

This is the template for how we collected all the feature data we used. The scraping process is described in detail on the "Data Scraping" section in the Introduction tab of the website.

The process below was repeated for various slices of 10000 playlists, and a slice was used every time the requests broke down (from an authentication token timeout, being blocked for too many hits, an internet error, etc.)

```
In [133]: %%bash
head 'mpd.v1/data/mpd.slice.20000-20999.json'

# preview first few lines

{
  "info": {
    "generated_on": "2017-12-03 08:41:42.057563",
    "slice": "20000-20999",
    "version": "v1"
  },
  "playlists": [
    {
      "name": "Prelude",
      "collaborative": "false",
```

```
In [135]: import ijson

filename = "mpd.v1/data/mpd.slice.20000-20999.json"

# open file with current slice of 1000 playlists
with open(filename, 'r') as f:
    objects = ijson.items(f, 'playlists.item')
    columns = list(objects)
```

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In [136]: column_names = [col["tracks"] for col in columns]
```

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In [137]: # get track URI and names from playlists; we will use these as reference
           # points when we hit the Spotify API
playlists = column_names
track_features_uri = []
track_features_name = []
for playlist in playlists:
    for tracks in playlist:
        track_features_uri.append(tracks["track_uri"])
        track_features_name.append(tracks["track_name"])
```

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In [138]: track_features = pd.DataFrame(track_features_name, columns=['track_name'
])
track_features["ids"] = track_features_uri
track_features = track_features.drop_duplicates()
track_features.ids = track_features.ids.str.slice(14)
track_features = track_features.reset_index()
track_features.head()
```

Out[138]:

	index	track_name	ids
0	0	A Thousand Years	4eYaDRhiL5iesFp2EuoODr
1	1	Can't Help Falling In Love - Recorded Live at ...	5GBWQszdw6PtAN0Negzut6
2	2	Ho Hey	1jdNcAD8lr58RlsdGjJJdx
3	3	Everything	4T6HLdP6OcAtqC6tGnQelG
4	4	She Is Love	1q74TevRClo5RvJM5B84F

```
In [139]: # how many tracks in the current slice?
track_features.shape
```

Out[139]: (35247, 3)

```
In [140]: # various arrays to store later dataframe's column data; we manually chose potentially relevant attributes

# from Spotify track object
album_id = []
album_name = []
album_release_date = []

track_artist_ids = []

track_id = []
track_duration_ms = []
track_explicit = []
track_name = []
track_popularity = []

# from Spotify audio features object
danceability = []
energy = []
key = []
loudness = []
mode = []
speechiness = []
acousticness = []
instrumentalness = []
liveness = []
valence = []
tempo = []
audio_features_id = []

# from Spotify artist object
artist1_id = []
followers = []
artist_popularity = []
artist_genre1 = []
artist_genre2 = []
artist_genre3 = []

# from Spotify album object
album_label = []
album_popularity = []
```

```

In [141]: i=0

for ids in track_features.ids:

    # FROM TRACK OBJECT
    track_features_endpoint = "https://api.spotify.com/v1/tracks/{}".format(ids)
    # the below authorization token must be periodically changed and manually requested from the Spotify API
    headers = {"Authorization": "Bearer BQCqe5naoZ073MxotOIlnxw9QgiYYkpwv148di3XSYyc8zEF2-lc_2DDWKxi383ZuNZVTSMECPa5Wp5OWyyiaXj_WUH_ZrlQyLLvwNiS-NY0tzr_u2wzkJMA3fZLY46KInkd8H9iRFWuAfAG2nl9rG02PyLtxRhpRIEijNd1T-J_biHFN5gTfZZpKmXsS83tqoT0LYIQF9-LFVTuOTwbgvWcvVKnV7J0VmfdCd75Mwupgiqlag--TKTeVkyvPD_NubDH46m_kC0XDe8c"}
    rep = requests.get(url=track_features_endpoint, headers=headers).json()

    album_id.append(rep['album']['id'])
    cur_album_id = album_id[i]

    album_name.append(rep["album"]["name"])
    album_release_date.append(rep["album"]["release_date"])

    track_artist_ids.append([artist['id'] for artist in rep['artists']])
    #this is multiple but we're only doing 1st
    track_artist_id1 = track_artist_ids[i][0]

    track_id.append(rep['id'])
    track_duration_ms.append(rep["duration_ms"])
    track_explicit.append(rep["explicit"])
    track_name.append(rep["name"])
    track_popularity.append(rep["popularity"])

