Analyzing Features that Shape Spotify Playlist Curation

ECE 143 - Group 12

Rakshitha Venkappa Handral
Karan Variyambat
Megna Anand
Keerthivasan Vijayakumar
Chuqiao Lu

Overview

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Research Question

How can we define which audio features are most important in curating a cohesive playlist?

Dataset Overview and Methodology

Spotify Web API & Million Playlist Dataset

- Spotify Million Playlist Dataset was used to get playlists
- Curl requests made with track ID, Access token
- Audio-features/Tracks API used

Dataset -

	PLAYLIST_id	PLAYLIST_name	TRACK_uri	TRACK_name	ALBUM_id	ALBUM_name	ALBUM_type	ARTIST_names	DURATION_ms	RELEASE_date
0	0	Throwbacks	0UaMYEvWZi0ZqiDOoHU3YI	Lose Control (feat. Ciara & Fat Man Scoop)	6vV5UrXcfyQD1wu4Qo2I9K	The Cookbook	album	Missy Elliott	226863	2005-07-04
1	0	Throwbacks	67T6l4q3zVjC5nZZPXByU8	Whatcha Say	0aVJmVAeEx78nAA1rAKYf7	Jason Derulo	album	Jason Derulo	221253	2010-02-24
2	0	Throwbacks	34ceTg8ChN5HjrqilYCn9Q	Miss Independent	6dTn9vJSxVTIGm4Cu5dH4x	Year Of The Gentleman (Bonus Track Edition)	album	Ne-Yo	232000	2008-01-01
3	0	Throwbacks	5Q0Nhxo0l2bP3pNjpGJwV1	Party In The U.S.A.	64aKkqxc3Ur2LYIKeS5osS	The Time Of Our Lives	album	Miley Cyrus	202066	2009-01-01
4	0	Throwbacks	6GIrIt2M39wEGwjCQjGChX	The Great Escape	4WqgusSAgXkrjbXzqdBY68	Boys Like Girls	album	BOYS LIKE GIRLS	206520	2007-08-31
...	...	...	...	...	...	...	...	...	...	...
69667	999	thinking of you	7du4OH1Ld78PJhC8fDLUJO	Light Outside	0loXIblbl6Gm8mcVoOVctK	Light Outside	album	Rusty Clanton	227369	2016-02-22
69668	999	thinking of you	3pvHEWAY1XrI5bctqEPcPB	Our Song	7zNbatyo73uEnOlTDSVJed	Coexist	album	The xx	193813	2012-09-05
69669	999	thinking of you	1lgWOtohsjX526FK6Ch5B8	that one song	65OO1Lvu27sSpND6QycjcW	me	album	gnash	193000	2015-12-25
69670	999	thinking of you	755gQFe8AygwKePVjrMDoj	The Simple Things	5R3YIYy4faDKKUtdBqbE52	Love Adolescent	album	Michael Carreon	263633	2014-01-01
69671	999	thinking of you	5RVuBrXVLptAEbGJdSDzL5	Cosmic Angel - Acoustic From Capitol Studios	7D6Y19tjm4DQNch39FeWpO	Cosmic Angel (Acoustic From Capitol Studios)	album	Grizfolk	257194	2016-03-18

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Dataset Creation

- Batched API requests reduce the total server requests.
- Dictionary of each track is a dataframe entry containing:
  - Features
  - Playlist name
  - Playlist ID
- General statistics for each playlist is extracted:

	DURATION_ms	POPULARITY	DANCEABILITY	ACOUSTICNESS	ENERGY	INSTRUMENTALNESS	VALENCE	TEMI
count	6.647300e+04	66473.000000	66473.000000	66473.000000	66473.000000	66473.000000	66473.000000	66473.0000
mean	2.331912e+05	36.100101	0.608576	0.234648	0.643804	0.049239	0.496061	121.6229
std	6.465327e+04	30.093615	0.160249	0.276675	0.208410	0.174625	0.237724	28.8504
min	3.056000e+03	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
25%	1.983320e+05	0.000000	0.502000	0.021800	0.510000	0.000000	0.308000	99.0390
50%	2.248640e+05	40.000000	0.617000	0.107000	0.672000	0.000003	0.489000	120.2640
75%	2.580260e+05	64.000000	0.725000	0.365000	0.807000	0.000580	0.682000	140.0200
max	2.424189e+06	94.000000	0.988000	0.996000	1.000000	0.995000	0.998000	219.2970

