Now Playing: Spotify's Most Streamed Songs

WRAPPED

TOP ARTISTS BY STREAMS

TOP SONGS BY STREAMS

PLATFORM DOMINANCE

SONGS WITH HIGHEST DANCEABILITY & ENERGY

Shuffle Play: "The Dataset"

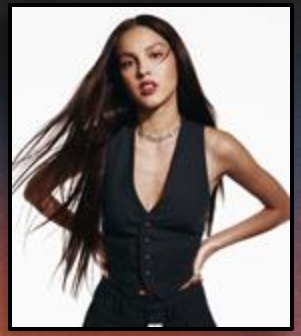
RECURRING ARTISTS IN CHARTS

SONGS WITH LEAST SPEECHINESS

TOP ARTISTS WITH MULTIPLE CONTRIBUTORS

RECURRING ARTISTS IN PLAYLISTS

Artists


Track

ely | Flowers | Escapism | Kill Bill | Blinding Lights | Heat Waves | Summ

Streaming Metrics

rts | Streams | Spotify Charts | Deezer Playlists | Shazam Charts | Spotify Playlists | Apple Playli

Musical Attributes

om | key | mode | danceability | energy | valence | liveness | acousticness | spe

Description of the dataset

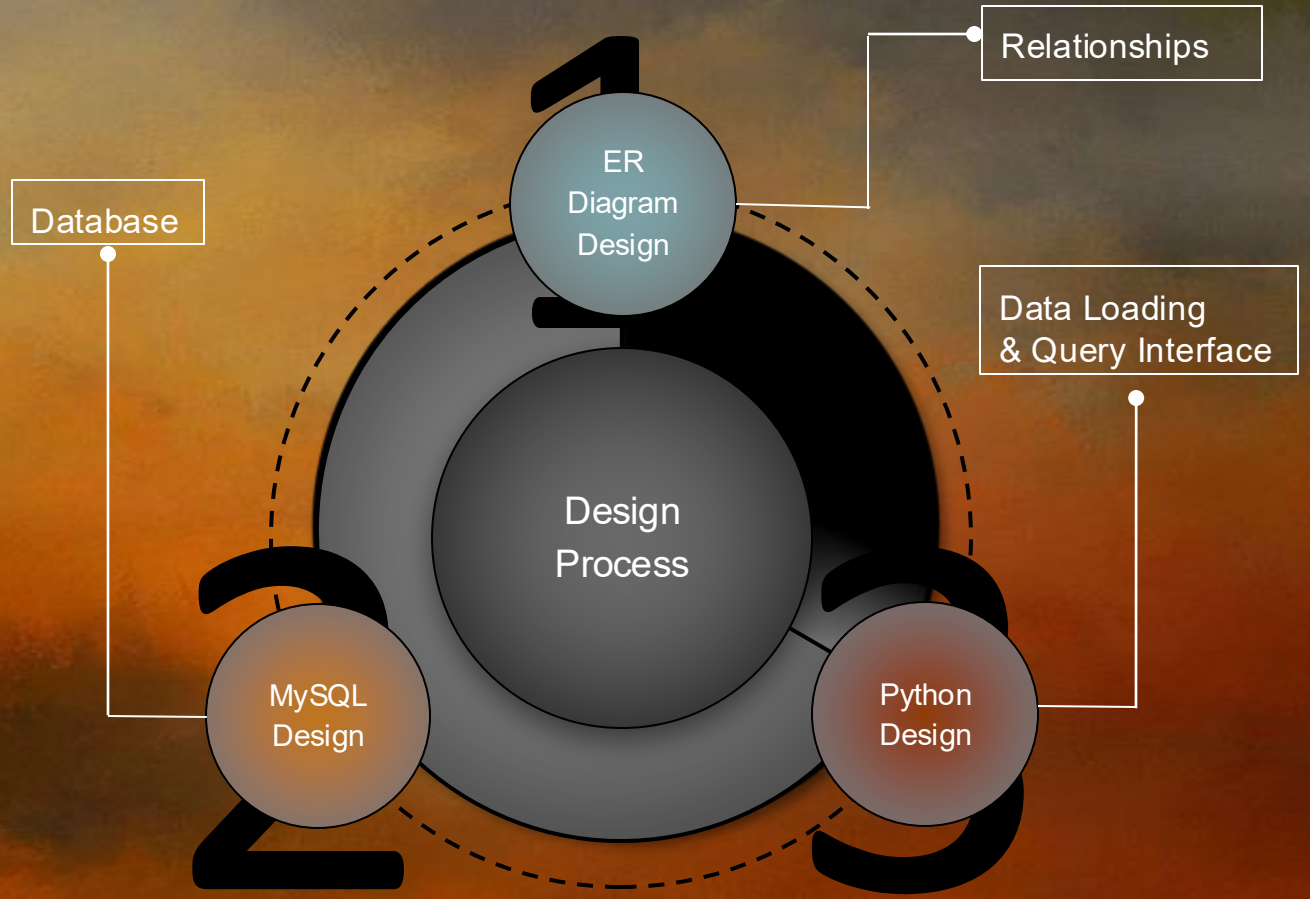
The dataset contains important information about Spotify top-streamed songs, including:

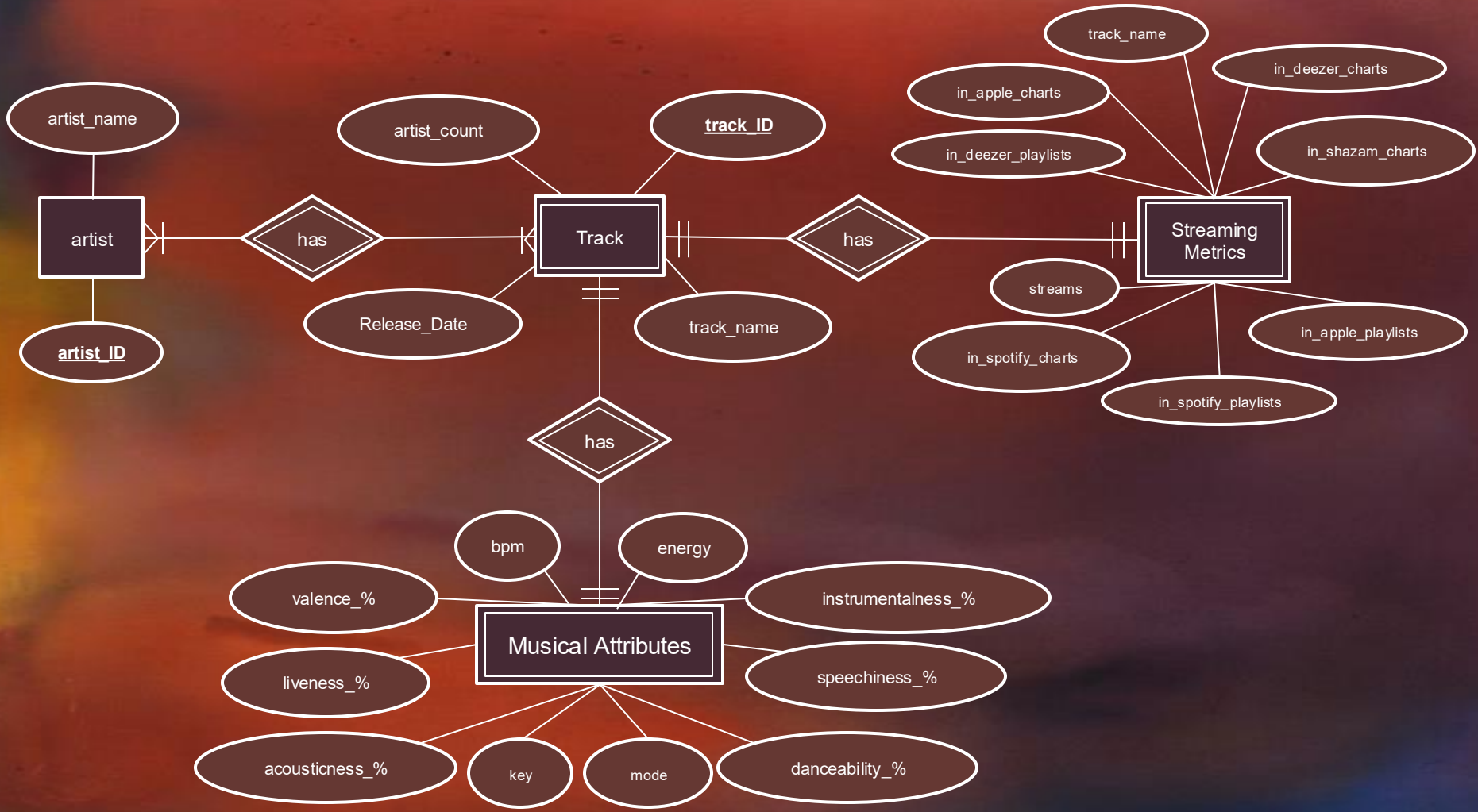
- General track details such as song name, artists, collaborators and release dates.
- Streaming metrics among Spotify, Apple Music, Deezer and Shazam, including their appearance in numerous playlists and chart rankings
- Information about musical attributes such as BPM, danceability, energy and acousticness (crucial for pattern identification)

Project overview

In this project, we're exploring the trends and characteristics of tracks and artists among popular streaming platforms, such as Spotify, Apple Music, Shazam and Deezer.

