

5_pandas

November 6, 2023

1 Cleaning, Transforming and Storing your Data

Now we know a little about selecting, filtering and sorting our data, we can move on to cleaning and transforming our data too.

Data is rarely perfect, missing values, anomalous values and duplicates can cause all sorts of issues in analysis. It may also be that data is not interpreted correctly straight away, and that we need to tell Pandas what kind of data it's looking at.

Once we've got on top of that we can also explore how Pandas powerful summarisation tools can help us understand our data better.

Pandas Documentation

```
[ ]: import pandas as pd
filename = 'spotify_top_songs.csv'
songs_df = pd.read_csv(filename)
songs_df.head()
```

```
[ ]:
      track_id      track_name      artists \
0  5mjYQaktjmcMKcUIcqz4s      Strangers  Kenya Grace
1  56y1j0TKOXsvJzVv9vHQBK  Paint The Town Red    Doja Cat
2  1reEeZH9wNt4z1ePYLyC7p      greedy    Tate McRae
3  59NraMJsLaMCVtwXTSia8i      Prada      cassö
4  5aIVCx5tnk0ntmdiinnYvw      Water      Tyla

      genre  release_year  release_date  explicit  popularity \
0  singer-songwriter pop      2023    2023-09-01    False      97
1      dance pop      2023    2023-09-20     True      87
2      alt z      2023    2023-09-13     True      31
3      ***OOPS!***      2023    2023-08-11     True      94
4      ***OOPS!***      2023    2023-07-28    False      91

      duration_ms      playlist_name  danceability  loudness  speechiness \
0      172964  Top 50 - United Kingdom      0.628    -8.307      NaN
1      230480  Top 50 - United Kingdom      0.864    -7.683      0.1940
2      131872  Top 50 - United Kingdom      0.750    -3.190      0.0322
3      132359  Top 50 - United Kingdom      0.638    -5.804      0.0375
4      200255  Top 50 - United Kingdom      0.673    -3.495      0.0755
```

```

playlist_type
0    mixed_pop
1    mixed_pop
2    mixed_pop
3    mixed_pop
4    mixed_pop

```

1.1 Data Cleaning

Data cleaning can involve a range of techniques, but the unifying goal is to get your data into a state that is ready for analysis. This could include: - Removing rows where data is missing - Replacing missing data with another value. - Replacing data that may be oddly formatted to make it more analysis compatible. - Transforming the type of data in a column to correct mistakes or to make it more useful.

If we examine the `.info()` we can quickly identify if there are missing values that Pandas knows about by comparing the total entries with the 'Non-Null Count' for each column.

1.1.1 Dropping and filling missing data

```
[ ]: songs_df.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1280 entries, 0 to 1279
Data columns (total 14 columns):
#   Column          Non-Null Count  Dtype
---  -
0   track_id        1280 non-null   object
1   track_name      1280 non-null   object
2   artists         1280 non-null   object
3   genre           1280 non-null   object
4   release_year    1280 non-null   int64
5   release_date    1280 non-null   object
6   explicit        1280 non-null   bool
7   popularity      1280 non-null   int64
8   duration_ms     1280 non-null   int64
9   playlist_name   1280 non-null   object
10  danceability    1280 non-null   float64
11  loudness        1280 non-null   float64
12  speechiness     1279 non-null   float64
13  playlist_type   1280 non-null   object
dtypes: bool(1), float64(3), int64(3), object(7)
memory usage: 131.4+ KB

```

We can identify which row is missing that value for speechiness using a special filter called `.isna()`

```
[ ]: songs_df[songs_df['speechiness'].isna()]
```

```
[ ]:          track_id track_name      artists      genre \
0  5mjYQaktjmcMKcUIcqz4s  Strangers  Kenya Grace  singer-songwriter pop

      release_year release_date  explicit  popularity  duration_ms \
0           2023   2023-09-01     False           97       172964

      playlist_name  danceability  loudness  speechiness playlist_type
0  Top 50 - United Kingdom      0.628    -8.307           NaN    mixed_pop
```

There are multiple approaches to missing data, depending on your analysis. The simplest approach is to simply drop any rows that have any missing data. `.dropna()` will do this for us, returning a version of the dataframe where every row has a value for every column.

If you only want to drop rows with a missing value in a specific column(s) you can use the `subset=` argument. You must pass it a list of column names, even when only checking one column.

