



# Spotify

## What Makes a Playlist Successful?

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- ▶ Data Scientist at Marketplace team of Wish
- ▶ Work highlight: Ads campaign & promotion design and evaluations
- ▶ Ph.D. in Applied Econometrics & Financial Economics
- ▶ Five year premium user of Spotify



Music Interest  
Pop, Soul, Indie Rock, Dance and  
House



Favorite Artists  
Adele, Amy Winehouse, Charlie  
Puth, Karen Mok, Hikaru Utada

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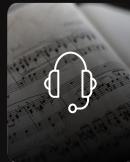
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Owner Type: Spotify Playlist VS Individual  
Playlist



Music Types by Genre & Mood

# Data Analysis & Visualization

## Data Overview



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- 403,366 playlists in given playlist data
  - Snapshot from U.S. active listeners over 2 months
  - 399 playlists by Spotify and 402,967 playlists by listeners
- Data cover both user behavior and playlist characteristics
  - User engagement: active users & streams in different periods
  - Playlist feature: # of tracks, genre, etc.

# Data Analysis & Visualization

## Spotify VS Individual Playlist



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- Playlists by Spotify reaches more users than individual playlists
  - Higher conversion by active users
  - Greater engagement breadth by streams
  - Brand awareness from platform-wide promotions (e.g Pop All Day & Kpop ON! )

	Median		Mean	
	Spotify	Indiv Playlist	Spotify	Indiv Playlist
DAU	583	0	3222	1
MAU	13,059	2	51,858	15
# of Streams (>30s)	4602	0	31,192	12
# of Monthly Streams (>30s)	154,812	79	916,431	354

# Data Analysis & Visualization

## Spotify VS Individual Playlist



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- Individual Playlists connects with listeners more deeply and consistently than Spotify playlist

- More streams per user
- Higher monthly retention
- Due to the customization nature and intimacy

	Median		Mean	
	Spotify	Indiv Playlist	Spotify	Indiv Playlist
<b>Streams per MAU</b>	12	24	13	50
<b>MOM Active User Retention</b>	13%	50%	15%	57%

# Data Analysis & Visualization

## Music Style



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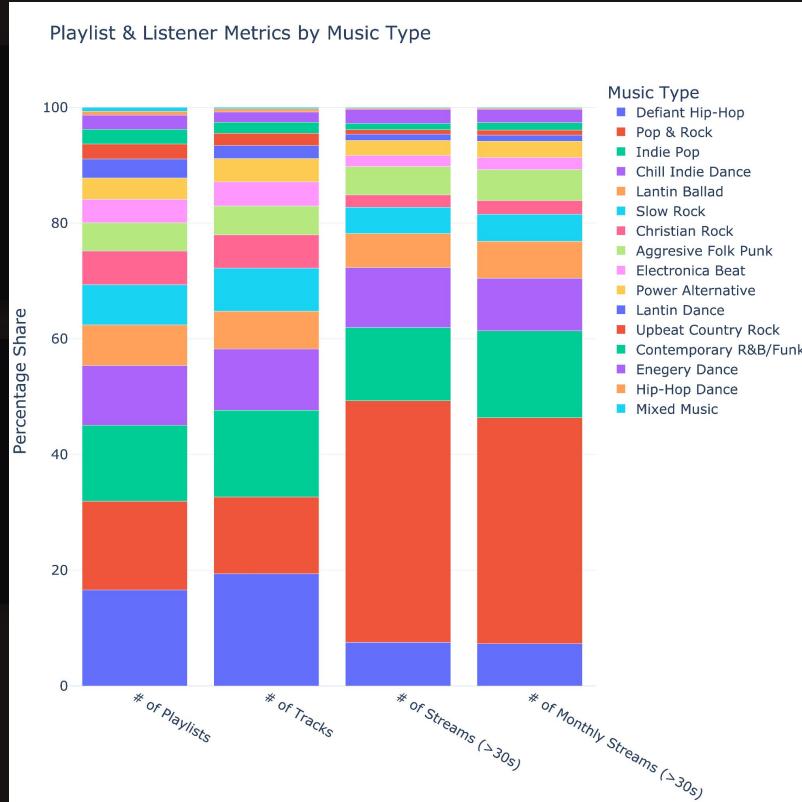
- Playlists are classified into 16 music types defined by genre and mood