Our primary goal is designing and implementing a relational database to store and analyze the Spotify Most Streamed Songs dataset.

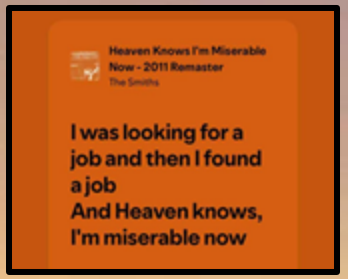


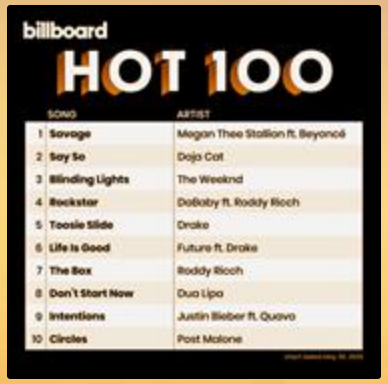

artist_name
artist_count
track_ID
track_name
in_deezer_charts
in_apple_charts
in_deezer_playlists
in_shazam_charts
artist
has
Track
has
Streaming Metrics
artist_ID
Release_Date
track_name
streams
in_apple_playlists
in_spotify_charts
in_spotify_playlists
has
bpm
energy
valence_%
instrumentalness_%
Musical Attributes
liveness_%
speechiness_%
acousticness_%
key
mode
danceability_%

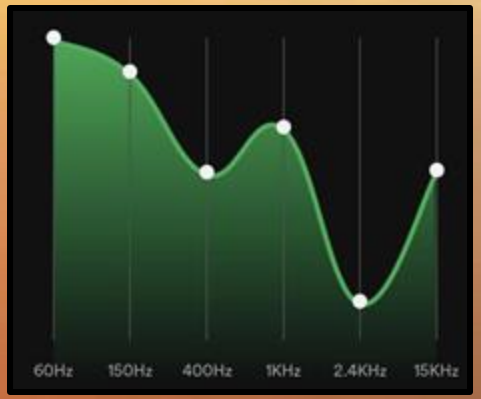
Database Creation

After creating our ER Diagram, we begin creating tables in MySQL with respect to the entities and relationships in the diagram.

Additionally, we include foreign keys and IDs in the tables that will be tools for us to call data with later in our queries.



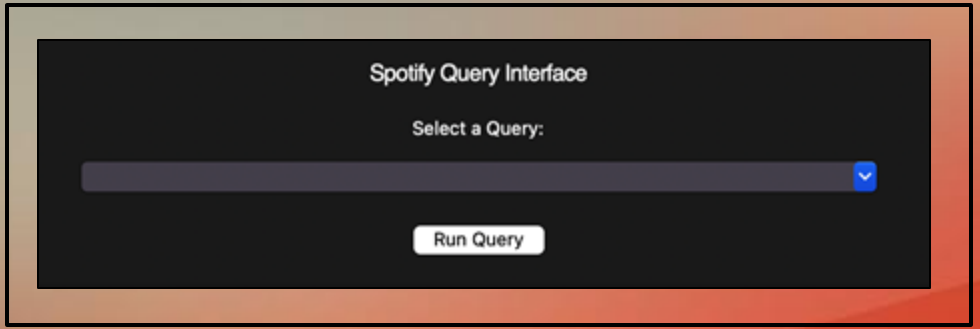




After designing and creating the database in MySQL, the next step involves populating it with clean, structured data. Here's how we accomplished this in VSCode with Python:

- *Data Cleaning and Preparation:*
  We implemented a data cleaning function to handle inconsistencies, null values, and incorrect formatting in the raw CSV dataset. This ensured the data was ready for seamless insertion without causing errors or compromising results.
- *Efficient Data Insertion with the "**dataloading**" Function:*
  The **"dataloading"** function connects to the MySQL database and systematically inserts the cleaned data into normalized tables. It uses:
  - Caching: For artist and track IDs to optimize performance and avoid redundant database queries.
  - Iterative Logic: To map multiple artists to tracks and establish relationships across tables like Artist_Track.
- *Structured Attribute Mapping:*
  We aligned dataset columns with our table attributes, ensuring every entry (e.g., streams, playlists, musical properties) was correctly mapped into its respective table.

Query Interface



Database Connection

After loading the data, we create a query interface and connect it to the query interface.

Query Implementation

After creating and testing our queries in MySQL, we add them into the interface.

User Interface

We set up the user interface to be user friendly and efficient with our queries.