We can see that the total number of rows is now one less than the original dataframe.

```
[ ]: songs_df.dropna(subset=['speechiness']).info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1279 entries, 1 to 1279
Data columns (total 14 columns):
#   Column          Non-Null Count  Dtype
---  -
0   track_id        1279 non-null   object
1   track_name      1279 non-null   object
2   artists         1279 non-null   object
3   genre           1279 non-null   object
4   release_year    1279 non-null   int64
5   release_date    1279 non-null   object
6   explicit        1279 non-null   bool
7   popularity      1279 non-null   int64
8   duration_ms     1279 non-null   int64
9   playlist_name   1279 non-null   object
10  danceability     1279 non-null   float64
11  loudness        1279 non-null   float64
12  speechiness     1279 non-null   float64
13  playlist_type   1279 non-null   object
dtypes: bool(1), float64(3), int64(3), object(7)
memory usage: 141.1+ KB
```

As `.dropna()` returns a version of the dataframe without the offending rows, if we want to continue working with the cleaned version, we simply overwrite the variable with the new dataframe.

This is shown below as a comment as we don't want to actually do that just yet!

```
[ ]: # songs_df = songs_df.dropna()
```

If we wanted to keep the row, we could instead replace the missing value with another value such as the average value for that column. There are other ways to generate replacement data but they

have their issues. In general it is usually better to drop these rows unless you absolutely have to keep them.

Again to save the transformed result we overwrite, but this time we overwrite the specific column in the dataframe. Shown below as a comment to avoid committing changes.

```
[ ]: # avg_speechiness = songs_df['speechiness'].mean()
      # songs_df['speechiness'] = songs_df['speechiness'].fillna(avg_speechiness)
```

1.1.2 When missing data doesn't look missing

Sometimes datasets can fool you into thinking they're more complete than they are. According to `.info()` there are no missing values in the `genre` column. However if we look at the data we can see an odd value called `***OOPS!***`. This looks like a placeholder value entered if data collection went wrong.

We can replace this with a `NaN` or `NA`, an object that represents a missing value - when we used `.isna`, `.dropna` and `.fillna` Pandas was specifically looking for these `NA` objects.

First let's check how many of these odd placeholder values we have.

```
[ ]: songs_df[songs_df['genre'] == '***OOPS!***'].info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 50 entries, 3 to 1210
Data columns (total 14 columns):
 #   Column          Non-Null Count  Dtype
---  -
 0   track_id        50 non-null    object
 1   track_name      50 non-null    object
 2   artists         50 non-null    object
 3   genre           50 non-null    object
 4   release_year    50 non-null    int64
 5   release_date    50 non-null    object
 6   explicit        50 non-null    bool
 7   popularity      50 non-null    int64
 8   duration_ms     50 non-null    int64
 9   playlist_name   50 non-null    object
10   danceability    50 non-null    float64
11   loudness        50 non-null    float64
12   speechiness     50 non-null    float64
13   playlist_type   50 non-null    object
dtypes: bool(1), float64(3), int64(3), object(7)
memory usage: 5.5+ KB
```

We can `.replace()` all these values with `NaN` objects so that we have a clearer picture of our data, and can then have the option to use our other missing data cleaning methods.

```
[ ]: songs_df['genre'] = songs_df['genre'].replace('***OOPS!***', pd.NA)
      songs_df.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1280 entries, 0 to 1279
Data columns (total 14 columns):
#   Column                Non-Null Count  Dtype
---  -
0   track_id              1280 non-null   object
1   track_name            1280 non-null   object
2   artists               1280 non-null   object
3   genre                 1230 non-null   object
4   release_year          1280 non-null   int64
5   release_date          1280 non-null   object
6   explicit              1280 non-null   bool
7   popularity            1280 non-null   int64
8   duration_ms           1280 non-null   int64
9   playlist_name         1280 non-null   object
10  danceability           1280 non-null   float64
11  loudness               1280 non-null   float64
12  speechiness           1279 non-null   float64
13  playlist_type         1280 non-null   object
dtypes: bool(1), float64(3), int64(3), object(7)
memory usage: 131.4+ KB

```

Now we have a more accurate representation of our missing values let's go ahead and just drop any row with missing data using `.dropna()`.

```

[ ]: songs_df = songs_df.dropna()
     songs_df.head()

