

JANUARY 2024

# SPOTIFY PLAYLIST ANALYZER REPORT

CS210 TERM PROJECT

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## 02

## PURPOSE OF THE PROJECT

My project revolves around exploring the relationship between my music listening habits and weather conditions, with a specific focus on the songs I enjoy on Spotify. The primary motivation behind the project stems from my personal connection to music, acknowledging its significant role in my life. By delving into the correlation between my favorite songs and weather conditions, I aim to uncover patterns, preferences, or insights that may contribute to a better understanding of how external factors of weather influence my music choices.

## GOAL OF THE PROJECT

The overarching goal of this project is to discern the weather conditions that are most conducive to the enjoyment of MY favorite songs on Spotify. The primary hypothesis posits that higher temperatures, specifically those exceeding 15-20 degrees Celsius, would be optimal for creating an ideal music-listening experience for me depending on my favorite-songs playlist . As an individual who appreciates the summer season, the expectation is that elevated temperatures correlate positively with the number of selection of favorite songs from the playlist.

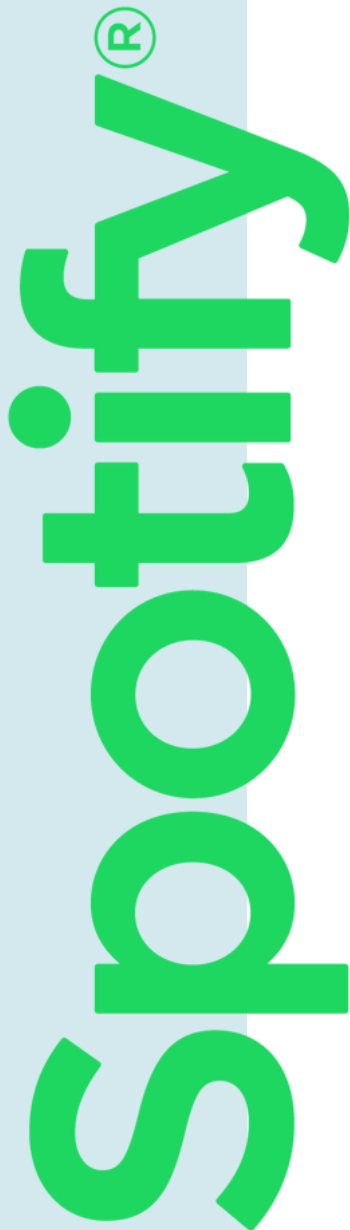
## 03

## HYPOTHESIS

1. ***Temperature and Song Preference:*** The first hypothesis revolves around the local climate of Adana which is my hometown, known for its high temperatures. The assumption is that I tend to gravitate towards songs that align with the prevailing weather conditions in Adana. Therefore, I hypothesized that my favorite songs would be more conveniently chosen during days with high temperatures, reflecting a synergy between climate and musical preference.
2. ***Humidity and Song Filtering:*** Considering Adana's reputation for intense humidity, the second hypothesis focuses on whether the function generated for humidity-songs filtering significantly affects song choices on days with high temperatures. The expectation is that, despite the humidity, the established criteria for song selection during high temperatures will remain robust, suggesting that humidity may not be a prominent factor in determining your preferred songs under such weather conditions.
3. ***Cloudiness and Dancing Preferences:*** The third hypothesis delves into the relationship between cloudiness values and the choice of songs during high-temperature days. As my inclination towards dancing on good weather days, it is hypothesized that weather conditions with lower cloudiness values would have a minimal impact on the songs selected for high temperatures. The assumption here is that the desire for danceable tunes during favorable weather conditions takes precedence over cloudiness levels.

## 04

## PROGRESS OF THE PROGRAM

**1. Data Retrieval and DataFrame Creation:**

- The Spotify favorite songs playlist data was obtained by reading the CSV file using BeautifulSoup.
- A DataFrame was created, encompassing essential song attributes such as song names, dance values, energy values, and happiness values.
- Preprocessing was performed to handle empty values, replacing them with 0 for consistency.