Adding Query Functionality

This step adds SQL queries to the queries dictionary for use in the interface. Each query is linked to a clear title for easy selection from the dropdown menu.

```
# Queries for the Spotify database
queries = {
    '-- Top Artist by Stream Count': '''
        SELECT
            a.artist_name,
            SUM(sm.streams) AS total_streams
        FROM
            Artist a
        JOIN
            Artist_Track at ON a.artist_id = at.artist_id
        JOIN
            Track t ON at.track_id = t.track_id
        JOIN
            StreamingMetrics sm ON t.track_id = sm.track_id
        GROUP BY
            a.artist_name
        ORDER BY
            total_streams DESC
        LIMIT 10;
    ''',
```

Executing and Displaying Queries

This part manages the execution of SQL queries and displays the results in the interface. It connects to the database, retrieves query results, and dynamically updates the Treeview to show the data in a user-friendly format. Errors are handled gracefully, ensuring a smooth user experience.

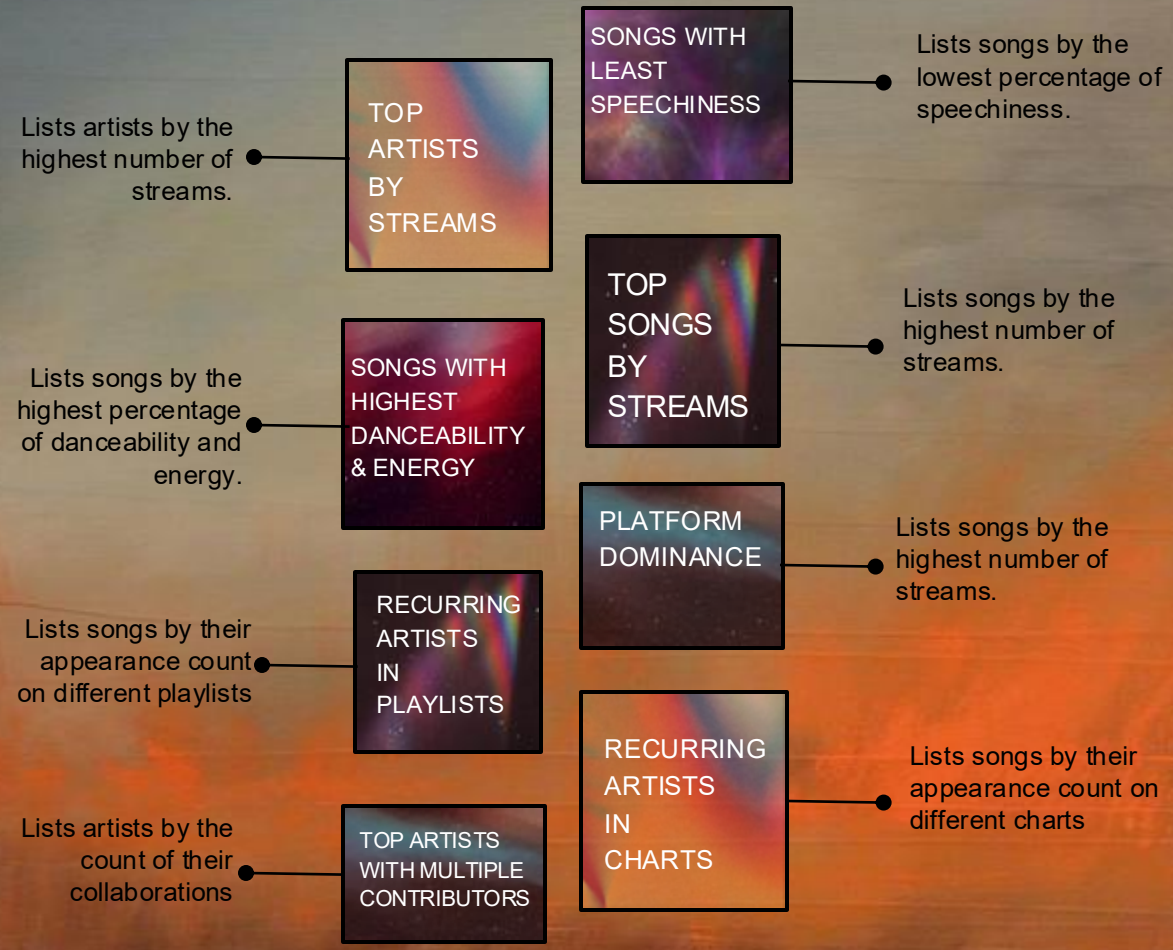
```python
# Execute a query and return the result as a DataFrame
def execute_query(query):
    """
    Executes the given SQL query and retrieves the results in a pandas DataFrame.

    Args:
        query (str): The SQL query to execute.

    Returns:
        DataFrame: A pandas DataFrame containing the query results.
    """
    try:
        conn = pymysql.connect(**db_config)
        cursor = conn.cursor()
        # Execute the query and fetch all the rows
        cursor.execute(query)
        rows = cursor.fetchall()
        # Extract column names for the DataFrame
        columns = [desc[0] for desc in cursor.description]
        # Return the results as a pandas DataFrame
        return pd.DataFrame(rows, columns=columns)
    except Exception as e:
        # Show an error message if the query fails
        messagebox.showerror("Error", f"Failed to execute query: {e}")
        return None
    finally:
        if conn:
            conn.close()
```

```python
# Run the selected query and display the results in the UI
def run_query():
    """
    Handles the execution of the query selected by the user
    and displays the results in the Treeview widget.
    """
    # Get the selected query from the dropdown
    selected_query = query_combobox.get()
    if not selected_query:
        messagebox.showwarning("Warning", "Please select a query first.")
        return
        # Fetch the query from the dictionary and execute it
    query = queries[selected_query]
    result = execute_query(query)
    if result is not None:
        # Clear any previous results in the Treeview
        for item in tree.get_children():
            tree.delete(item)
        # Set up the Treeview columns to match the query results
        tree["columns"] = list(result.columns)
        tree["show"] = "headings"
        for col in result.columns:
            tree.heading(col, text=col)  # Set column header text
            tree.column(col, width=150, anchor="center")  # Adjust column width
        # Insert the rows into the Treeview
        for _, row in result.iterrows():
            tree.insert("", "end", values=list(row))
```

