Spotify Data Extraction using Python: A Guide

Contents

Chapter 1. Spotify Data Extraction using Python: A Guide

Description:I am an avid Spotify user. My Spotify wrapped 2019 tells me that I spent 35,095 minutes lisetening to music on Spotify. This project originally started as an exploratory data analysis I did during my free time after having a discussion with a fellow Lorde fan about which Lorde songs we like/dislike the most. I wanted to compare our subjective rankings to the actual rankings. As my interest in technical writing grew, I have decided to create a technical instruction of my data analysis project to demonstrate my technical authoring skills. This DITA guide was made using OxygenXML author.

The tools I used to make this guide:

- Oxygen XML Author - for creating, structuring, and publishing the document.

Chapter 2. Step 0: Install the Required Tools

Here you can find the instructions to install required tools for this task. Skip this part if you have installed all the required tools.

Python

This is the first tool that you have to install. There are many ways to install Python to your machine. One way is to use the Python official installer.

1. Go to Python's Official Website .
2. Go to Downloads page, and select the version appropriate for your machine.
3. Once the file has been downloaded, click on the .exe file to open the installer.
4. Click *continue* to proceed.
5. You will be shown the software license. click *agree*.
6. Select the appropriate installation location.
7. Close the installer once it has finished installing Python.

Jupyter Notebook

Jupyter Notebook is a lightweight environment run and test your code.

To install Jupyter Notebook:

1. Head to your computer's command-line
    - For Windows users:
        - Click on the search bar beside the Windows logo.
        - Type "Command Prompt".
    - For Mac Users:
        - Press F4 on your keyboard.
        - You will see a search bar on top of your screen.
        - Type "Terminal".
2. On the command prompt, run this line:

    ```
    pip install jupyter
    ```

    Note: To make sure that your pip is up-to-date run this line on command-line

    ```
    pip install --upgrade pip
    ```
3. To run Jupyter Notebook, run this line on command-line

    ```
    jupyter notebook
    ```

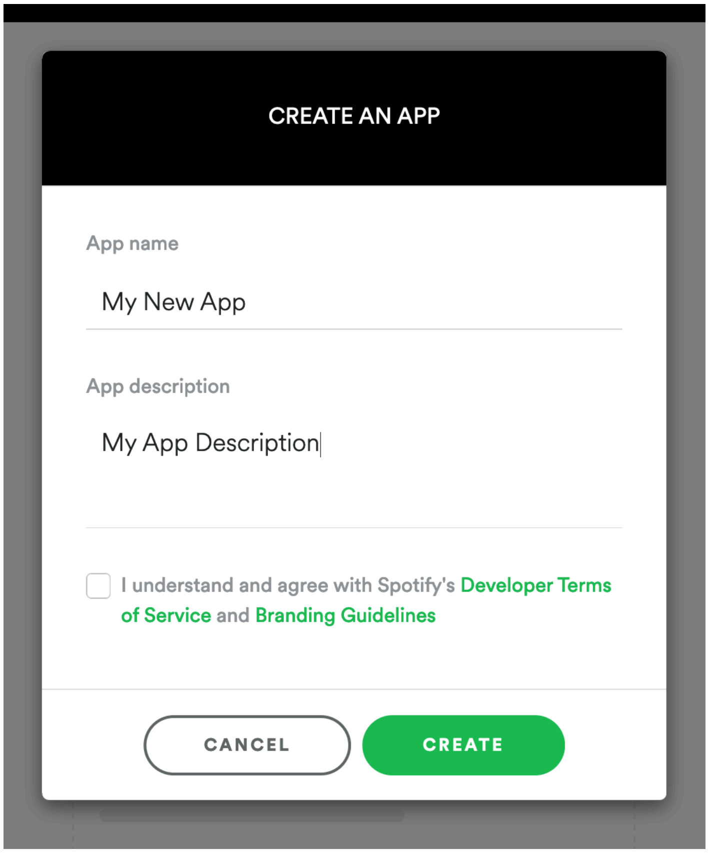
Spotify Developer Account

We will be using Spotify API to get our data. To get access to the Spotify API, we have to create a Spotify Developer account.

To create a Spotify Developer account:

1. Head to https://developer.spotify.com/dashboard/
2. Sign in with your Spotify account login info. If you do not have a Spotify account, Sign up for a Spotify account

   Note: You do not need a premium Spotify account to create a Spotify Developer account
3. Accept Spotify's Terms of Service
4. Next, click "Create an app"
5. Fill in your app name and a brief description of your app.