```

```

[ ]:
      track_id      track_name  artists \
1  56y1j0TK0XSvJzVv9vHQBK  Paint The Town Red  Doja Cat
2  1reEeZH9wNt4z1ePYLyC7p      greedy  Tate McRae
5  2FDTHlrBguDzQkp7PVj16Q      Sprinter      Dave
6  1BxfuPKGuaTgP7aMOBbdwr  Cruel Summer  Taylor Swift
7  3vkCue0mm7xQDoJ17W1Pm3  My Love Mine All Mine  Mitski

      genre  release_year  release_date  explicit  popularity \
1  dance pop      2023    2023-09-20      True      87
2  alt z      2023    2023-09-13      True      31
5  uk hip hop      2023    2023-06-01      True      94
6  pop      2019    2019-08-23     False      99
7  brooklyn indie      2023    2023-09-15     False      93

      duration_ms  playlist_name  danceability  loudness  speechiness \
1      230480  Top 50 - United Kingdom      0.864    -7.683      0.1940
2      131872  Top 50 - United Kingdom      0.750    -3.190      0.0322
5      229133  Top 50 - United Kingdom      0.916    -8.067      0.2410
6      178426  Top 50 - United Kingdom      0.552    -5.707      0.1570
7      137773  Top 50 - United Kingdom      0.504   -14.958      0.0321

```

```

playlist_type
1    mixed_pop
2    mixed_pop
5    mixed_pop
6    mixed_pop
7    mixed_pop

```

Unless you want to retain the index to match back to the original data later, often it is a good idea to `.reset_index()` before continuing. We use `drop=True` to ensure the original index is not retained and just cleaned away entirely.

```
[ ]: songs_df = songs_df.reset_index(drop=True)
```

1.1.3 Fixing Wrong data types

Sometimes either due to the way data was interpreted when Pandas loaded it, or due to the way data was created, it won't necessarily be the right type of data.

In our dataset we have a `release_date` column, and currently it is listed as an object

```
[ ]: songs_df.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1229 entries, 0 to 1228
Data columns (total 14 columns):
#   Column          Non-Null Count  Dtype
---  -
0   track_id        1229 non-null   object
1   track_name      1229 non-null   object
2   artists         1229 non-null   object
3   genre           1229 non-null   object
4   release_year    1229 non-null   int64
5   release_date    1229 non-null   object
6   explicit        1229 non-null   bool
7   popularity      1229 non-null   int64
8   duration_ms     1229 non-null   int64
9   playlist_name   1229 non-null   object
10  danceability    1229 non-null   float64
11  loudness        1229 non-null   float64
12  speechiness     1229 non-null   float64
13  playlist_type   1229 non-null   object
dtypes: bool(1), float64(3), int64(3), object(7)
memory usage: 126.1+ KB

```

If we look at the `release_date` value for the first row, we can see it is actually a string, and if we ask Pandas to `.describe()` it to us it can do very little as it thinks they are just words, rather than dates.

```
[ ]: songs_df.loc[0, 'release_date']
```

```
[ ]: '2023-09-20'
```

```
[ ]: songs_df['release_date'].describe()
```

```
[ ]: count          1229
      unique         684
      top      2023-09-08
      freq           15
      Name: release_date, dtype: object
```

We can recast the column as a date by using `pd.to_datetime()` which takes a column of strings and returns a column of dates.

```
[ ]: songs_df['release_date'] = pd.to_datetime(songs_df['release_date'])
      songs_df['release_date'].describe(datetime_is_numeric=True)
```

```
[ ]: count          1229
      mean    2001-01-04 20:20:53.702196864
      min      1954-01-01 00:00:00
      25%      1983-03-23 00:00:00
      50%      2008-03-28 00:00:00
      75%      2020-05-22 00:00:00
      max      2023-10-13 00:00:00
      Name: release_date, dtype: object
```

1.2 Exercises 1

Take a look at section 1 of the exercises sheet. Complete the tasks before moving on.

1.3 Data Transformations

We can use Pandas to quickly transform our data to provide us quick insights into the data that would otherwise be difficult or impossible to achieve manually. For example we can: - Count the number of times particular values are used, good for categorical data. - Use `groupby` to compare different subsets of data quickly.