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Features

acousticness	number [float]
danceability	number [float]
energy	number [float]
instrumentalness	number [float]
key	integer
liveness	number [float]
loudness	number [float]
mode	integer
popularity	integer
speechiness	number [float]
valence	number [float]
tempo	number [float]

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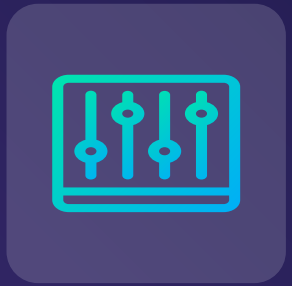

Exploratory Data Analysis and Visualization

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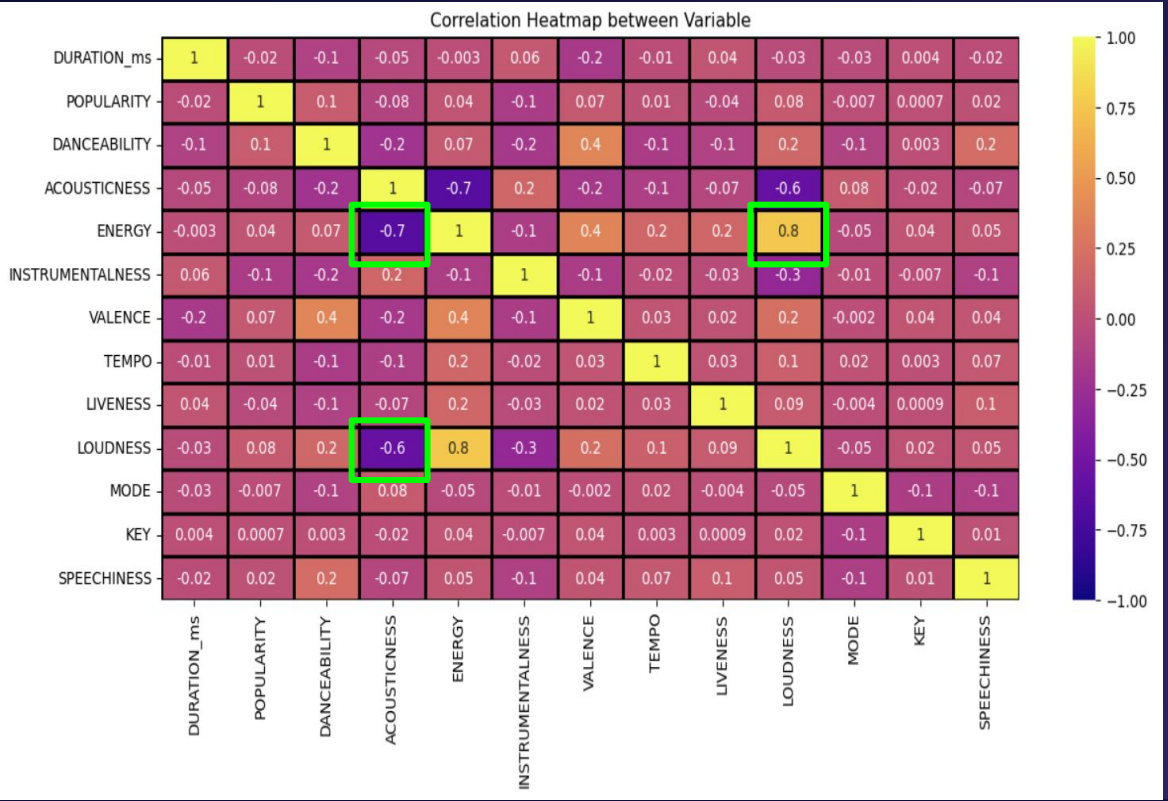
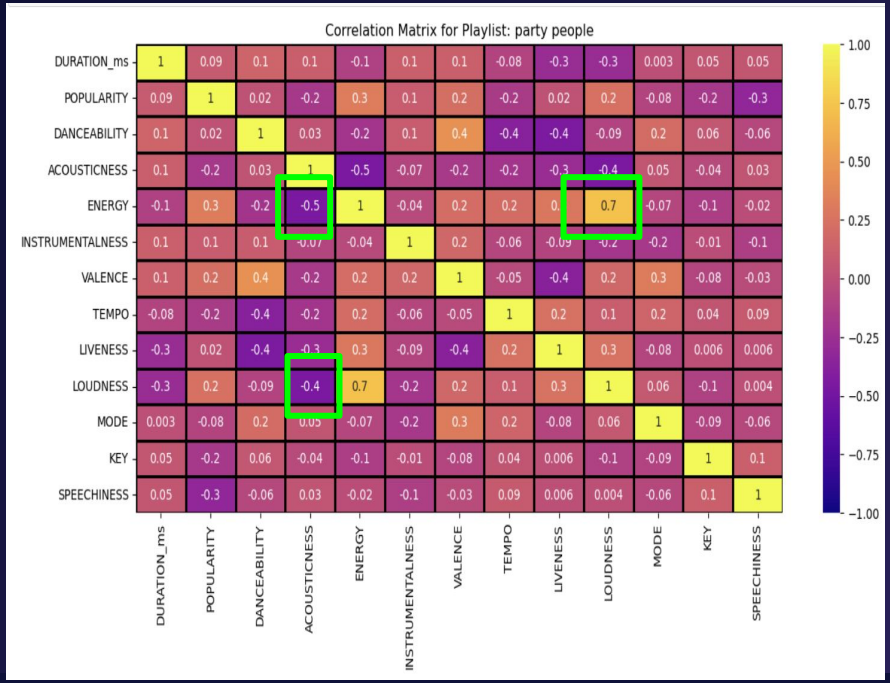
Feature Correlation - Entire Dataset