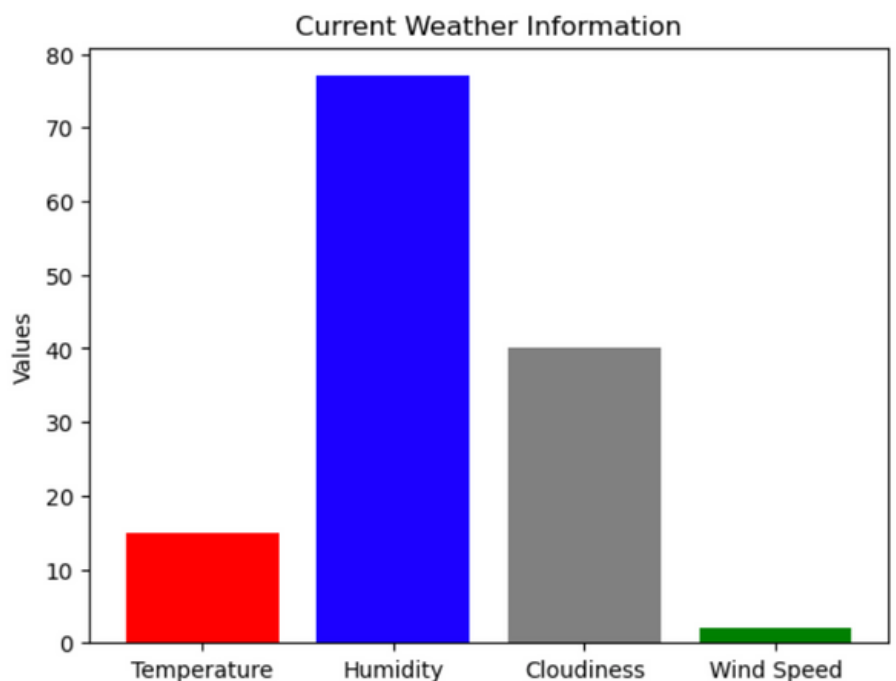
**2. Extra Information:**

- Initial insights were gained by determining the most common genre among the songs in the favorite-songs playlist from Spotify.

**3. Current Weather Data Collection:**

- OpenWeatherMap API was utilized to gather real-time weather conditions for the specified location using longitude and latitude values.
- Current weather features were printed and displayed through a bar graph.
- The geographical location's weather map was visualized using folium.

Temperature: 15.01 °C  
Weather Description: scattered clouds  
Wind Speed: 2.06 m/s  
Humidity: 77%  
Cloudiness: 40%



## 05

## PROGRESS OF THE PROGAM

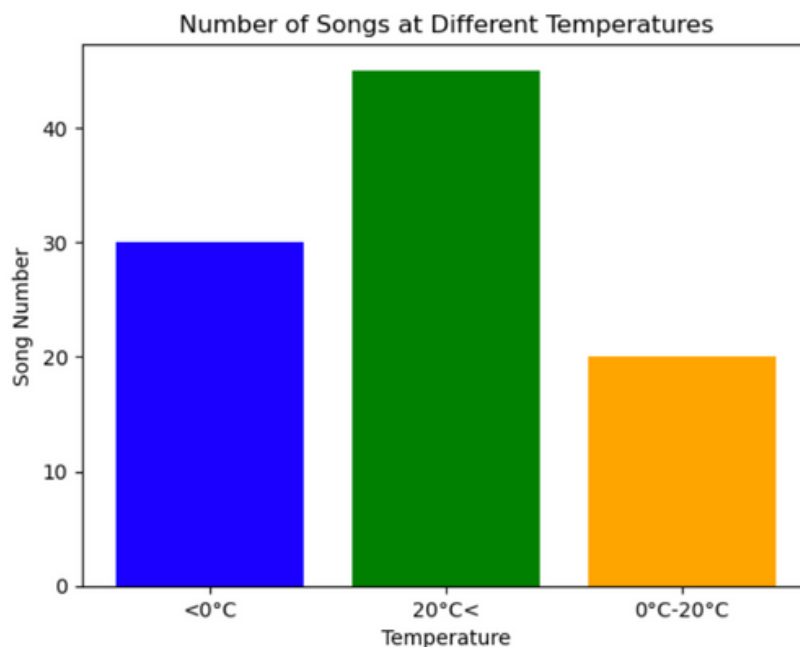
### 4. Algorithm for Song Selection:

- An algorithm was developed, calculating the summation of dance values, energy values, and happiness values for each song.
- A function was defined to select songs based on the current temperature:
  - If below 0°C, songs with algorithm summation between 0-100 were chosen.
  - For temperatures between 0-20°C, songs with algorithm summation between 100-200 were selected.
  - For temperatures above 20°C, songs with algorithm summation above 200 were chosen.
- Track numbers for each temperature type were displayed, allowing exploration of temperature-convenient songs.