    # FROM ARTIST OBJECT
    artists_endpoint = "https://api.spotify.com/v1/artists/{}".format(track_artist_id1)
    rep = requests.get(url=artists_endpoint, headers=headers).json()
    artist1_id.append(rep['id'])
    followers.append(rep["followers"]["total"])
    artist_popularity.append(rep["popularity"])
    if len(rep['genres']) >= 1:
        artist_genre1.append(rep['genres'][0])
    else:
        artist_genre1.append(None)
    if len(rep['genres']) >= 2:
        artist_genre2.append(rep['genres'][1])
    else:
        artist_genre2.append(None)
    if len(rep['genres']) >= 3:
        artist_genre3.append(rep['genres'][2])
    else:
        artist_genre3.append(None)

    # FROM AUDIO FEATURES OBJECT
    audio_features_endpoint = "https://api.spotify.com/v1/audio-feature

```

```

s/{}".format(ids)
rep = requests.get(url=audio_features_endpoint, headers=headers).json()
danceability.append(rep["danceability"])
energy.append(rep["energy"])
key.append(rep["key"])
loudness.append(rep["loudness"])
mode.append(rep["mode"])
speechiness.append(rep["speechiness"])
acousticness.append(rep["acousticness"])
instrumentalness.append(rep["instrumentalness"])
liveness.append(rep["liveness"])
valence.append(rep["valence"])
tempo.append(rep["tempo"])
audio_features_id.append(rep['id'])

# FROM ALBUM OBJECT
albums_endpoint = "https://api.spotify.com/v1/albums/{}".format(current_album_id)
rep = requests.get(url=albums_endpoint, headers=headers).json()
album_label.append(rep["label"])
album_popularity.append(rep["popularity"])

if i==10000:
    break
# print all i's so we can figure out when the scraping broke down
print("{}".format(i))
i = i + 1

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KeyError                                Traceback (most recent call l  
ast)  
<ipython-input-141-68996017ba49> in <module>()  
      9  
     10     #used for album request  
----> 11     album_id.append(rep['album']['id'])  
     12     cur_album_id = album_id[i]  
     13  
  
KeyError: 'album'
```

```
In [113]: # SPECIAL CELL: this is for when the scraping breaks down IN THE MIDDLE
          # of the previous cell's running. You can see
          # on which object request the scraping broke, so append None to all list
          # s after that breakdown

          # this ensures that when we combine all the lists into one dataframe, it
          # doesn't automatically drop columns with
          # no data (from the breakdown)

          # tracks
          album_id.append(None)
          album_name.append(None)
          album_release_date.append(None)

          track_artist_ids.append(None)

          track_id.append(None)
          track_duration_ms.append(None)
          track_explicit.append(None)
          track_name.append(None)
          track_popularity.append(None)

          #artists
          artist1_id.append(None)
          followers.append(None)
          artist_popularity.append(None)
          artist_genrel.append(None)
          artist_genre2.append(None)
          artist_genre3.append(None)

          #audio features
          danceability.append(None)
          energy.append(None)
          key.append(None)
          loudness.append(None)
          mode.append(None)
          speechiness.append(None)
          acousticness.append(None)
          instrumentalness.append(None)
          liveness.append(None)
          valence.append(None)
          tempo.append(None)
          audio_features_id.append(None)

          #albums
          album_label.append(None)
          album_popularity.append(None)
```

```
In [142]: # combine all lists into one df
track_records = pd.DataFrame(album_id, columns=['album_id'])

track_records["album_name"] = album_name
track_records["album_release_date"] = album_release_date

track_records["track_artist_ids"] = track_artist_ids

track_records['track_id'] = track_id
track_records["track_duration_ms"] = track_duration_ms
track_records["track_explicit"] = track_explicit
track_records["track_name"] = track_name
track_records["track_popularity"] = track_popularity


track_records["danceability"] = danceability
track_records["energy"] = energy
track_records["key"] = key
track_records["loudness"] = loudness
track_records["mode"] = mode
track_records["speechiness"] = speechiness
track_records["acousticness"] = acousticness
track_records["instrumentalness"] = instrumentalness
track_records["liveness"] = liveness
track_records["valence"] = valence
track_records["tempo"] = tempo
track_records["audio_features_id"] = audio_features_id


track_records['artist1_id'] = artist1_id
track_records['followers'] = followers
track_records['artist_popularity'] = artist_popularity
track_records['artist_genrel'] = artist_genrel
track_records['artist_genre2'] = artist_genre2
track_records['artist_genre3'] = artist_genre3


track_records['album_label'] = album_label
track_records['album_popularity'] = album_popularity
```