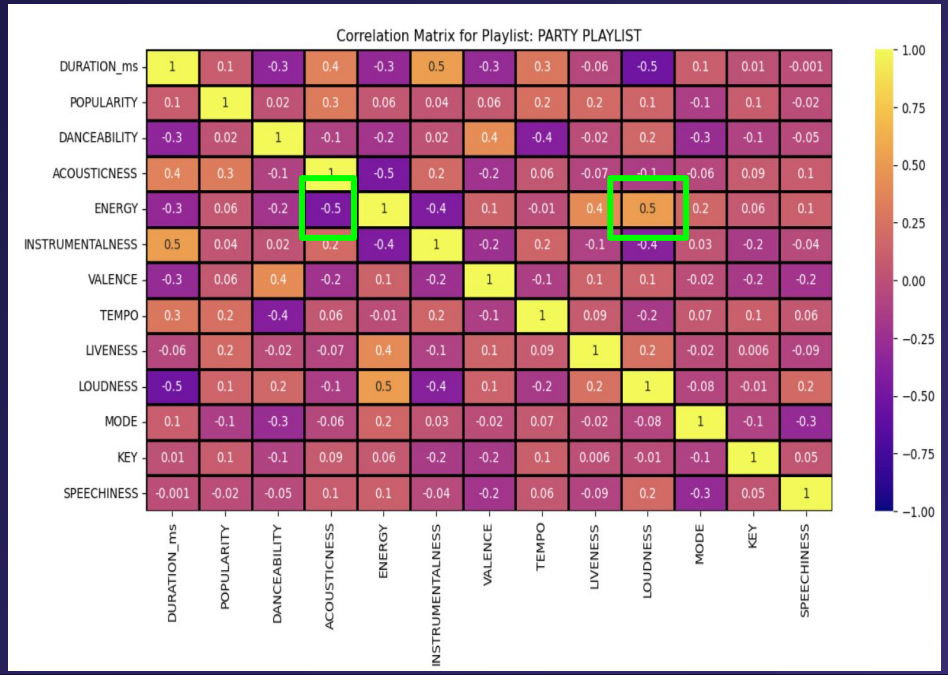


- Feature correlation across all the playlists
- Positive correlation of 0.8 is observed between Energy and Loudness
- Negative correlation of -0.7 is observed between Energy and Accousticness