UI Layout Setup for Spotify Query Interface

- **Title Label:** Displays the application title prominently at the top.
- **Dropdown Menu:** Enables users to select a query from a list of predefined options.
- **Run Query Button:** Executes the selected query and fetches data.
- **Treeview Frame:** Dynamically displays query results in a table-like structure.
- **Global Widgets:** Ensures accessibility for critical UI components across the application.

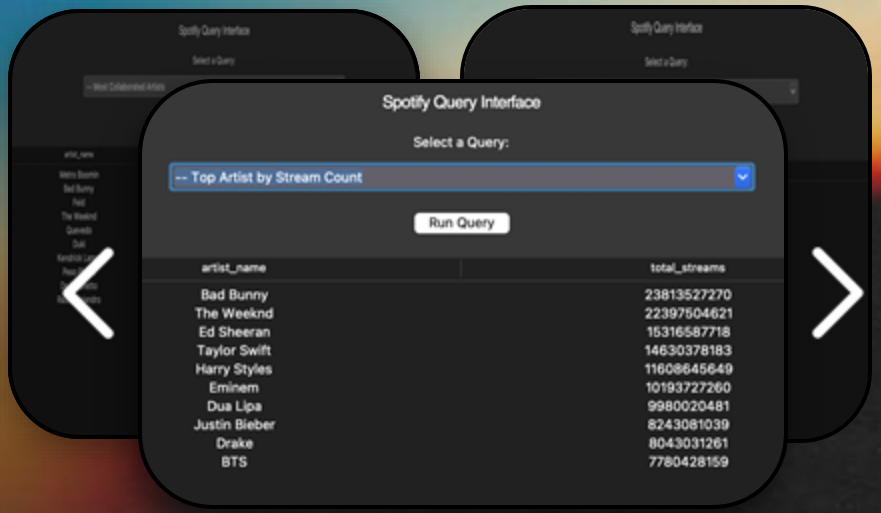
```python
# Set up the UI layout
def setup_ui(root):
    """
    Sets up the graphical interface for the application, including labels, buttons, and the Treeview.

    Args:
        root (Tk): The root Tkinter window.
    """
    # Add a title label at the top of the window
    tk.Label(root, text="Spotify Query Interface", font=("Helvetica", 16)).pack(pady=10)
    # Add a label and dropdown menu for selecting queries
    tk.Label(root, text="Select a Query:").pack(pady=5)
    global query_combobox
    query_combobox = ttk.Combobox(root, values=list(queries.keys()), state="readonly", width=60)
    query_combobox.pack(pady=5)
    # Add a button to run the selected query
    tk.Button(root, text="Run Query", command=run_query).pack(pady=10)
    # Add a frame to hold the Treeview widget
    tree_frame = tk.Frame(root)
    tree_frame.pack(fill="both", expand=True, padx=10, pady=10)
    # Add the Treeview to display query results
    global tree
    tree = ttk.Treeview(tree_frame)
    tree.pack(fill="both", expand=True)
```



Query analysis

In frame of this project, our group developed the following queries:

- Top Songs by Stream Count
- Top Artists by Stream Count
- Artist Appearing Most in Playlists
- Most Collaborated Artists
- Minimum Speechiness
- Artists Appearing Most in Charts
- Average Danceability & Energy
- Popularity Score of Artists (Normalized)
- Top Acoustic tracks by acousticness and streams
- Most streamed track per year