CREATE AN APP

App name

My New App

App description

My App Description

□ I understand and agree with Spotify's Developer Terms of Service and Branding Guidelines

6. After you click create, the website will take you to your dashboard containing your**Client ID**.
7. Click "Show client secret" to view your **Client Secret**.
8. Now that you have both Client ID and Client Secret, you can make request through Spotify API.

NumPy

Numpy is a scientific computing python package. We will use NumPy to work with Arrays.

To install NumPy:

1. Head to your computer's command-line.
    - For Windows users:
        - Click on the search bar beside the Windows logo
        - Type "Command Prompt"
    - For Mac Users:
        - Press F4 on your keyboard
        - You will see a search bar on top of your screen
        - Type "Terminal"
2. Run this line:

    ```
    pip install numpy
    ```

Pandas

Pandas is a python package used to manipulate data.

To install Pandas:

1. Head to your computer's command-line.
    - For Windows users:
        - Click on the search bar beside the Windows logo
        - Type "Command Prompt"
    - For Mac Users:
        - Press F4 on your keyboard
        - You will see a search bar on top of your screen
        - Type "Terminal"
2. Run this line:

    ```
    pip install pandas
    ```

Spotipy

Spotipy is a python library for the Spotify Web API.

To install Spotipy:

1. Head to your computer's command-line.
    - For Windows users:
        - Click on the search bar beside the Windows logo
        - Type "Command Prompt"
    - For Mac Users:
        - Press F4 on your keyboard
        - You will see a search bar on top of your screen
        - Type "Terminal"
2. Run this line

    ```
    pip install spotipy
    ```

Chapter 3. Step 1: Import Packages and Libraries

The first thing to do is to import required libraries and packages to our code.

1. Open Jupyter Notebook
2. First, we need to import all the packages and librarires needed for our code

   Note: See our installation guide (Step 0) to install the tools needed for this task.

   ```
   import spotipy

   from spotipy.oauth2 import SpotifyClientCredentials

   pandas as pd

   numpy as np
   ```

3. Run the cell by pressing Shift + Enter/ Return or by pressing ▶ Run icon
4. Running this cell will not yield any output. As long as there is no error message, you can proceed to the next step.

Chapter 4. Step 2: Create a list of Album Names and Album URIs

We are going to create a list of albums and album URIs. On this guide, we will be using Lorde's albums *Melodrama* and *Pure Heroine* as the examples.

1. Declare variables for Spotify API authentication.

   We are going to declare the spotify Client ID and Client Secret Variables . Refer to your Client ID and Client Secret on your Spotify Developer Account dashboard and create these variables:

   ```
   client_id = 'YOUR-CLIENT-ID'
   ```

   ```
   client_secret = 'YOUR-CLIENT-SECRET'
   ```

   Note: Replace the texts between the parentheses with your Client ID and Client Secret.

   Next, we are going to create these two variables which we will use to authenticate requests to Spotify API.

   ```
   client_credentials = SpotifyClientCredentials(client_id, client_secret)
   ```

   ```
   sp = spotipy.Spotify(client_credentials_manager = client_credentials)
   ```

   Run the cell to make sure no error occurs.