1.3.1 Value Counts

A simple but powerful method for quickly summarising a column of categorical data, often string data. For example we could ask how many tracks are in the dataset per playlist, and get the answer easily using `.value_counts()`.

```
[ ]: songs_df['playlist_name'].value_counts()
```

```
[ ]: Hit Rewind          100
      All Out 2000s      100
      All Out 2010s      100
```

| | |
|---------------------------------|-----|
| All Out 90s | 100 |
| All Out 80s | 100 |
| All Out 60s | 100 |
| All Out 70s | 99 |
| All Out 50s | 99 |
| Every Official UK Number 1 Ever | 93 |
| The Pop List | 88 |
| alt/pop | 59 |
| Cheesy Hits! | 50 |
| Top 50 - United Kingdom | 47 |
| Today's Top Hits | 47 |
| Every UK Number One: 2023 | 47 |

Name: playlist_name, dtype: int64

Or the most mentioned artist...

```
[ ]: artist_counts = songs_df['artists'].value_counts().head(10)
      artist_counts
```

```
[ ]: Ed Sheeran      21
      Olivia Rodrigo  17
      Drake          17
      Taylor Swift    15
      Billie Eilish   13
      The Weeknd      11
      Coldplay        11
      Calvin Harris   11
      Lewis Capaldi   10
      Rihanna         10
      Name: artists, dtype: int64
```

One thing to note is that `value_counts` returns a Series (column), just like any other column in a dataframe. It sets the index to be the unique values from the column it is counting, in our case, artist names.

This means that if you have a particular value in mind you want to check, you can use the `.loc` to select the specific value, or for convenience omit `.loc` and just use square brackets `[]`.

```
[ ]: artist_counts.loc['Billie Eilish']
```

```
[ ]: 13
```

We could also use this index in other operations. For example we could filter our dataset to only contain records of our top 10 most mentioned artists.

```
[ ]: top_10_artists = artist_counts.index
      top_10_artists
```



```
[ ]: Index(['Ed Sheeran', 'Olivia Rodrigo', 'Drake', 'Taylor Swift',
          'Billie Eilish', 'The Weeknd', 'Coldplay', 'Calvin Harris',
          'Lewis Capaldi', 'Rihanna'],
          dtype='object')
```

```
[ ]: top_10_filter = songs_df['artists'].isin(top_10_artists)
top_10_artists_df = songs_df[top_10_filter]
top_10_artists_df.head()
```

```
[ ]:
      track_id      track_name \
3    1BxfuPKGuaTgP7aM0Bbdwr    Cruel Summer
5    1kuGVB7EU95pJ0bxwvfwKS      vampire
7    2YSzYUF3jWqb9YP9VXmpjE    IDGAF (feat. Yeat)
11   6wf7Yu7cxBSPrRlWeSeK0Q  What Was I Made For? [From The Motion Picture ...
13   3IX0yuEVvDbnqUwMBB3ouC    bad idea right?
```

```

      artists      genre  release_year  release_date  explicit \
3    Taylor Swift      pop           2019    2019-08-23     False
5    Olivia Rodrigo      pop           2023    2023-09-08      True
7           Drake  canadian hip hop           2023    2023-10-06      True
11   Billie Eilish      art pop           2023    2023-07-13     False
13   Olivia Rodrigo      pop           2023    2023-09-08      True
```

```

      popularity  duration_ms      playlist_name  danceability  loudness \
3             99      178426  Top 50 - United Kingdom      0.552    -5.707
5             95      219724  Top 50 - United Kingdom      0.511    -5.745
7             89      260111  Top 50 - United Kingdom      0.663    -8.399
11            96      222369  Top 50 - United Kingdom      0.444   -17.665
13            94      184783  Top 50 - United Kingdom      0.627    -3.446
```

```

      speechiness  playlist_type
3           0.1570    mixed_pop
5           0.0578    mixed_pop
7           0.2710    mixed_pop
11          0.0307    mixed_pop
13          0.0955    mixed_pop
```

.value_counts() also allows us to get proportions rather than frequencies by using the argument `normalize=True`. The simplest way to interpret the numbers is as a percentage. For example 0.1 is 10%, 0.04 is 4% etc.

```
[ ]: songs_df['genre'].value_counts(normalize=True)
```

```
[ ]: pop           0.109845
      dance pop     0.080553
      album rock    0.075671
      adult standards 0.045566
      alt z         0.022783
```

```

...
electro          0.000814
dutch edm       0.000814
indie rock      0.000814
danish pop      0.000814
acoustic blues  0.000814
Name: genre, Length: 190, dtype: float64