If the temperature would be below 0°C → Number of songs: 41

If the temperature would be between 0°C–20°C → Number of songs: 253

If the temperature would be above 20°C → Number of songs: 47



## 06

## PROGRESS OF THE PROGAM

### 5. Song Display:

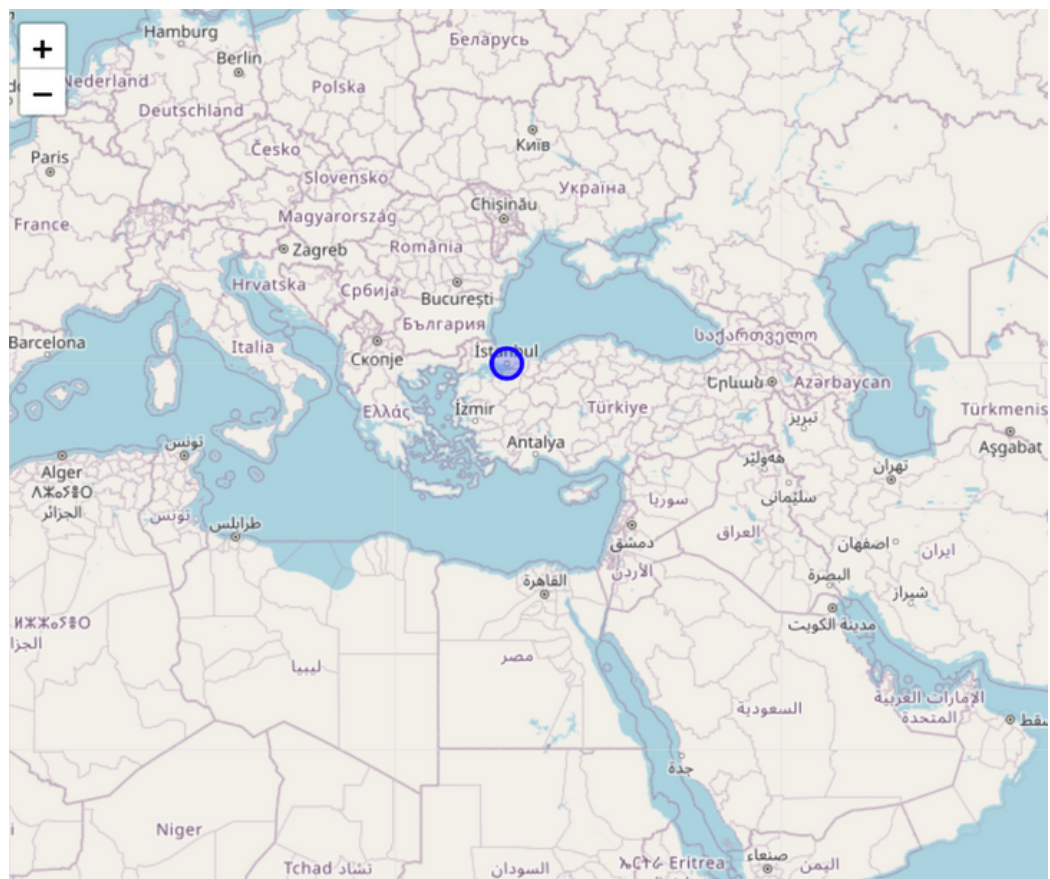
- Song names were displayed by calling the algorithm function based on the current temperature obtained from the weather API.

### 6. Extreme Condition Filtering (Cloudiness):

- Extreme condition checking was implemented; if cloudiness is below 50% from temperature-chosen songs, only songs with dance values above 50 were selected (further filtering).

### 7. Extreme Condition Filtering (Humidity):

- Another extreme condition check was implemented; if humidity is above 70% from temperature-chosen songs (or extreme condition cloudiness-filtered songs, if applicable), only songs with happiness values below 50 were chosen.