2. Create a list of album URIs to be included in the dataframe

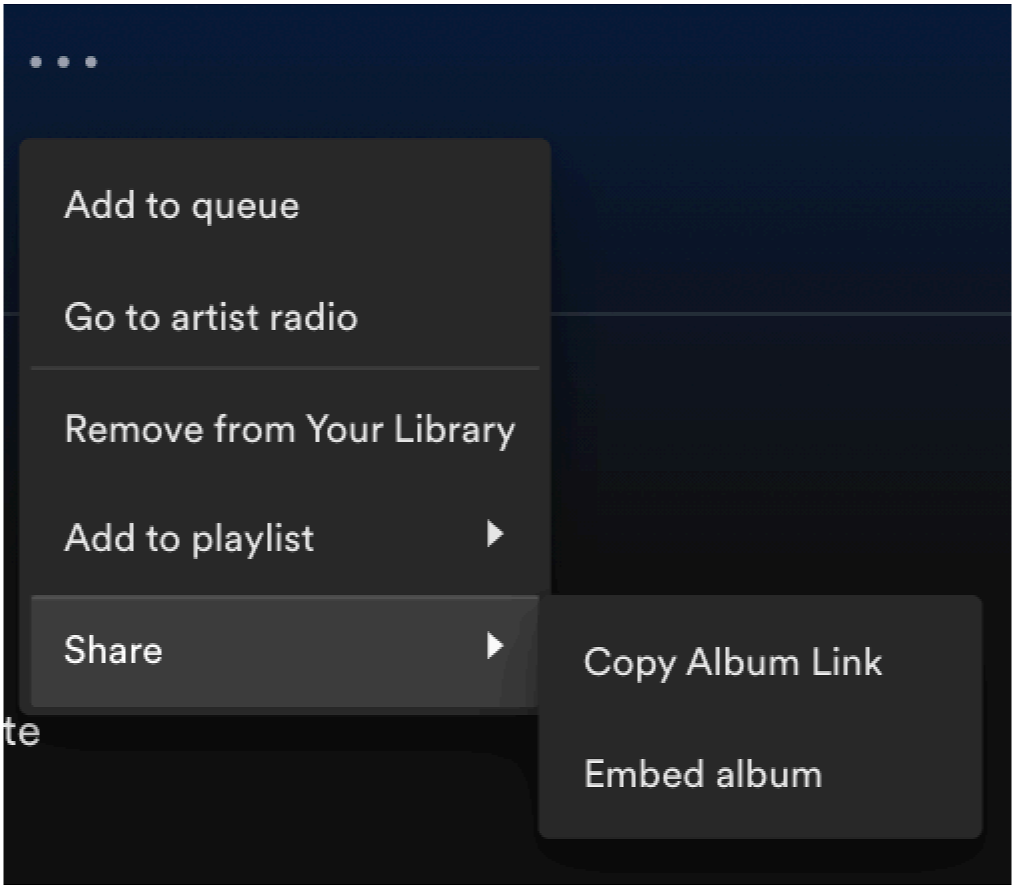
   Uniform Resource Indicator (URI) serves as a link that directs you to a spotify resource (artist/song/album/playlist, etc). Each resource has its own unique URI.

   To access a spotify URI:

   a. Open Spotify and head to your album/artist/playlist of choice

   b. Click on the three dots under the album name

c. Go to "Share" and place your cursor on "Copy Album Link"



d. Press the Option/Alt key on your keyboard while your cursor is placed on "Copy Album Link"

e. Click "Copy Album URI"

Create a list to store the URIs of the albums we want to include in our dataframe. Place a URI in a parenthesis. Separate each URI with a comma. For example:

```
album_uris = ['spotify:album:6rnzvZhe3PA57xKcKLRtJ6', 'spotify:album:4oCGmYsAQOWt2ACWTpNU'
```

3. Use Spotipy's **albums** function to get the album data from spotify. We are passing our list of album URIs to this function.

```
get_album = sp.albums(albums_uris)
```

4. Create empty lists to store album names and album URIs. We will append the data from Spotify to these lists.

```
lorde_album_names = []
```

```
lorde_album_uris = []
```

5. Create a loop that will go over each albums in the album URIs list and append the name of the album and the uri to the empty list made previously.

```
for i in range(len(get_album['albums'])):

    lorde_album_names.append(get_album['albums'][i]['name'])

    lorde_album_uris.append(get_album['albums'][i]['uri'])
```

The spotify data comes in a JSON format. Inside the JSON data, the album name is stored under the key “name”. To get the name, we use the function **get_album['albums'][i]['name']**, which will be appended to the lorde_album_names. We do the same thing with the URIs.

Note: To see albums data from spotify, run this code below. The data from Spotify is strored in JSON format and you can see the values contained each album.

```
sp.albums(album_uris).
```

6. Run the cell to check if it works.

Chapter 5. Step 3: Extract All the Tracks From the Album List

The goal of this step is to create a dictionary containing all of our albums, including each tracks and the relevant data that it contains. To do this, we will create a function that will extract and store each tracks from a list of albums.

1. Create an empty dictionary. This dictionary will be the place to store the album and album tracks.

   ```
   lorde_albums={}
   ```

2. Create a function that, given an album URI, will extract and store each tracks, and its relevant data (album, track number, id, name, and uri) contained in the album to the dictionary we made in the previous step.

   a. Define a function **lorde_songs** that takes in one parameter, album.

   b. Inside the function, create lists that will store each tracks album, track number, id, name and URI.

   c. Create an empty dictionary that stores all the lists from **step b**. Place this empty dictionary on the line after we define the function.