```
In [143]: track_records.shape
```

```
Out[143]: (1989, 29)
```

```
In [144]: track_records
```

Out[144]:

	album_id	album_name	album_release_date	tr
0	1gluyEXICtt24CEKrYSOW8	The Piano Guys	2012	[0jW6R8CVyVohu
1	7o2VLivg95UduHjTMTIElf	Be OK	2008	[2vm8GdHyrJh2C
2	5h7fx8ILwOZ3I5yQ4eGBI7	The Lumineers	2012-01-01	[16oZKvXb6WkQl
3	3h4pyWRJIB9ZyRKXChbX22	Call Me Irresponsible (Standard Edition)	2007-04-27	[1GxkXIMwML1o
4	6QJw1UxLAFYQfy8XirsXiW	Losing Sleep	2009-01-01	[2PCUhxD40qIMc
5	6Pb3K1oPXdhsqFXtzKe3Z1	19	2008-01-28	[4dpARuHxo51G
6	10HuTnFqkhym6gXmIDxBsm	For Emma, Forever Ago	2008-02-19	[4LEiUm1SRbFM
7	39xrkt8RILtwa9DMyLkv32	Up from Below	2009-07-14	[7giUHu5pv6YTZ
8	5HHP1ctEzugQvbPCKJiWkc	Ok Go	2002	[3hozsZ9hqNq7C
9	1hyorM32T35U5HAxdh6gll	Stop Drop And Roll!!!	2008-02-05	[5tI0Vj2FhioY8AK
10	5fQ4tDLM2FfesO66R9nDF9	Scott Pilgrim vs. the World (Original Score Co...	2010-01-01	[0g7gHEXKEHU4
11	2zLZzOfiwQ4hnPCu2gVtKB	Timespace - The Best Of Stevie Nicks	1991-08-30	[7crPfGd2k81ekC5dbuFbrHa1SJIQ
12	4CVzsnMQTcC5mfU4XNTTal	I Had The Blues But I Shook Them Loose	2009-01-01	[3pTE9iaJTkWns
13	5d9FNx7UMLgfiGQG XU19jh	Underachievers Please Try Harder	2003-08-21	[5gInJ5P5gQnOK

	album_id	album_name	album_release_date	tr
14	2DhfVYIEdTZLLFJ3WKBAPc	Without A Sound	1994-08-29	[267VY6GX5LyU5
15	3NcGNYXKiHeygdXXL7czL1	Let's Get Out Of This Country	2006-05-29	[5gInJ5P5gQnOK
16	3NPyAfTeu40LVzwwqQ6RI7	Teen Dream	2010	[56ZTgzPBDge0C
17	2oAh7vprZx8iSqoyNxQASX	Bachelor No. 2 (Or, The Last Remains of the Dodo)	2000	[3UplbyXfGzmHG
18	2G9UuU6wxAa4Folv1rwHBo	The Futureheads (new version)	2004-06-28	[3TBfn8PtXr42Or
19	1csBXckSWxkPEUXT4nSeP3	Album	2009-09-28	[6eO95BjZhrWHF
20	7Ghyo1U9g3ZILTT5Kn6DD1	Dream Team	2014-11-28	[0aWSylARSZCDi
21	4agEw6mF6zvlt42zdIT6VY	Secret Rituals	2011-01-01	[0aWSylARSZCDi
22	4uG8q3GPuWHQIRbswMIRS6	Dookie	1994-02-01	[7oPftvlwr6VrsViS
23	5yliFmVkza1N3ddMtftxIZ	Fox Confessor Brings The Flood (Bonus Track Ve...	2008-04-15	[4Cedjq5BQL3Mf
24	5msfCyqu8fJYqDDV6OrXTg	I'm Wide Awake, It's Morning	2005-01-25	[5o206eFLx38glA
25	12DdKE2ScfqqnBEIXL9WM5	Everything's Amazing & Nobody's Happy	2011-09-26	[62ZE05EcDkspU
26	07fUjvOPfrD7pe5ACRsyVy	Teeth Lost, Hearts Won	2008-01-01	[0aWSylARSZCDi
27	1hyorM32T35U5HAXdh6gll	Stop Drop And Roll!!!!	2008-02-05	[5tl0Vj2FhioY8AK

	album_id	album_name	album_release_date	tr
28	2btXQFitnklvkPC0dAlvAx	Small Steps, Heavy Hooves	2007	[1aOp1lgpcwRxA