Music Type	Playlist Share	Playlist Example	Music Type	Playlist Share	Playlist Example
Defiant Hip-Hop	16.61%	Rap (2014)	Electronica Beat	4.03%	Can I Play With Madness
Pop & Rock	15.31%	Pop Girls	Power Alternative	3.73%	Gunsmoke and Lone Ranger
Indie Pop	13.11%	👉 Indie Pop 'till You Drop	Latin Dance	3.24%	Zumba Music
Chill Indie Dance	10.31%	Jetzt Jetzt Jam	Upbeat Country Rock	2.60%	Road Trippin
Latin Ballad	7.06%	Love Mix1 (Español)	Contemporary R&B/Funk	2.55%	Lemonade Mouth
Slow Rock	6.93%	Southern Rock	Energy Dance	2.45%	Summer
Christian Rock	5.83%	4201: The Anthems	Hip-Hop Dance	0.68%	Can't stop Won't stop
Aggressive Folk Punk	4.88%	Outlaw #1	Mixed Music	0.66%	Loungey Thursdays

# Data Analysis & Visualization

## Music Style

- Inconsistent playlist pattern compared to stream patterns across music types
  - Large scale music category receives low attention (e.g. Defiant Hip-hop)
  - Music popularity depends on both playlist features and user engagement



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## Music Style & Playlist Ownership



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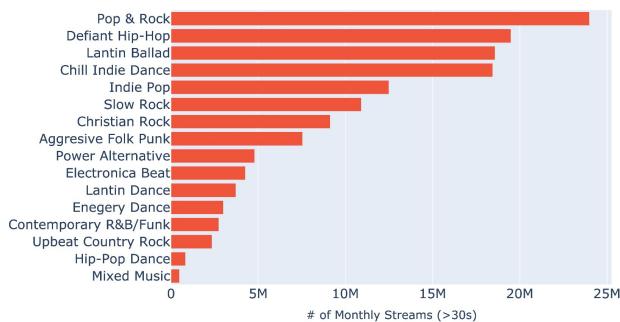
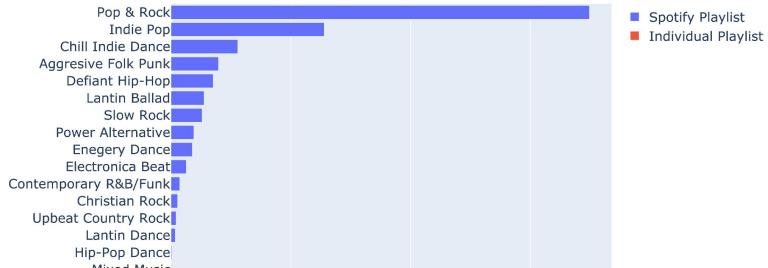
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- Evenly distributed streams of individual playlist relative to Spotify playlist

- Due to listener's diversified music tastes

- Spotify playlists is inclusive but may not fit in each music preference

Monthly Streams Distribution by Music Type





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# Successful Playlist Definition

# Successful Playlist Definition



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**Goal:** in both **short term** and **long term**

- Broader user coverage
- Deeper user engagement
- Longer user relationship



Success Metrics	Short Term	Long term
User Conversion	DAU	MAU
User Engagement	Average streams per DAU + % of daily streams > 30s	Average streams per MAU
User Retention	Month over Month user retention	