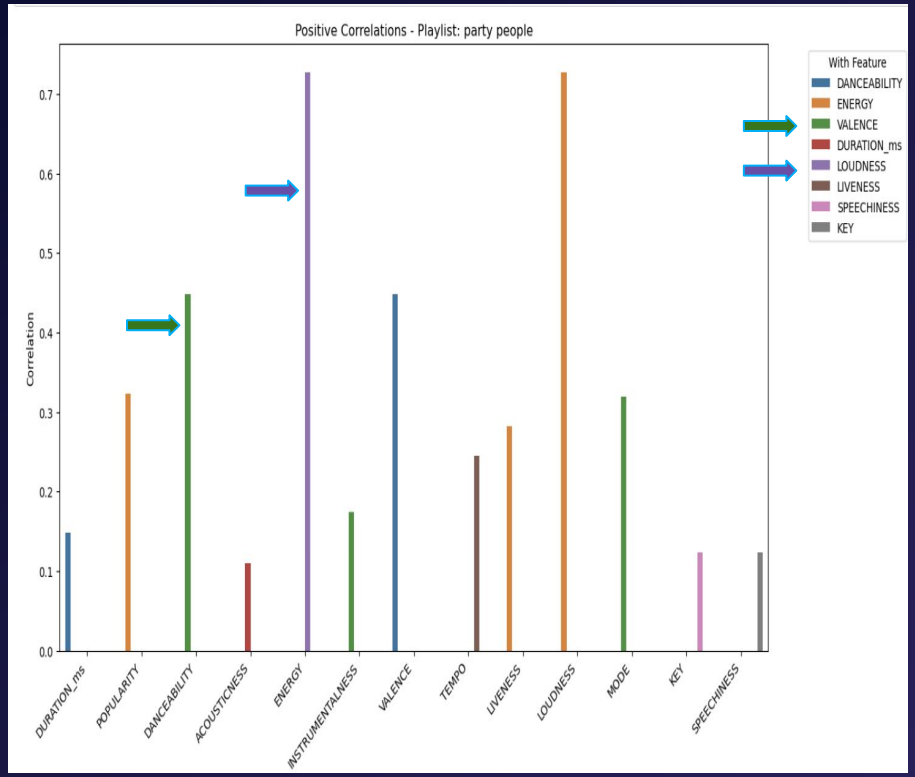
Feature Correlation in Party Playlists

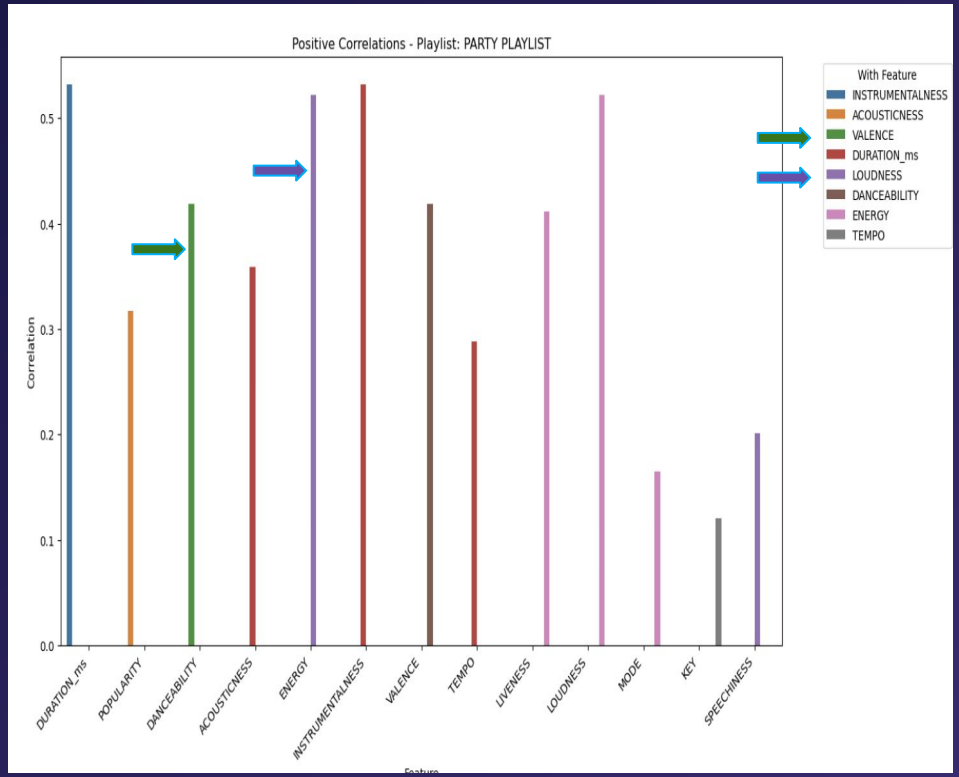
- ENERGY exhibits robust positive correlation with LOUDNESS
- ACOUSTICNESS shows negative correlation with ENERGY and LOUDNESS