29	7p82DTmb2pwKwzXBLIURT6	Drake & Josh: Songs From & Inspired By The Hit...	2005-03-08	[03illKH0i08lxmjK
...
1959	0lUL92det7mZ4DaHYmiUEC	There's Really A Wolf	2017-05-05	[1z7b1Pr1rSlvWR
1960	5W98Ab4VvQEuFEE4Tle5fE	Title (Deluxe)	2015-01-09	[6JL8zeS1NmiOft 5y2Xq6xcjJb2jVM
1961	1BFCyhRrtgOwgJq7AtWfBL	Rodéo Boulevard	2008-10-03	[3700G3mzTkuxc
1962	5tBOCi2TekXZ1lbrmIBZO4	I Told You	2016-08-19	[2jku7tDXc6XoB6
1963	3yWRq9Dd2UO5xyqxTjLDmp	bloom	2017-05-12	[6TIYQ3jFPwQSR 4nDoRrQiYLoBzv
1964	28ZKQMoNBB0etKXZ97G2SN	Beauty Behind The Madness	2015-08-28	[1Xyo4u8uXC1Znr
1965	41Tj1cy7HlmdSmaOO6f6TI	D.N.A.	2009-10-08	[20s0P9QLxGqKl
1966	1BSzAkEW5ZE2QsBScQgoAb	If I Ever Fall In Love	1992-01-01	[72y3ZI95ctkQC2
1967	2jg7PvcpCK9V7MyWM7pvzr	Better	2016-04-29	[5cKIE8f6b26h61l
1968	6X1x82kppWZmDzlXXK3y3q	Take Care (Deluxe)	2011	[3TVXtAsR1Inumv
1969	7l4LGPXk2mB80WgXy4VeuB	Waves (Robin Schulz Radio Edit)	2014-02-07	[33W1pnW9zScZ 3t5xRXzsuZmMD
1970	6a3RDPcFamZvFCi8VeXWkK	Fórmula Vol. 1 (Deluxe Edition)	2012-08-27	[5lwmRuXgjX8xlv 23zg3TcAtWQy7J
1971	4754Cgv1sdfwTpdVX83xAC	Halcyon	2012-01-01	[0X2BH1fck6amE
1972	3Yk19X5zgXDSrG8uqrPnXC	It's About Us	2014-10-06	[58MLI9nC29IXbE
1973	74PXwYZw2Z5UF6keoLp8qH	head or heart	2014-03-27	[7H55rcKCfwqkyl

	album_id	album_name	album_release_date	tr
1974	2jLRmeMyWyKhuNofvsQGJT	I'm Falling for You	2013-02-11	[2iTtSaR023likZD:
1975	4OmQJXPhD5FOqwdg5tBsnu	Gossip Columns	2017-10-13	[3tQx1LPXbsYjE902kJSzxNuaWGq
1976	4JiY4JUvXdEA7UFibiAyor	Joanne (Deluxe)	2016-10-21	[1HY2Jd0NmPua
1977	4JiY4JUvXdEA7UFibiAyor	Joanne (Deluxe)	2016-10-21	[1HY2Jd0NmPua
1978	0K4pIOOsfJ9IK8OjrZfXzd	25	2016-06-24	[4dpARuHxo51Gx
1979	7oiJYvEJHsmYtrgviAVIDD	Back from the Edge	2016-10-28	[4IWBuUAFIplrNt
1980	7vN82vd1Vq44fjlhjfVHJp	Loud	2010-11-16	[5pKCCKE2ajJHZ7dGJo4pcD2V6o
1981	2JgVVnno2fzdmV1BqwdQBi	Jealous	2014-11-21	[2feDdbD5araYcn
1982	6Yw7f0kqQ1gbt2OHa7fi1g	Rockferry	2008	[37NqXwtb6nIEqf
1983	6Yw7f0kqQ1gbt2OHa7fi1g	Rockferry	2008	[37NqXwtb6nIEqf
1984	2OXZJLXxM8jrY3gBoVNfmz	Nobody But Me (Deluxe Version)	2016-10-21	[1GxkXIMwML1o
1985	0K4pIOOsfJ9IK8OjrZfXzd	25	2016-06-24	[4dpARuHxo51Gx
1986	7A8fZ2jjiu5heq7wNCutKN	VHS	2015-06-30	[3NPpFNZtSTHhe
1987	5gCo4z8XZ0T16nJmnw9wnG	The Script	2008	[3AQRLZ9PuTAoz
1988	2019iQx5MmA6byqYqdK7zS	Keeps Gettin' Better: A Decade Of Hits	1999	[1I7ZsJRRS8wIW:

1989 rows × 29 columns


```
In [145]: # export that data to a csv, which we will merge with all other csvs in  
          Excel  
          track_records.to_csv("20000-20999,1988.csv", sep=',')
```