   ```
   def lorde_songs(album):

       lorde_albums[album] = {}

       lorde_albums[album]['album'] = []

       lorde_albums[album]['track_number'] = []

       lorde_albums[album]['id'] = []

       lorde_albums[album]['name'] = []

       lorde_albums[album]['uri'] = []
   ```

   d. Using Spotipy's **album_tracks** function, we will get the catalog of the album's track. Create a variable named **tracks** to contain the **album_tracks** function.

   Album_tracks gets the catalog of albums track, and it has 4 parameters. We will only use **album_id** for this task.

   You can name the paramterer passed to tracks to anything, because the function we are creating will be passed later to a loop that goes through a list of URIs.

   ```
   tracks = sp.album_tracks(i)
   ```

   e. Next, create a for-loop that will go over a list of album and extracts the **album track number, id, name uri** to the empty list we made preiviously.

   ```
       for t in range(len(tracks['items'])):

           lorde_albums[album]['album'].append(lorde_album_names[album_count])
   ```

```
        lorde_albums[album]['track_number'].append(tracks['items'][t]['track_number'])

        lorde_albums[album]['id'].append(tracks['items'][t]['id'])

        lorde_albums[album]['name'].append(tracks['items'][t]['name'])

        lorde_albums[album]['uri'].append(tracks['items'][t]['uri'])
```

If we look at the spotify album JSON data (refer to **step 3**) , we can see that the infromation we want to extract is contained in an array with "items" as its key. Therefore, we pass **['items']** to the loop so we can get access to the data contained within it. We also want to append the values extracted, so we use **append**to add the values to the list we made in the previous step. We do this to every values we want to extract from each track. Now our function is complete.

3. Notice that in the loop inside our previously written function, we mention album_count. In the loop, album_count works so that our function knows which album from the album names list to extract the data from. For example, this snippet of code below

   ```
   lorde_albums[album]['album'].append(lorde_album_names[0])
   ```

   appends the name of the first item in our album names list.

   Note: Because of zero-based indexing, the sequence starts at 0 instead of 1.

   Since we want to reach all the albums in the album names list, we have to increase album_count by 1 for every iteration of the loop.

   But first, we have to initiate the variable album_count, which contains the number 0.

   ```
   album_count = 0
   ```

4. Now, we create the loop that will apply our function to each URI in the album URI list.

   ```
   for i in lorde_album_uris:

       lorde_songs(i)

       album_count += 1
   ```

   The variable we use in this function has to match the parameter name we pass to **tracks** (see step 2d). After each iteration of the loop, the value of album count increases by one.

5. Run the cell to make sure the code works.

Chapter 6. Step 4: Extract Audio Features

The goal of this step is to add the audio features of each tracks to our dictionary.

SpotifyAPI allows us to access audio features embedded in each track.

We will be extracting 10 audio features :

- Acousticness
- Danceability
- Energy
- Instrumentalness
- Liveness
- Loudness
- Speechiness
- Tempo
- Valence
- Popularity

Note: See https://developer.spotify.com/documentation/web-api/reference/#category-tracks for more information regarding the audio features

1. First, define a function **song_features** . **Song_features** takes in one parameter, album.
2. Create empty lists of all the features we want to extract.

```
def song_features(album):
    lorde_albums[album]['acousticness'] = []
    lorde_albums[album]['danceability'] = []
    lorde_albums[album]['energy'] = []
    lorde_albums[album]['instrumentalness'] = []
    lorde_albums[album]['liveness'] = []
    lorde_albums[album]['loudness'] = []
    lorde_albums[album]['speechiness'] = []
    lorde_albums[album]['tempo'] = []
    lorde_albums[album]['valence'] = []
    lorde_albums[album]['popularity'] = []
```

3. Inside the function, create a loop that goes through the URIs contained in the dictonary we made in the previous step.
4. To extract the features, we use to Spotipy's audio_features and track function.

```
    for track in lorde_albums[album]['uri']:

        features = sp.audio_features(track)

        popularity = sp.track(track)
```