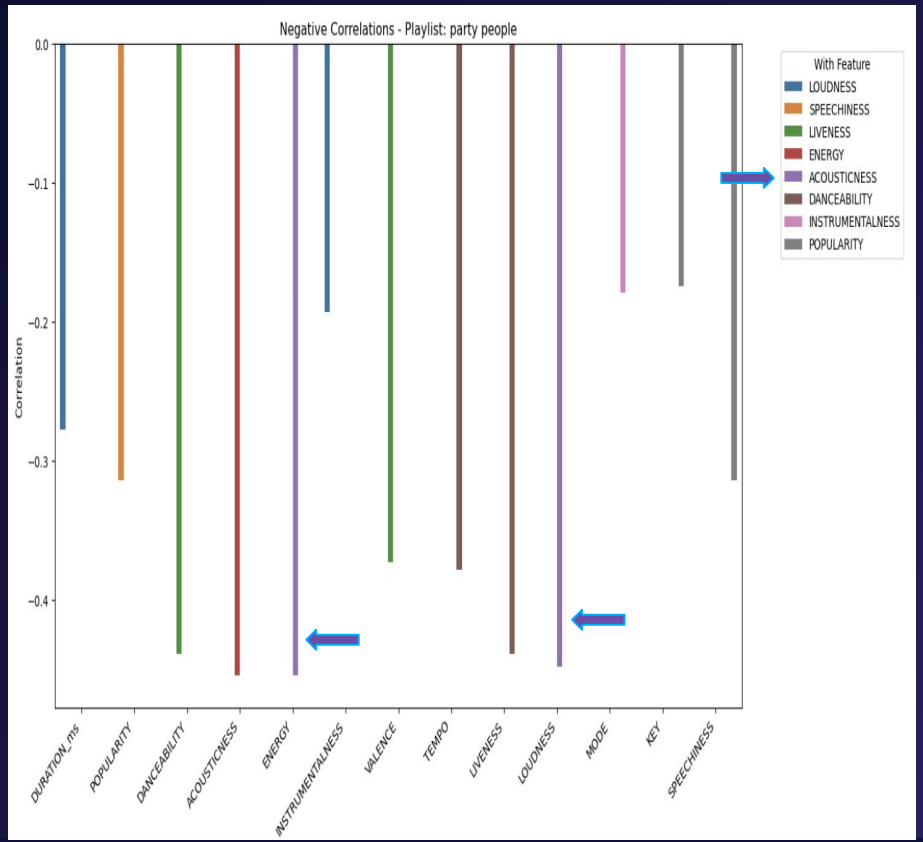


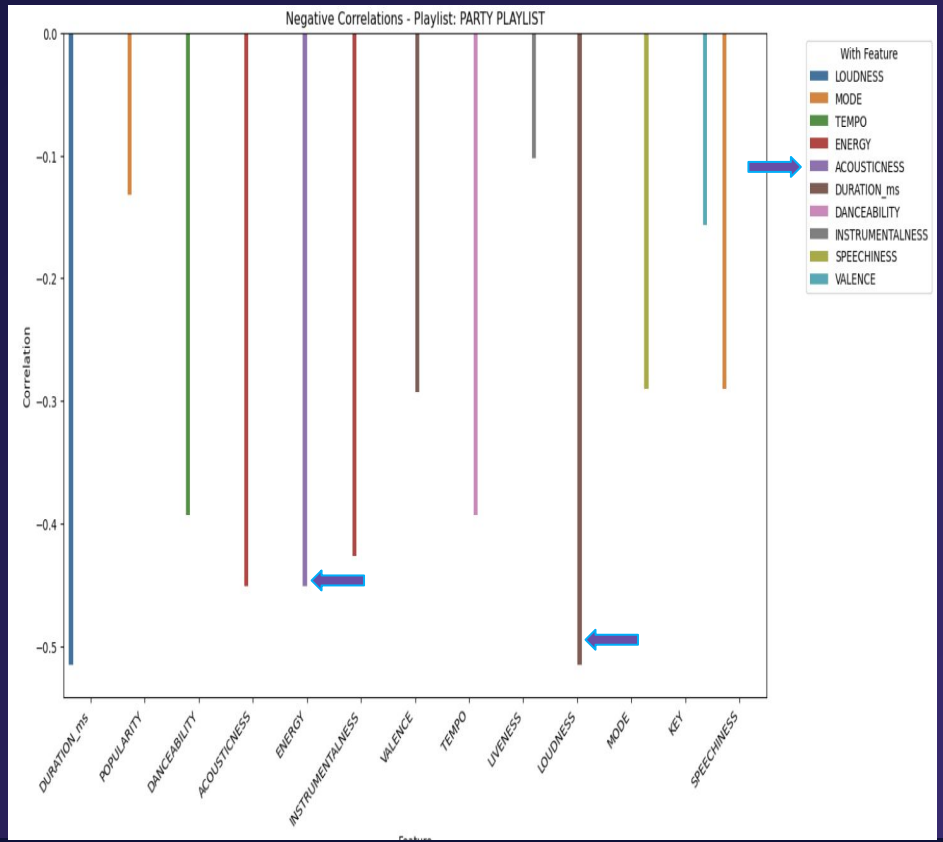
Positive Correlation in Party Playlists



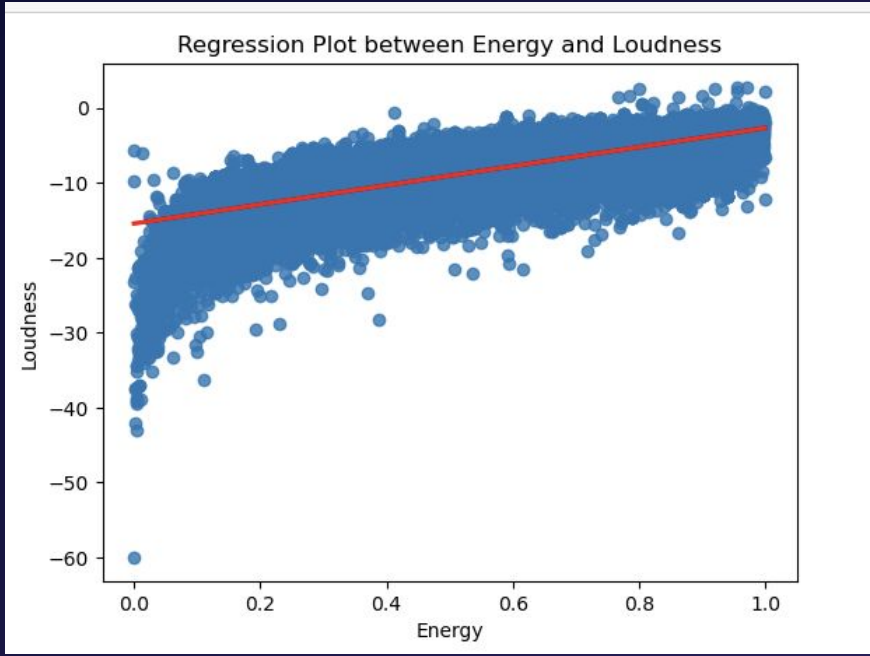


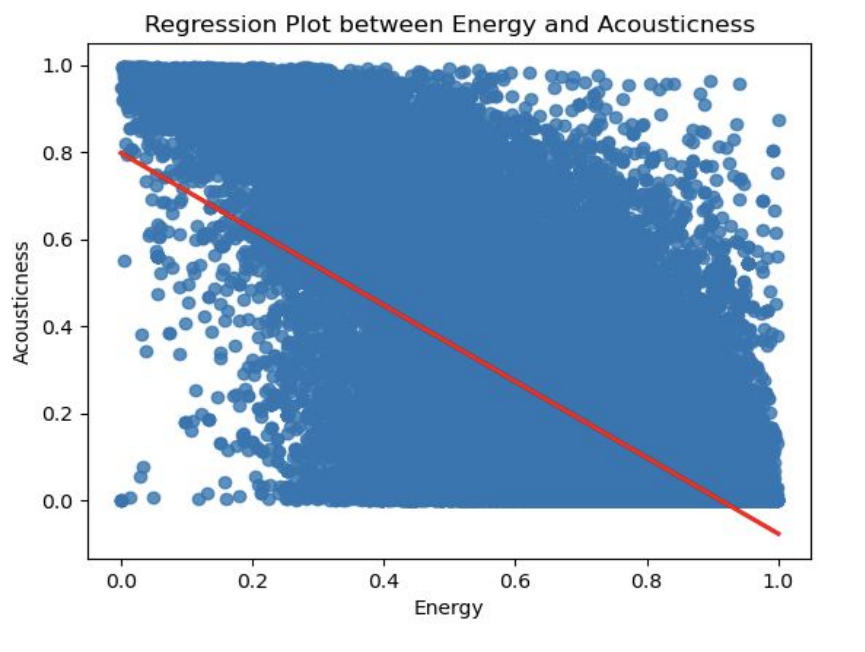