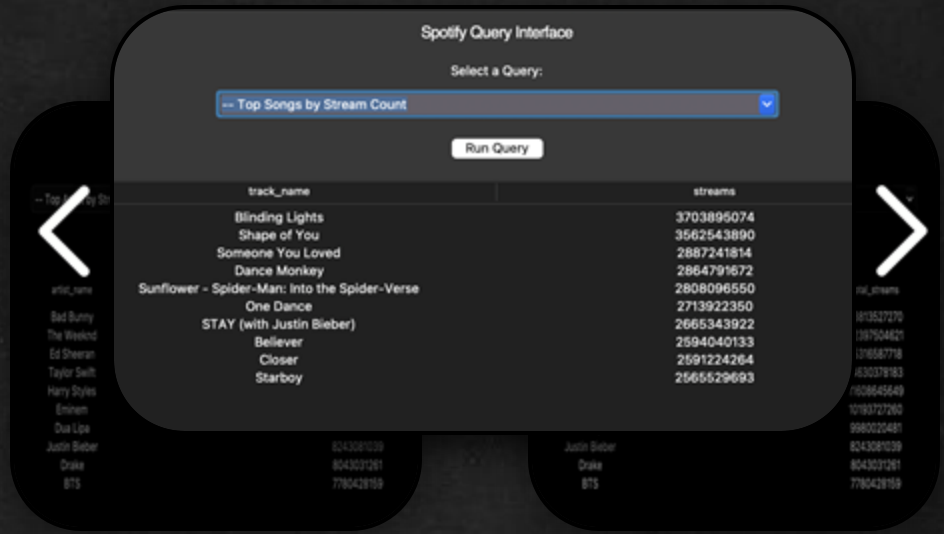


Top Artist by Stream Count:

Outputs the Top 10 artists with the highest number of total streams by gathering the artist name by artist ID. Total streams is calculated by summing up the stream counts for artists across the dataset.

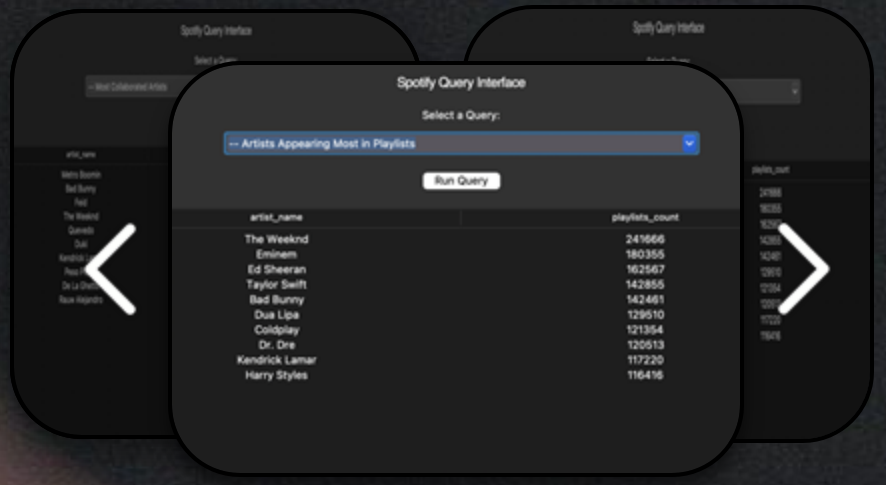
Top Songs by Stream Count:

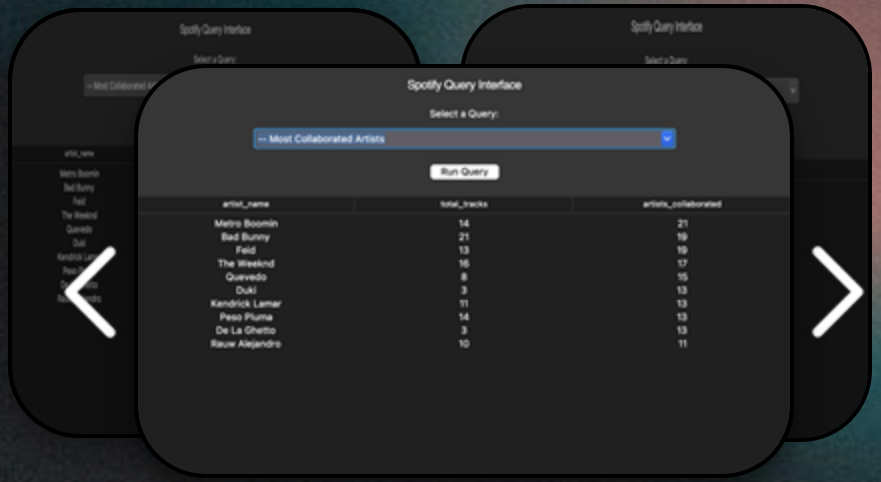
Outputs the Top 10 songs with the highest number of streams by gathering track names from track ID's and their streams. It is ordered by descending order.