# Successful Playlist Definition

## Short term

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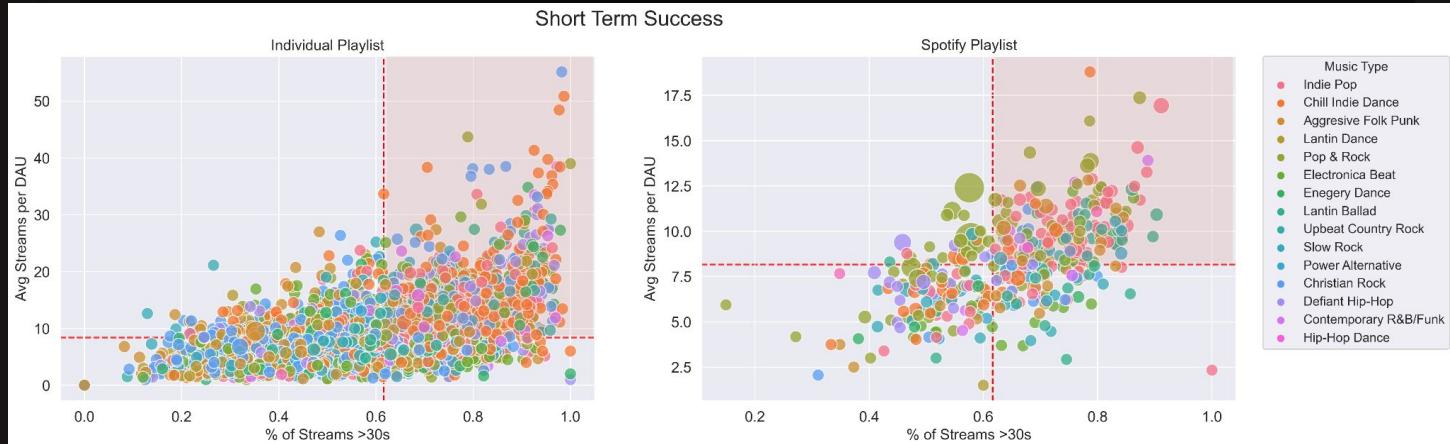
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- Focus on playlists with top 1% MAU ( $\geq 128$ )  $\approx 4$  DAU
  - Playlists with DAU  $< 4$  are assumed to be unpopular
- Short engagement above median
  - % share of daily (>30s) streams  $\geq 61.6\%$
  - Average streams per DAU  $\geq 8.4$



# Successful Playlist Definition

## Long term



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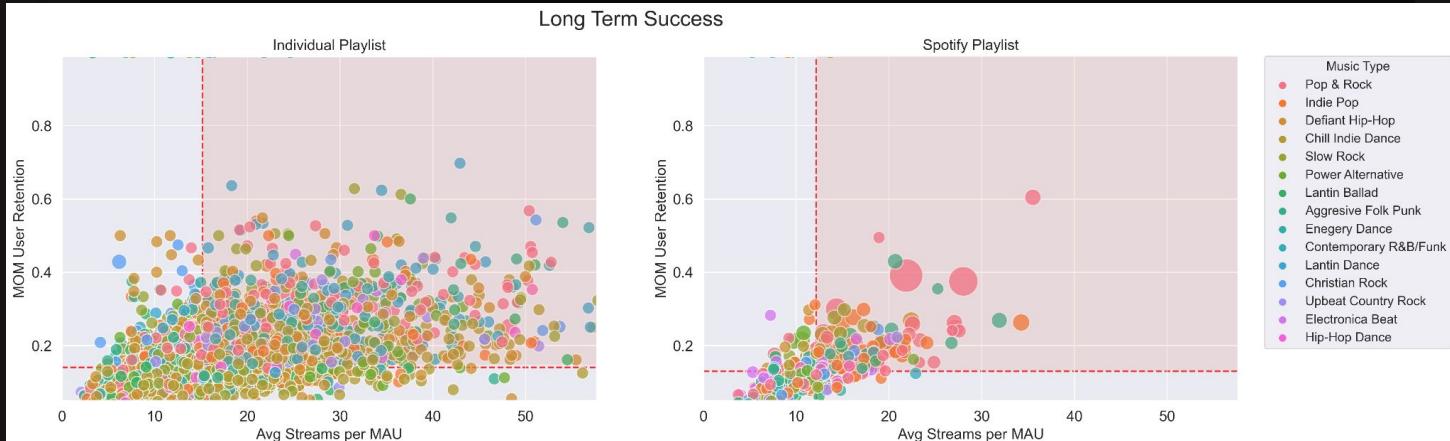


