")  
  
    # tack on .txt  
    name = name + ".txt"  
  
    return(name)
```

```
In [9]: os.getcwd()
```

```
Out[9]: 'c:\\USD\\MSADS\\Spring 24\\ADS 509\\Module 1\\Assignment\\Assignment 1.1\\ADS-509-TM'
```

```
In [10]: # Make the lyrics folder here. If you'd like to practice your programming, add functionality  
# that checks to see if the folder exists. If it does, then use shutil.rmtree to remove it and create a new one.  
  
if os.path.isdir("lyrics") :  
    shutil.rmtree("lyrics/")  
  
os.mkdir("lyrics")
```

```
In [11]: soup = BeautifulSoup(requests.get("https://www.azlyrics.com/lyrics/taylorswift/londonboy.html").content, "html.parser")  
soup.select_one(".ringtone ~ div").get_text(  
    strip=True, separator="\n"  
)
```

```
Out[11]: "[Idris Elba and James Corden:]\nWe can go driving in, on my scooter\nUh, you know, just 'round London\nAlright, yeah\nI love my hometown as much as Motown, I love SoCal\nAnd you know I love Springsteen, faded blue jeans, Tennessee whiskey\nBut something happened, I heard him laughing\nI saw the dimples first and then I heard the accent\nThey say home is where the heart is\nBut that's not where mine lives\nYou know I love a London boy\nI enjoy walking Camden Market in the afternoon\nHe likes my American smile, like a child when our eyes meet\nDarling, I fancy you\nTook me back to Highgate, met all of his best mates\nSo I guess all the rumors are true\nYou know I love a London boy\nBoy, I fancy you (Ooh)\nAnd now I love high tea, stories from Uni, and the West End\nYou can find me in the pub, we are watching rugby with his school friends\nShow me a gray sky, a rainy cab ride\nBabes, don't threaten me with a good time\nThey say home is where the heart is\nBut God, I love the English\nYou know I love a London boy, I enjoy nights in Brixton\nShoreditch in the afternoon\nHe likes my American smile, like a child when our eyes meet\nDarling, I fancy you\nTook me back to Highgate, met all of his best mates\nSo I guess all the rumors are true\nYou know I love a London boy\nBoy, I fancy you\nSo please show me Hackney\nDoesn't have to be Louis V up on Bond Street\nJust wanna be with you\nWanna be with you\nStick with me, I'm your queen\nLike a Tennessee Stella McCartney, on the Heath\nJust wanna be with you\nWanna be with you (Oh)\nYou know I love a London boy, I enjoy walking SoHo\nDrinking in the afternoon (Yeah)\nHe likes my American smile, like a child when our eyes meet\nDarling, I fancy you (You)\nTook me back to Highgate, met all of his best mates\nSo I guess all the rumors are true (Yeah)\nYou know I love a London boy (Oh)\nBoy (Oh), I fancy you (I fancy you, ooh)\nSo please show me Hackney\nDoesn't have to be Louis V up on Bond Street\nJust wanna be with you\nI, I, I fancy you\nOh whoa, oh, I\nStick with me, I'm your queen\nLike a Tennessee Stella McCartney, on the Heath\nJust wanna be with you (Ooh)\nWanna be with you\nI fancy you (Yeah), I fancy you\nOh whoa, ah"
```

```
In [12]: for artist in lyrics_pages :
         artistfolder = "lyrics/"+artist
         if os.path.isdir(artistfolder) :
             shutil.rmtree(artistfolder)
         os.mkdir(artistfolder)
```

```
In [13]: subs = 'taylorswift'
         taylorswifturls = list(filter(lambda x: subs in x, urls))
```

```
In [14]: url_stub = "https://www.azlyrics.com"
         start = time.time()

         total_pages = 0

         os.chdir("C:/USD/MSADS/Spring 24/ADS 509/Module 1/Assignment/Assignment 1.1/ADS-509-TM/lyrics/taylorswift")

         path = os.getcwd()

         for x in taylorswifturls :
             if total_pages == 22:
                 break
             name0 = x.replace('/', '')
             name = name0.replace('.html', '')
             filename = name+".txt"
             if os.path.exists(filename):
                 file = open(filename, "r+")
             else:
                 file = open(filename, "w+")
             soup = BeautifulSoup(requests.get(url_stub+x).content, "html.parser")
             time.sleep(5 + 10*random.random())
             lyrics = soup.select_one(".ringtone ~ div").get_text(strip=True, separator="\n")
```

```
title = name.replace('lyricstaylorswift', '')
file.writelines(title+'\n'+'\n'+lyrics)
time.sleep(5 + 10*random.random())
total_pages += 1
```

```
In [15]: subs = 'eminem'
eminemurls = list(filter(lambda x: subs in x, urls))
```

```
In [16]: url_stub = "https://www.azlyrics.com"

total_pages = 0

os.chdir("C:/USD/MSADS/Spring 24/ADS 509/Module 1/Assignment/Assignment 1.1/ADS-509-TM/lyrics/eminem")

path = os.getcwd()

for x in eminemurls :
    if total_pages == 22:
        break
    name0 = x.replace('/', '')
    name = name0.replace('.html', '')
    filename = name+".txt"
    if os.path.exists(filename):
        file = open(filename, "a+")
    else:
        file = open(filename, "w+")
    soup = BeautifulSoup(requests.get(url_stub+x).content, "html.parser")
    time.sleep(5 + 10*random.random())
    lyrics = soup.select_one(".ringtone ~ div").get_text(strip=True, separator="\n")
    title = name.replace('lyricseminem', '')
    file.writelines(title+'\n'+'\n'+lyrics)
    time.sleep(5 + 10*random.random())
    total_pages += 1
```

```
In [17]: print(f"Total run time was {round((time.time() - start)/3600,2)} hours.")
```

Total run time was 0.33 hours.

---

## Evaluation

This assignment asks you to pull data by scraping www.AZLyrics.com. After you have finished the above sections , run all the cells in this notebook. Print this to PDF and submit it, per the instructions.

```
In [18]: # Simple word extractor from Peter Norvig: https://norvig.com/spell-correct.html
def words(text):
    return re.findall(r'\w+', text.lower())
```

```
In [20]: os.getcwd()
```

```
Out[20]: 'C:\\USD\\MSADS\\Spring 24\\ADS 509\\Module 1\\Assignment\\Assignment 1.1\\ADS-509-TM\\lyrics\\eminem'
```

## Checking Lyrics

The output from your lyrics scrape should be stored in files located in this path from the directory: `/lyrics/[Artist Name]/[filename from URL]`. This code summarizes the information at a high level to help the instructor evaluate your work.

```
In [21]: os.chdir("C:/USD/MSADS/Spring 24/ADS 509/Module 1/Assignment/Assignment 1.1/ADS-509-TM/")
artist_folders = os.listdir("lyrics/")
artist_folders = [f for f in artist_folders if os.path.isdir("lyrics/" + f)]

for artist in artist_folders :
    artist_files = os.listdir("lyrics/" + artist)
    artist_files = [f for f in artist_files if 'txt' in f or 'csv' in f or 'tsv' in f]

    print(f"For {artist} we have {len(artist_files)} files.")

    artist_words = []

    for f_name in artist_files :
        with open("lyrics/" + artist + "/" + f_name) as infile :
            artist_words.extend(words(infile.read()))

    print(f"For {artist} we have roughly {len(artist_words)} words, {len(set(artist_words))} are unique.")
```

```
For eminem we have 22 files.
For eminem we have roughly 14204 words, 2624 are unique.
For taylorswift we have 22 files.
For taylorswift we have roughly 6323 words, 897 are unique.
```