## 07

# Machine Learning Strategies and Techniques

## 1. *Data Preprocessing:*

- Cleaning Empty Data: The initial step involved cleaning the dataset obtained from the favorite-songs playlist. Preprocessing techniques were applied to handle and replace empty values with 0, ensuring data consistency and integrity.

## 2. *Algorithm Formulation for Song Filtering:*

- Temperature-Based Filtering Algorithm: A rule-based algorithm was formulated to filter songs based on temperature conditions. This algorithm dynamically categorizes songs into different temperature ranges, allowing for personalized song recommendations depending on the current weather.

## 3. *Prediction for Temperature-Convenient Songs:*

- Dynamic Song Selection: The algorithmic decision-making process is akin to prediction, as it dynamically selects songs based on the current temperature obtained from the OpenWeatherMap API. The formulated algorithm acts as a rule-based prediction model, ensuring that song selections align with the user's preferences in varying weather conditions.

## 08

# Machine Learning Strategies and Techniques

## 4. *Graphical Visualization for User Understanding:*

- **Bar Graphs for Weather Features:** Bar graphs were employed to visually represent the weather features gathered from the OpenWeatherMap API. This graphical representation enhances user understanding by providing a clear and concise overview of current weather conditions, including temperature, cloudiness, and humidity.
- **Weather Map Visualization:** Utilizing folium, a geographical map was displayed, showcasing the geographical location's weather conditions. This visual representation offers a spatial context for the user to better comprehend the current weather state.

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## 5. *Dynamic Song Display:*

- **Visualization of Song Recommendations:** Track numbers and song names were dynamically displayed to the user, providing a visual representation of the songs recommended based on the temperature-convenient algorithm. This step aids in user interaction and understanding of the selected songs for different weather scenarios.



## 09

# Machine Learning Strategies and Techniques

## 6. *Extreme Condition Filtering:*

- **Graphical Representation of Extreme Conditions:** The extreme condition checks, such as cloudiness and humidity filtering, were visually represented through conditional statements. When conditions were met, the user was provided with a clear visual indication of the applied filters, ensuring transparency in the song selection process.
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*“The combination of preprocessing, algorithm formulation, and dynamic song selection based on real-time weather conditions contributes to a user-centric and visually intuitive music recommendation system. The graphical visualizations enhance the user experience by presenting weather features and song recommendations in an easily interpretable format.”*

## 10

## FINDINGS

Songs for the current temperature of=15.010000000000048°C :