5. Inside the loop, we append each features to the appropriate list we made previously.

```
        lorde_albums[album]['acousticness'].append(features[0]['acousticness'])

        lorde_albums[album]['danceability'].append(features[0]['danceability'])

        lorde_albums[album]['energy'].append(features[0]['energy'])

        lorde_albums[album]['instrumentalness'].append(features[0]['instrumentalness'])

        lorde_albums[album]['liveness'].append(features[0]['liveness'])

        lorde_albums[album]['loudness'].append(features[0]['loudness'])

        lorde_albums[album]['speechiness'].append(features[0]['speechiness'])

        lorde_albums[album]['tempo'].append(features[0]['tempo'])

        lorde_albums[album]['valence'].append(features[0]['valence'])

        lorde_albums[album]['popularity'].append(popularity['popularity'])
```

6. Now that we have a function, we use a loop to apply the function to each tracks in our dictionary that contains all albums and tracks.

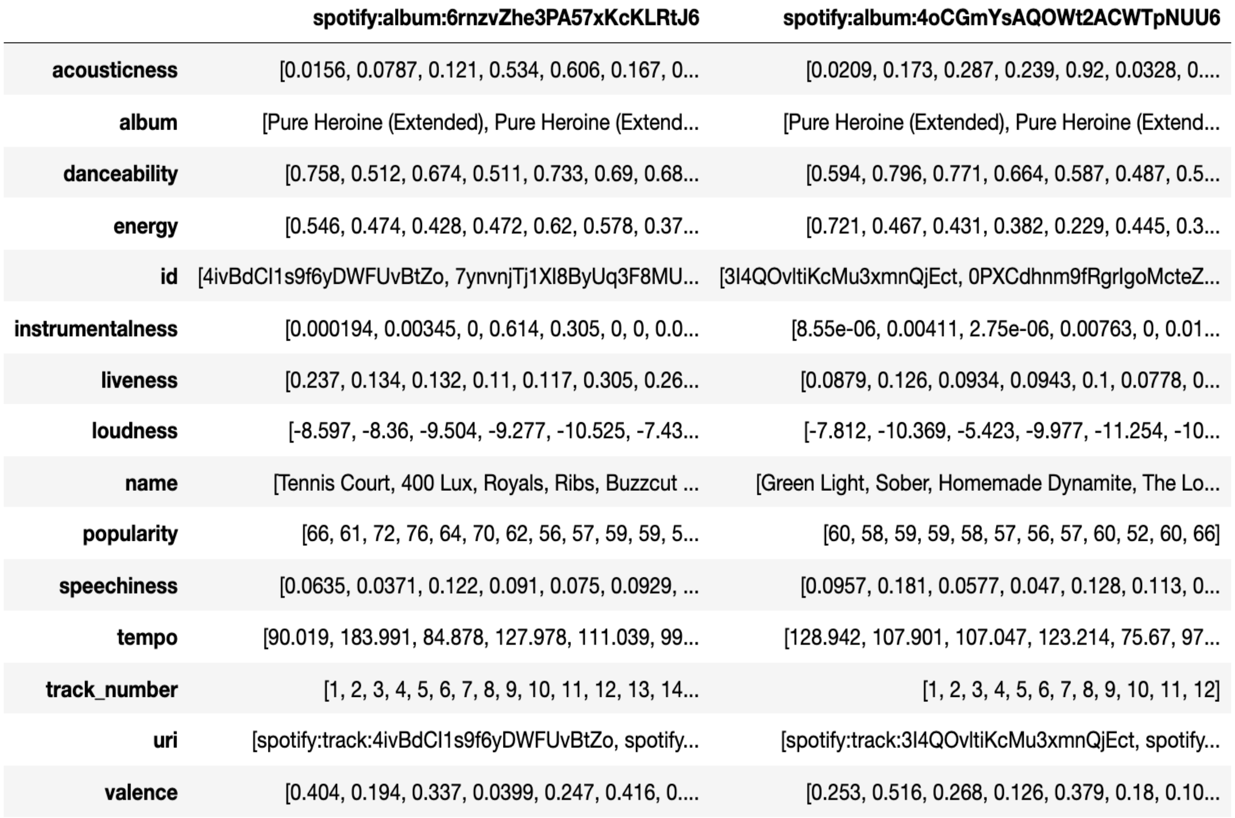
```
for i in lorde_albums:

    song_features(i)
```

7. Run the cell to make sure it works.

Chapter 7. Step 5: Transfrom the Dictionary into a Dataframe

The last step is to transform our dictionary into a dataframe.