```

1.3.2 Grouping Data

.groupby allows us to quickly separate our dataset up into groups based on the values in one or more columns.

```
[ ]: grouped = songs_df.groupby('playlist_name')
grouped
```

```
[ ]: <pandas.core.groupby.generic.DataFrameGroupBy object at 0x110b85e80>
```

```
[ ]: grouped.get_group('Cheesy Hits!').head()
```

```
[ ]:
      track_id      track_name      artists \
182  2Wfa0iMkCvy7F5fcp2zZ8L      Take on Me      a-ha
183  0GjEhVFGZW8afUYGChu3Rr      Dancing Queen      ABBA
184  4kbj5Mwx01bq9wjT5g9HaA  Shut Up and Dance  WALK THE MOON
185  2kQuhkFX7uSVepCD3h29g5      Smack That      Akon
186  47BBI51FKFwOMlIiX6m8ya  I Want It That Way  Backstreet Boys

      genre  release_year  release_date  explicit  popularity \
182  new romantic      1985   1985-06-01     False         88
183    europop      1976   1976-01-01     False         86
184  dance rock      2014   2014-12-02     False         85
185  dance pop      2006   2006-01-01      True         85
186   boy band      1999   1999-05-18     False         84

      duration_ms  playlist_name  danceability  loudness  speechiness \
182       225280  Cheesy Hits!         0.573    -7.638         0.0540
183       230400  Cheesy Hits!         0.543    -6.514         0.0428
184       199080  Cheesy Hits!         0.578    -3.804         0.0619
185       212360  Cheesy Hits!         0.939    -5.171         0.0467
186       213306  Cheesy Hits!         0.689    -5.830         0.0270

      playlist_type
182    mixed_pop
183    mixed_pop
184    mixed_pop
185    mixed_pop
186    mixed_pop

```

More importantly we can apply operations to our single grouped object and have them applied to each group separately with the results returned all together. For example, let's ask what the average popularity score is for each different playlist.

```
[ ]: grouped.mean()['popularity'].sort_values(ascending=False)
```

```
[ ]: playlist_name
      Today's Top Hits          90.914894
      All Out 2010s            86.780000
      Top 50 - United Kingdom  86.638298
      Hit Rewind               85.110000
      All Out 2000s            82.940000
      Cheesy Hits!             80.140000
      Every UK Number One: 2023 79.978723
      All Out 90s              79.810000
      All Out 80s              79.720000
      All Out 70s              78.787879
      All Out 60s              74.210000
      The Pop List             72.954545
      All Out 50s              62.363636
      Every Official UK Number 1 Ever 58.655914
      alt/pop                  55.203390
      Name: popularity, dtype: float64
```

We can use different aggregations by using the appropriate method such as `.mean`, `.count`, `.sum`, `.median` and `.nunique`.

```
[ ]: grouped.nunique()[['track_name', 'artists']]
```

```
[ ]:
      playlist_name      track_name  artists
      All Out 2000s          100         70
      All Out 2010s          100         58
      All Out 50s            98         54
      All Out 60s           100         64
      All Out 70s            98         65
      All Out 80s           100         73
      All Out 90s           100         75
      Cheesy Hits!           50         48
      Every Official UK Number 1 Ever 93         56
      Every UK Number One: 2023      47         39
      Hit Rewind             100         70
      The Pop List           88         68
      Today's Top Hits        47         40
      Top 50 - United Kingdom      47         36
      alt/pop                59         52
```

We can ask for different types of aggregation per column using `.agg`

```
[ ]: aggregations = {'track_id': 'count', 'artists': 'nunique', 'popularity': 'mean'}
grouped.agg(aggregations)
```

```
[ ]:
           track_id  artists  popularity
playlist_name
All Out 2000s           100      70    82.940000
All Out 2010s           100      58    86.780000
All Out 50s              99      54    62.363636
All Out 60s           100      64    74.210000
All Out 70s            99      65    78.787879
All Out 80s           100      73    79.720000
All Out 90s           100      75    79.810000
Cheesy Hits!            50      48    80.140000
Every Official UK Number 1 Ever    93      56    58.655914
Every UK Number One: 2023         47      39    79.978723
Hit Rewind              100      70    85.110000
The Pop List             88      68    72.954545
Today's Top Hits          47      40    90.914894
Top 50 - United Kingdom          47      36    86.638298
alt/pop                  59      52    55.203390
```

Lastly, we can also group by more than one variable to break down the data further.

```
[ ]: songs_df.groupby(['release_year', 'explicit']).agg(aggregations).loc[2020:]
```

```
[ ]:
           track_id  artists  popularity
release_year explicit
2020      False      13      8    65.153846
           True       14      8    73.142857
2021      False      15      7    71.466667
           True       10      5    66.100000
2022      False      23     12    80.130435
           True       8      6    80.125000
2023      False     154    104    71.870130
           True      82     42    78.085366
```