['Basic Instinct', 'Try Hard Fool', 'Pyro', 'Myth', 'Space Song', 'The Good Side', 'Sleep Forever', 'midnight love', 'Ivy', 'Falling Down - Bonus Track', 'Liability', 'Take Care', 'Telescope', 'Migraine', 'Bored', '505', 'High By The Beach', 'Everybody', 'Please, Please, Please, Let Me Get What I Want - 2011 Remaster', 'Taking Pictures Of You', 'Dark Paradise', 'Wires', 'Pretty When You Cry', 'Heaven', 'So It Goes', 'Come a Little Closer', 'Everytime', 'Bunker', 'Surf', 'Woods', 'Good News', 'Location', 'Share with Me the Sun', 'Drew Barrymore', 'Good Days', 'Dark Necessities', 'All the Pretty Girls', 'Don't Delete The Kisses', 'California', 'Brooklyn Baby', 'Sweater Weather', 'Aquarium', 'Naive', '16 / 04 / 16 (Jack's Song)', '18 Dollars', '2009', 'You're Somebody Else', 'Softcore', 'Habits (Stay High)', 'Bloom Later', 'Warned You', 'First Love / Late Spring', 'American Honey', 'Heavenly', 'Sunsetz', 'Sadderdays', 'Without You', 'Goner', 'Beautiful People Beautiful Problems (feat. Stevie Nicks)', 'Fear', 'Trouble', 'Silver Soul', 'Olive Juice', 'Flawless', 'I Love You So', 'Fancy Shoes', 'Mykonos', 'White Winter Hymnal', 'Reflections', 'Back to the Old House - 2011 Remaster', 'Working for the Knife', 'Love Hurts - 2007 Remaster', 'Alleyways', 'Meet Me in The Pale Moonlight', 'R.I.P. 2 My Youth', '400 Lux', 'Leaving Tonight', 'You Get Me So High', 'Call It Fate, Call It Karma', 'Sweetie Little Jean', 'Too Late To Say Goodbye', 'Sad Girl', 'Eventually', 'New Person, Same Old Mistakes', 'Paracetamol', 'Ghosting', 'Feels Like We Only Go Backwards', 'I Know It's Over - 2011 Remaster', 'Afraid', 'When You Were Made', 'Nervous', 'Francis Forever', 'No Buses', 'Cry Baby', 'Void', 'You', 'American Money', 'Yes I'm Changing', 'How Are You True', 'From the Dining Table', 'Golden Hour', 'Scary Love', 'National Anthem', 'Born To Die', 'Ride', 'The Sun', 'Do You', 'People Say', 'Created', 'Smile', 'Once Was One', 'So American', 'Ayye', 'ROS', 'Weekend (feat. Miguel)', 'Jet Fuel', 'Small Worlds', 'Blue World', 'The Hours', 'Beyond Love', 'Zebra', 'Once Twice Melody', 'Pink Funeral', 'White Teeth Teens', 'Supercut', 'A World Alone', 'Buzzcut Season', 'Skin and Bones', 'Cigarette Daydreams', 'Come A Little Closer', 'The Adults Are Talking', 'At The Door', 'Not The Same Anymore', 'Someday', 'PRIDE.', 'Saved', 'Chanel', 'Olive Juice', 'Riot Van', 'Atlantis', 'Oceans', 'Missing', 'Heavydirtysoul', 'List Of People (To Try And Forget About)', 'Super Rich Kids', 'Televised', 'July', 'Dreams Tonite', 'Adult Diversion', 'Neon Moon - with Kacey Musgraves', 'Undercover Martyn', 'She Will Be Loved', 'perfume', 'Sky's Still Blue', 'Brian is the Most Beautiful', 'Oceans', 'Green Light', 'Ribs', 'Daddy Issues', 'Lover of Mine', 'What's the Use?', 'Hurt Feelings', 'Wings', 'Floating (Time Isn't Working My Side)', 'It Might Be Time', 'Fallen Star', 'Brand Name', 'A Little While', 'The Blackest Day', 'dear god', 'Bros', 'dying on the inside', 'HONEST', 'PRIDE.', 'XXX. FEAT. U2.', 'Crave You', 'Happy & Sad', 'Silver Soul', 'Wildflower', 'The Hours', 'Zebra', 'PPP', 'Gap in the Clouds', 'That Easy', 'American Honey', 'Bye-bye Darling', 'Goodbye', 'Half a Person - 2011 Remaster', 'Yazlık', 'Gördüm Günümü', 'Bir Düşün', 'HOŞÇAKAL KADAR', 'Maazallah (YGA)', 'Olanla Olunmaz', 'Bırakma Kendini', 'Halah', 'I'm In Here', 'Make Me Your Queen', 'Sleep Apnea', 'Alrighty Aphrodite', 'Back In The Day', 'Rush Hour', 'Ladders', 'Perfect Circle / God Speed', 'Hands', 'Right', 'Floating', 'Hand Me Downs', 'I Can See', 'Complicated', 'Circles', 'Norway', 'West Coast', 'Without You', 'Florida Kilos', 'Diet Mountain Dew', 'Radio', 'Music To Watch Boys To', 'Crying All the Time', 'The Face', 'Rosa', 'Dopamine', 'Full Moon', 'Blue', 'Objects in the Mirror', 'Cupid', 'Let's Fall in Love for the Night', 'Don't Come Home Today', 'Because', 'Do Not Claim Them Anymore', 'Mardy Bum', 'Same Ol' Mistakes', 'Stay', 'Cherry-coloured Funk', 'Savior', 'Backseat Freestyle', 'untitled 07 | 2014 - 2016', 'DON'T SHOOT UP THE PARTY', 'lie', 'Say Yes To Heaven', 'İstedğin Gibi Kullan', 'Takıl Yani Takımyo Belli', 'Koca Bir Saçmalık', 'Sleeping Powder', 'people', 'Television / So Far So Good', 'Les', 'Heartbeat', 'Bonfire', 'IV. Sweatpants', 'I. The Worst Guys', 'N95', 'Count Me Out']

Number of the convenient songs: 253

## 11

## FINDINGS

Since the cloudiness of the weather is below 50% more filtering will be applied on the chosen songs:

['Basic Instinct', 'Try Hard Fool', 'Space Song', 'Sleep Forever', 'Ivy', 'Falling Down - Bonus Track', 'Liability', 'Take Care', 'Telescope', 'Migraine', 'Bored', '505', 'High By The Beach', 'Everybody', 'Taking Pictures Of You', 'Dark Paradise', 'Wires', 'Pretty When You Cry', 'Heaven', 'So It Goes', 'Bunker', 'Surf', 'Woods', 'Good News', 'Location', 'Share with Me the Sun', 'Drew Barrymore', 'Dark Necessities', 'Don't Delete The Kisses', 'Sweater Weather', 'Aquarium', '16 / 04 / 16 (Jack's Song)', '18 Dollars', '2009', 'You're Somebody Else', 'Softcore', 'Habits (Stay High)', 'Bloom Later', 'Warned You', 'Heavenly', 'Sadderdaze', 'Without You', 'Goner', 'Beautiful People Beautiful Problems (feat. Stevie Nicks)', 'Fear', 'Olive Juice', 'Flawless', 'I Love You So', 'Fancy Shoes', 'White Winter Hymnal', 'Reflections', 'Back to the Old House - 2011 Remaster', 'Love Hurts - 2007 Remaster', 'Alleyways', 'Meet Me in The Pale Moonlight', '400 Lux', 'Leaving Tonight', 'You Get Me So High', 'Call It Fate, Call It Karma', 'Sweetie Little Jean', 'Ghosting', 'When You Were Made', 'Nervous', 'Francis Forever', 'Cry Baby', 'Void', 'American Money', 'From the Dining Table', 'Golden Hour', 'Scary Love', 'National Anthem', 'The Sun', 'People Say', 'Created', 'So American', 'Ayye', 'ROS', 'Weekend (feat. Miguel)', 'Jet Fuel', 'Small Worlds', 'Blue World', 'Zebra', 'White Teeth Teens', 'Supercut', 'A World Alone', 'Buzzcut Season', 'Skin and Bones', 'Cigarette Daydreams', 'The Adults Are Talking', 'Someday', 'PRIDE.', 'Saved', 'Chanel', 'Olive Juice', 'Riot Van', 'Heavydirtysoul', 'Super Rich Kids', 'Televised', 'July', 'Dreams Tonight', 'Neon Moon - with Kacey Musgraves', 'She Will Be Loved', 'perfume', 'Oceans', 'Green Light', 'Ribbs', 'Daddy Issues', 'Lover of Mine', 'What's the Use?', 'Hurt Feelings', 'Wings', 'Floating (Time Isn't Working My Side)', 'It Might Be Time', 'Fallen Star', 'A Little While', 'dear god', 'Bros', 'dying on the inside', 'HONEST', 'PRIDE.', 'XXX. FEAT. U2.', 'Crave You', 'Happy & Sad', 'Zebra', 'Gap in the Clouds', 'Half a Person - 2011 Remaster', 'Gördüm Günümü', 'HOŞÇAKAL KADAR', 'Maazallah (YGA)', 'Bırakma Kendini', 'Halah', 'I'm In Here', 'Sleep Apnea', 'Alrighty Aphrodite', 'Back In The Day', 'Rush Hour', 'Ladders', 'Hands', 'Right', 'Floating', 'Hand Me Downs', 'I Can See', 'Complicated', 'Circles', 'West Coast', 'Without You', 'Diet Mountain Dew', 'Rosa', 'Dopamine', 'Full Moon', 'Blue', 'Objects in the Mirror', 'Cupid', 'Let's Fall in Love for the Night', 'Do Not Claim Them Anymore', 'Mardy Bum', 'Stay', 'Savior', 'Backseat Freestyle', 'untitled 07 | 2014 - 2016', 'DON'T SHOOT UP THE PARTY', 'lie', 'İstedğin Gibi Kullan', 'Sleeping Powder', 'people', 'Les', 'Heartbeat', 'Bonfire', 'IV. Sweatpants', 'I. The Worst Guys', 'N95', 'Count Me Out']

## 12

## FINDINGS

Since the humidity of the weather is above 70% more filtering will be applied on the chosen songs:

['Basic Instinct', 'Try Hard Fool', 'Sleep Forever', 'Ivy', 'Falling Down - Bonus Track', 'Liability', 'Take Care', 'Telescope', 'Migraine', 'Bored', '505', 'High By The Beach', 'Everybody', 'Dark Paradise', 'Wires', 'Pretty When You Cry', 'Heaven', 'So It Goes', 'Bunker', 'Surf', 'Woods', 'Good News', 'Location', 'Drew Barrymore', 'Dark Necessities', 'Don't Delete The Kisses', 'Sweater Weather', 'Aquarium', '16 / 04 / 16 (Jack's Song)', '18 Dollars', '2009', 'You're Somebody Else', 'Softcore', 'Habits (Stay High)', 'Bloom Later', 'Warned You', 'Heavenly', 'Sadderdaze', 'Goner', 'Beautiful People Beautiful Problems (feat. Stevie Nicks)', 'Olive Juice', 'Flawless', 'I Love You So', 'Back to the Old House - 2011 Remaster', 'Alleyways', '400 Lux', 'Leaving Tonight', 'You Get Me So High', 'Call It Fate, Call It Karma', 'Sweetie Little Jean', 'Ghosting', 'When You Were Made', 'Nervous', 'Francis Forever', 'Cry Baby', 'Void', 'American Money', 'From the Dining Table', 'Golden Hour', 'Scary Love', 'National Anthem', 'Created', 'Ayye', 'ROS', 'Weekend (feat. Miguel)', 'Jet Fuel', 'Zebra', 'White Teeth Teens', 'Supercut', 'A World Alone', 'Buzzcut Season', 'Skin and Bones', 'Cigarette Daydreams', 'PRIDE.', 'Chanel', 'Olive Juice', 'Riot Van', 'Heavydirtysoul', 'Televised', 'July', 'Dreams Tonite', 'Neon Moon - with Kacey Musgraves', 'Oceans', 'Green Light', 'Ribs', 'Daddy Issues', 'Lover of Mine', 'Hurt Feelings', 'Wings', 'It Might Be Time', 'Fallen Star', 'A Little While', 'dear god', 'Bros', 'dying on the inside', 'HONEST', 'PRIDE.', 'XXX. FEAT. U2.', 'Crave You', 'Zebra', 'Gap in the Clouds', 'HOŞÇAKAL KADAR', 'Maazallah (YGA)', 'I'm In Here', 'Sleep Apnea', 'Almighty Aphrodite', 'Back In The Day', 'Rush Hour', 'Ladders', 'Right', 'Floating', 'Hand Me Downs', 'I Can See', 'Circles', 'West Coast', 'Rosa', 'Blue', 'Objects in the Mirror', 'Let's Fall in Love for the Night', 'Mardy Bum', 'untitled 07 | 2014 - 2016', 'İstedğin Gibi Kullan', 'Sleeping Powder', 'people', 'Les', 'Heartbeat', 'Bonfire', 'I. The Worst Guys', 'N95', 'Count Me Out']

Number of the songs: 130

# 13

## LIMITATIONS AND FUTURE WORK

### Limitations:

#### 1. Data Source Constraints:

- The project relies on data from the Spotify favorite songs playlist. The diversity and quantity of songs may be limited by the contents of this playlist, potentially leading to biased or narrow recommendations.

#### 2. Generalization to Individual Preferences:

- The algorithm assumes a general correlation between weather conditions and song preferences. Individual preferences may vary, and some users may not find the proposed weather-based song recommendations applicable to their taste.

#### 3. Genre Homogenization:

- The project identifies the most common genre in the playlist, but it may not capture the full diversity of genres present. This simplification may overlook nuanced genre preferences within the playlist.



# 14

## FUTURE WORK:

### 1. User Feedback Mechanism:

- Implement a feedback mechanism to gather user responses to song recommendations. This data can be used to continuously improve and adapt the algorithm based on individual user feedback.

### 2. Genre-Specific Analysis:

- Conduct a more in-depth analysis of genre preferences within the playlist. Explore clustering or categorization techniques to identify genre patterns and tailor recommendations based on specific genre preferences.

### 3. Dynamic User Profiles:

- Develop a system that learns and adapts to the user's changing preferences over time. Consider incorporating user interactions and feedback to create dynamic user profiles that evolve with individual music tastes.