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- Long term engagement above median
  - Average streams per MAU  $\geq 14.6$
- Long term retention above median
  - Month over month user retention  $\geq 13.9\%$



# Successful Playlist Definition

## Summary



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- 20% of the popular playlist (MAU  $\geq 128$ ) classified as successful playlists
  - 18% of Spotify playlists classified as success
  - 20% of Individual playlists classified as success

	Success	Non-Success
Individual	817 (20.2%)	3222 (79.8%)
Spotify	69 (17.7%)	320 (82.3%)
Total	886 (20%)	3542 (80%)

# Successful Playlist Definition

## Success Visualization



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- Music category rank based on the success rate for further promotion

Music Type	Success Share	Success Example	Music Type	Success Share	Success Example
Mixed Music	33.33%	Catholic Youth Summer Camp	Upbeat Country Rock	22.55%	Top 100 Country Tracks on Spotify
Hip-Hop Dance	32.00%	Underground Rap/Hip Hop	Energy Dance	18.68%	TRAPCITY
Indie Pop	31.94%	infinite indie	Power Alternative	17.53%	Lana Del Rey + Lorde
Aggressive Folk Punk	31.53%	Buffy the Vampire Slayer	Chill Indie Dance	16.87%	The Best Dance Playlist Ever
Contemporary R&B/Funk	28.57%	Chicano ~ Oldies	Pop & Rock	15.15%	OneRepublic, The Fray, The Script
Christian Rock	28.22%	Hillsongs Worship	Slow Rock	14.86%	Rock-a-Bye Baby
Latin Ballad	27.82%	Los Buquis 1	Defiant Hip-Hop	8.22%	2012 CrossFit Games Playlist
Electronica Beat	23.67%	Electro Swing UPBEAT	Latin Dance	7.47%	Reggaeton

# Successful Playlist Definition

## Success Visualization

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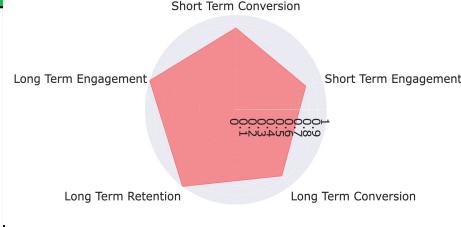
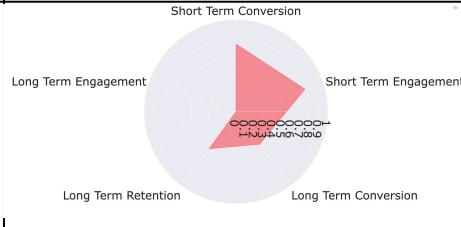
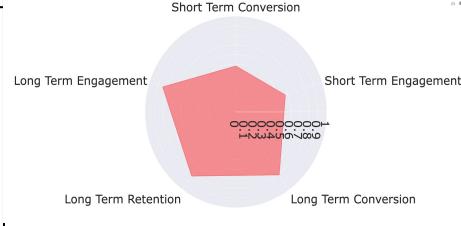
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- Playlists have different advantages and vary in five success criteria

	Category & Example	Success Metrics
<b>Success in all metrics</b>	<ul style="list-style-type: none"><li>- Chill Indie Dance</li><li>- Title: Cleaned ultimate playlist</li></ul> 	
<b>Short term success</b>	<ul style="list-style-type: none"><li>- Pop &amp; Rock</li><li>- Title: Sunny side</li></ul> 	
<b>Long term success</b>	<ul style="list-style-type: none"><li>- Pop &amp; Rock</li><li>- Title: Epic songs</li></ul> 	



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# Successful Playlist Prediction