You can also aggregate the same column twice in different ways by using a different syntax in `.agg`.

```
[ ]: songs_df.groupby('playlist_name').agg(
    mean_popularity=('popularity', 'mean'),
    median_popularity=('popularity', 'median'),
    n_tracks=('track_id', 'count') )
```

```
[ ]:
           mean_popularity  median_popularity  n_tracks
playlist_name
All Out 2000s           82.940000           82.5       100
All Out 2010s           86.780000           86.0       100
All Out 50s             62.363636           61.0        99
```

| | | | |
|---------------------------------|-----------|------|-----|
| All Out 60s | 74.210000 | 73.0 | 100 |
| All Out 70s | 78.787879 | 78.0 | 99 |
| All Out 80s | 79.720000 | 79.0 | 100 |
| All Out 90s | 79.810000 | 79.0 | 100 |
| Cheesy Hits! | 80.140000 | 80.0 | 50 |
| Every Official UK Number 1 Ever | 58.655914 | 74.0 | 93 |
| Every UK Number One: 2023 | 79.978723 | 82.0 | 47 |
| Hit Rewind | 85.110000 | 85.0 | 100 |
| The Pop List | 72.954545 | 73.0 | 88 |
| Today's Top Hits | 90.914894 | 92.0 | 47 |
| Top 50 - United Kingdom | 86.638298 | 89.0 | 47 |
| alt/pop | 55.203390 | 55.0 | 59 |

1.3.3 Storing your data

Whether you have gone through the process of cleaning your dataset, or you've produced some aggregations that you want to easily refer to later, you'll want to store your data in some way.

Whilst there are many options, the two simplest ways to store data are either to create a `.csv` file, or to use a `pickle` file.

CSV CSV files are a standard data format that are very common. They can be opened in other programmes like Microsoft Excel and are simple enough to be widely compatible.

The downside is that their simplicity means they can't store more complex types of data such as dates, meaning that you would have to do a little work upon loading the data to set the correct data types.

We've already seen the Pandas command for loading csv files (`.read_csv()`). We can create our own using `.to_csv`.

```
[ ]: explicit_summary = songs_df.groupby('explicit').agg(aggregations)
explicit_summary
```

```
[ ]:      track_id  artists  popularity
explicit
False      1005      514    76.289552
True       224      106    77.691964
```

```
[ ]: explicit_summary.to_csv('explicit_summary.csv')
```

Pickle Files Gets its name from the idea of 'pickling' as in preserving something. Pickle files can store all sorts of complex data types. Unlike a CSV where data is translated into a simple text representation, pickle files store the actual dataframe object from Python. This means the data is stored and reloaded exactly as it is. the downside is that it has very little compatibility beyond being reloaded by Pandas, and often there can be problems trying to load a pickle file anywhere other than in the same place it was created.

```
[ ]: songs_df.to_pickle('cleaned_songs_df.pkl')
```

```
[ ]: songs_df_2 = pd.read_pickle('cleaned_songs_df.pkl')
songs_df_2.head()
```

```
[ ]:
      track_id      track_name      artists \
0  56y1j0TK0XSvJzVv9vHQBK  Paint The Town Red  Doja Cat
1  1reEeZH9wNt4z1ePYLyC7p          greedy  Tate McRae
2  2FDTHlrBguDzQkp7PVj16Q          Sprinter    Dave
3  1BxfuPKGuaTgP7aM0Bbdwr    Cruel Summer  Taylor Swift
4  3vkCue0mm7xQDoJ17W1Pm3  My Love Mine All Mine    Mitski

      genre  release_year  release_date  explicit  popularity \
0  dance pop          2023    2023-09-20        True          87
1  alt z          2023    2023-09-13        True          31
2  uk hip hop          2023    2023-06-01        True          94
3  pop          2019    2019-08-23        False          99
4  brooklyn indie          2023    2023-09-15        False          93

      duration_ms      playlist_name  danceability  loudness  speechiness \
0      230480  Top 50 - United Kingdom        0.864    -7.683        0.1940
1      131872  Top 50 - United Kingdom        0.750    -3.190        0.0322
2      229133  Top 50 - United Kingdom        0.916    -8.067        0.2410
3      178426  Top 50 - United Kingdom        0.552    -5.707        0.1570
4      137773  Top 50 - United Kingdom        0.504   -14.958        0.0321

      playlist_type
0  mixed_pop
1  mixed_pop
2  mixed_pop
3  mixed_pop
4  mixed_pop
```

1.4 Exercises 2

Take a look at section 2 of the exercises sheet. Complete the tasks.

If there is time, work through the appropriate chapter of the McLevey textbook OR the recommended DataCamp course.

See Moodle for details.