We currently have a dictionary **lorde_albums** that contains all the albums, tracks as well as audio features. This is what our dictionary looks like, after we transform it into a dataframe:



	spotify:album:6rnzvZhe3PA57xKcKLRtJ6	spotify:album:4oCGmYsAQOWt2ACWTpNUU6
acousticness	[0.0156, 0.0787, 0.121, 0.534, 0.606, 0.167, 0...	[0.0209, 0.173, 0.287, 0.239, 0.92, 0.0328, 0....
album	[Pure Heroine (Extended), Pure Heroine (Extend...	[Pure Heroine (Extended), Pure Heroine (Extend...
danceability	[0.758, 0.512, 0.674, 0.511, 0.733, 0.69, 0.68...	[0.594, 0.796, 0.771, 0.664, 0.587, 0.487, 0.5...
energy	[0.546, 0.474, 0.428, 0.472, 0.62, 0.578, 0.37...	[0.721, 0.467, 0.431, 0.382, 0.229, 0.445, 0.3...
id	[4ivBdCl1s9f6yDWFUvBtZo, 7ynvnjTj1Xl8ByUq3F8MU...	[3I4QOvltiKcMu3xmnQjEct, 0PXCdhnm9fRgrIgoMcteZ...
instrumentalness	[0.000194, 0.00345, 0, 0.614, 0.305, 0, 0, 0.0...	[8.55e-06, 0.00411, 2.75e-06, 0.00763, 0, 0.01...
liveness	[0.237, 0.134, 0.132, 0.11, 0.117, 0.305, 0.26...	[0.0879, 0.126, 0.0934, 0.0943, 0.1, 0.0778, 0...
loudness	[-8.597, -8.36, -9.504, -9.277, -10.525, -7.43...	[-7.812, -10.369, -5.423, -9.977, -11.254, -10...
name	[Tennis Court, 400 Lux, Royals, Ribs, Buzzcut ...	[Green Light, Sober, Homemade Dynamite, The Lo...
popularity	[66, 61, 72, 76, 64, 70, 62, 56, 57, 59, 59, 5...	[60, 58, 59, 59, 58, 57, 56, 57, 60, 52, 60, 66]
speechiness	[0.0635, 0.0371, 0.122, 0.091, 0.075, 0.0929, ...	[0.0957, 0.181, 0.0577, 0.047, 0.128, 0.113, 0...
tempo	[90.019, 183.991, 84.878, 127.978, 111.039, 99...	[128.942, 107.901, 107.047, 123.214, 75.67, 97...
track_number	[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14...	[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12]
uri	[spotify:track:4ivBdCl1s9f6yDWFUvBtZo, spotify...	[spotify:track:3I4QOvltiKcMu3xmnQjEct, spotify...
valence	[0.404, 0.194, 0.337, 0.0399, 0.247, 0.416, 0....	[0.253, 0.516, 0.268, 0.126, 0.379, 0.18, 0.10...

Notice that even though our dictionary contains all information needed, it is not well organized. We want to be able to see the name of each tracks and its associated features. Thus, we need to re-structure our dictionary.

1. Start by creating an empty dictionary

   ```
   lorde_df={}
   ```

2. Create empty lists of the column names we want to have in our dataframe

   ```
   lorde_df['name'] = []

   lorde_df['album'] = []

   lorde_df['track_number'] = []
   ```

```
lorde_df['id'] = []

lorde_df['uri'] = []

lorde_df['acousticness'] = []

lorde_df['danceability'] = []

lorde_df['energy'] = []

lorde_df['instrumentalness'] = []

lorde_df['liveness'] = []

lorde_df['loudness'] = []

lorde_df['speechiness'] = []

lorde_df['tempo'] = []

lorde_df['valence'] = []

lorde_df['popularity'] = []
```

3. Create a nested loop that will go through each albums and features in lorde albums

```
for album in lorde_albums:

    for feature in lorde_albums[album]:

        lorde_df[feature].extend(lorde_albums[album][feature])
```

4. Transform the dictionary into a dataframe and arrange the index to start from 1 instead of 0

```
df = pd.DataFrame.from_dict(lorde_df)

df.index = np.arange(1, len(df) + 1)
```

5. Run this code to see the dataframe

```
df
```

6. To export the dataframe to a .csv, use pandas **to_csv** function

```
df.to_csv('lorde_discography.csv')
```

7. Congratuliations! You just created a dataframe containing your chosen artists' spotify data!