# Successful Playlist Prediction

## Overview

- **Goal:** identify the contributing playlist features for playlist success
- **Model:** Logistic Regression (baseline) & Random Forest Classifier
- **Outcome:** binary indicator of success ( 1 = success and 0 otherwise)
- **Input Features:**
  - Music type weights: correlation between playlist and each music types
  - Playlist Features:
    - # of tracks
    - # of albums
    - # of artists
    - # of local tracks
    - # of tokens



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# Successful Playlist Prediction

## Evaluation



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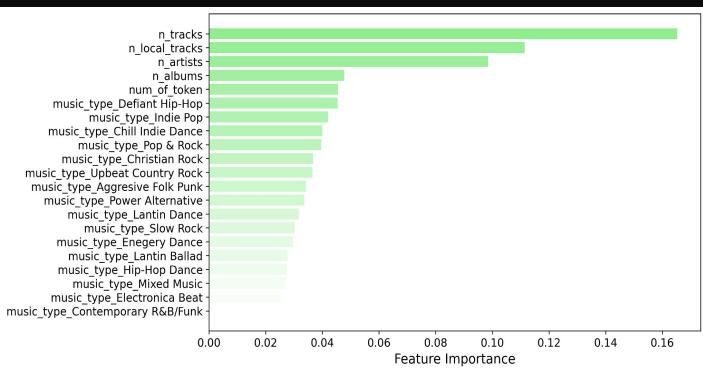
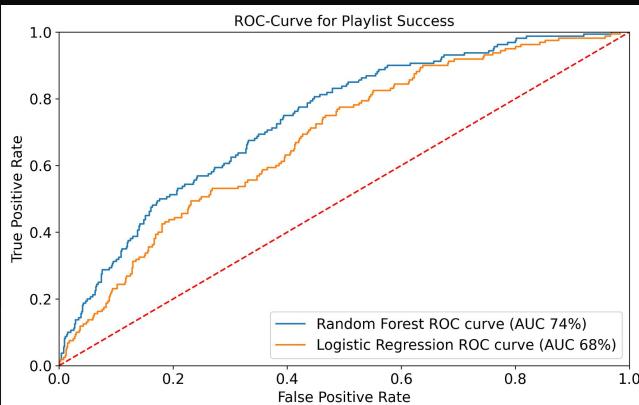


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- 5-fold cross validation with mean F1-score of 80% for both models
- Random Forest classifier outperforms logistic regression with 74% AUC
  - 74% chance the model successfully distinguishes between 2 classes
  - Outperform random classification by 24%
- Key contributing features
  - # of tracks and local tracks represents the playlist updates
  - # of artists captures music diversity
  - Further exploration based on these features





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- Spotify playlists play a different role from individual playlists
  - Spotify playlists: more audience reaching and preference coverage
  - Individual playlists: deep and consistent user connection
  - Complementary relationship between Spotify & individual playlist
- Playlist features and user engagement together measure music style popularity
- Playlist recency and diversity as most important factors for success

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- User-playlist level research
  - Role of playlists in user's overall engagement
  - Include user characteristics (e.g. membership status)
- Playlist-Artist/Track level research
  - Fandom captured by artist profile
  - Track feature capture music diversity & mixture
- NLP analysis on playlist title and playlists similarity
- Social interaction analysis to further refine user engagement

# Thank You!



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## Music Style & Playlist Owner