Artists Appearing Most In Playlists:

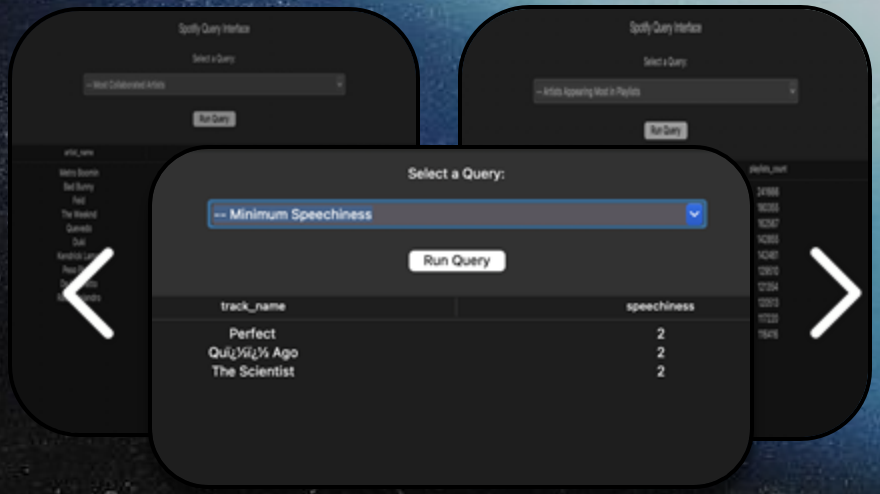
This query examines which artists are featured most frequently across numerous playlists





Most Collaborated Artists:

Lists the top 10 artists with the highest number of collaborations by counting unique tracks and distinct collaborators. The results are ordered by the number of collaborators in descending order.

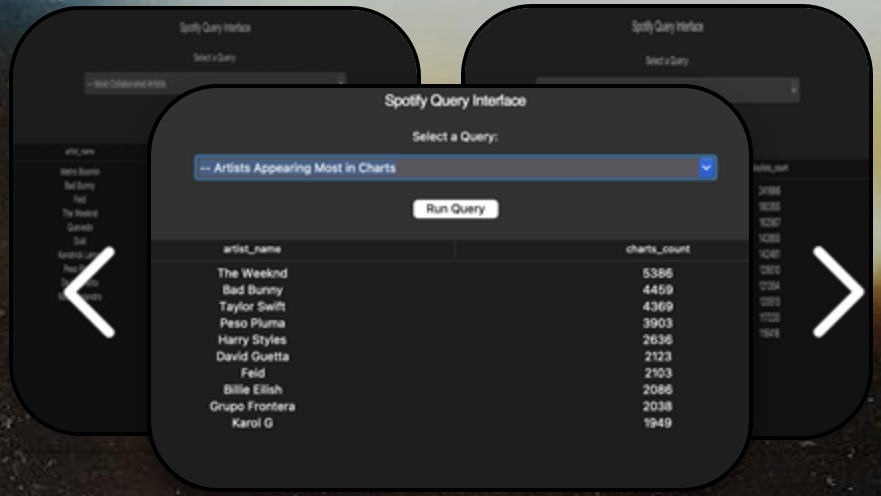


Minimum Speechiness:

Outputs the Top 10 songs with the highest number of streams by gathering track names from track ID's and their streams. It is ordered by descending order.

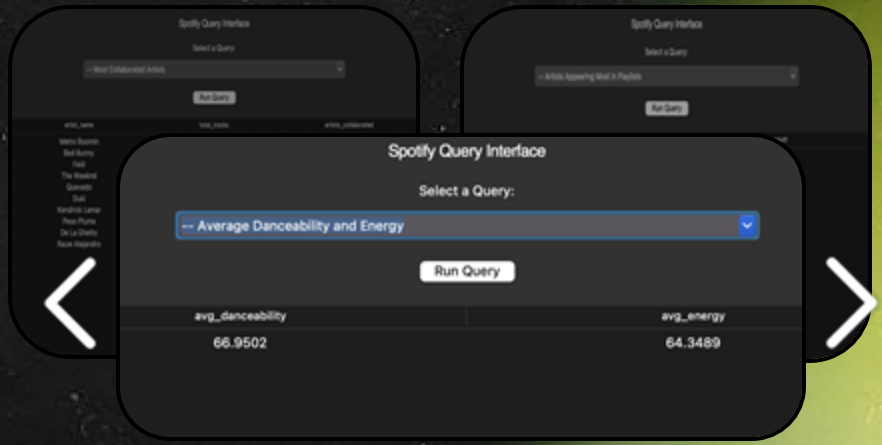
Artists Appearing Most In Charts:

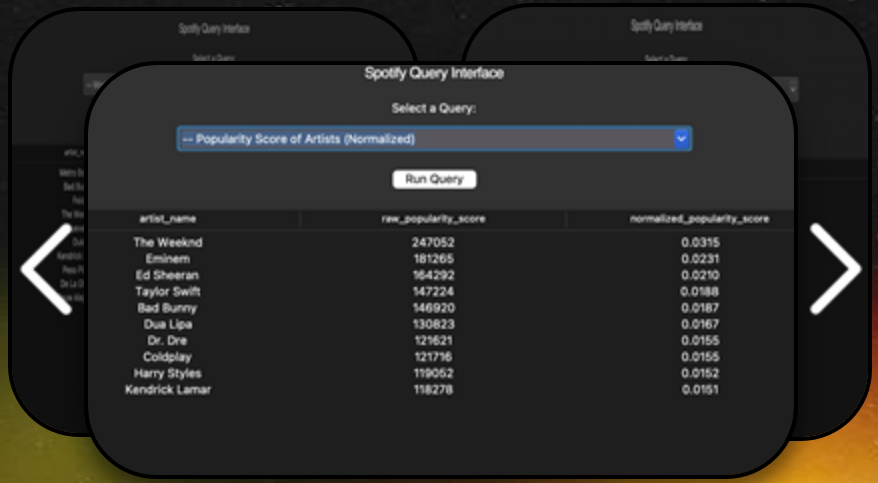
Outputs the top 10 artists who appear most frequently in charts (Spotify, Apple, Deezer, and Shazam) by aggregating chart metrics for their respective tracks. The results are ordered in descending order based on chart appearances



Average Danceability & Energy:

Outputs the Top 10 songs with the highest number of streams by gathering track names from track ID's and their streams. It is ordered by descending order.



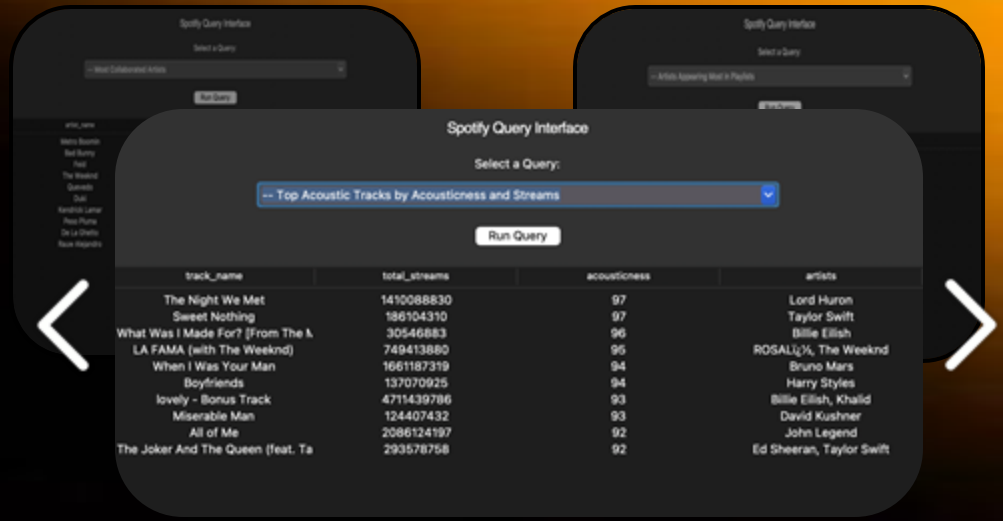


Popularity Score of Artists (Normalized):

Outputs the Top 10 artists with the most presence across all streaming platforms and charts by gathering track names from track IDs and their respective streaming metrics. Raw popularity (across all platforms) score is calculated and normalized to reflect a relative measure (fraction of total popularity).
The result is ordered in descending order.

Top Acoustic Tracks by Acousticness and Streams:

Outputs the Top 10 most popular songs (based on stream count) with the highest percentage of acousticness by gathering track names from track IDs, their acousticness, and streams. It is ordered by descending acousticness order.



Most Streamed Track Per Year:

Outputs the most streamed tracks of their respective years. It calls the track's release year as well as its artists and streams. If multiple artists are associated with a track, their names are concatenated into a single string by GROUP_CONCAT(). The result is sorted by release year.

Thank You

Let’s Rewind.

Our Project At A Glance

Essentially, we gathered information about artist and track trends. This output is crucial for streaming platforms like Spotify to cater to their users’ preferences.

We created an ER Diagram and visualized the entities, attributes, cardinalities and relationships.

In Python we loaded the dataset into our MySQL tables and cleaned the data. After that, we created a query interface in order to make an interactive visual demonstration of our queries.

Assima Amangeldina,
Ceyla Kaya,
Sabina Nurseitova,
Ziyi Dong

In MySQL we created tables and implemented relationships and keys.