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- Similar track volume

distribution for both playlist  
types

- Skewed towards Pop and

Dance music

- Individual playlist track volume

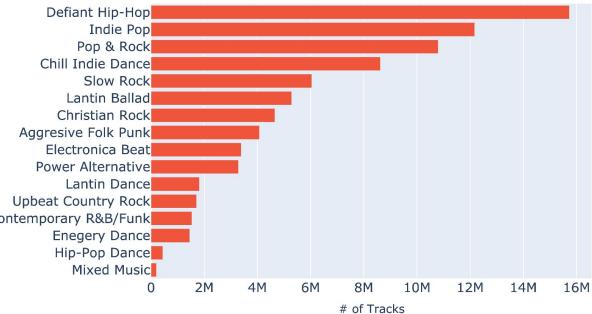
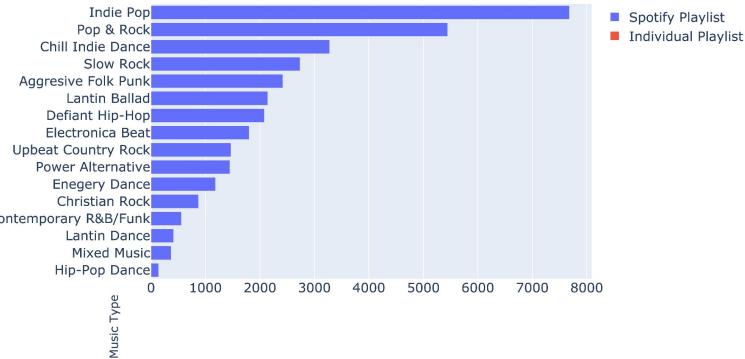
dominates in all music

categories

- Due to different playlist

design of track collection

Track Volume Distribution by Music Type



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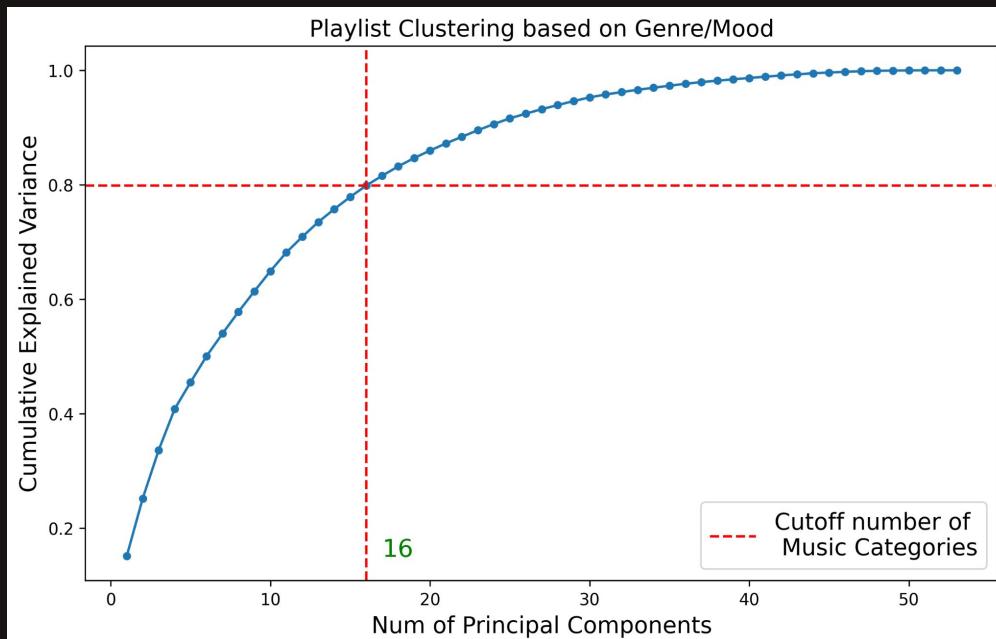
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## Playlist clustering with PCA

- 16 Music Types selected based on cumulative explained variance from PCA



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## Playlist clustering with PCA

- Top 5 genre & mood features for each playlist group

Defiant Hip-Hop	Pop & Rock	Christian Rock	Latin Dance	Latin Ballad	Hip-Hop Dance
mood_Defiant	genre_Pop	mood_Empowering	mood_Energizing	genre_Latin	mood_Brooding
genre_Rap	genre_Indie Rock	genre_Religious	genre_Latin	mood_Lively	genre_Dance & House
mood_Cool	mood_Defiant	genre_Rock	mood_Brooding	mood_Romantic	genre_Rap
genre_Metal	mood_Yeарning	genre_Indie Rock	mood_Urgent	genre_Soundtrack	genre_Pop
genre_Punk	mood_Excited	mood_Excited	genre_Alternative	genre_Electronica	mood_Cool



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## Github Link

- [What makes a playlist successful?](#)