Negative Correlation in Party Playlists





Regression plots





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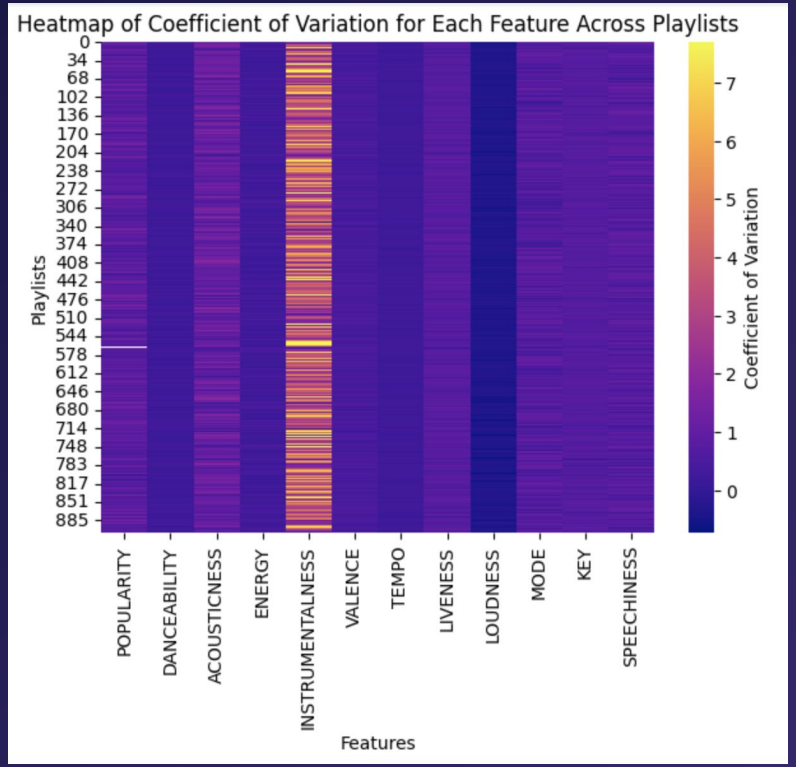
Which features vary the least within a playlist?

DANCEABILITY	0.225554
TEMPO	0.231488
ENERGY	0.289662
LOUDNESS	0.361610
VALENCE	0.444259
KEY	0.709852
MODE	0.734123
LIVENESS	0.748750
SPEECHINESS	0.764847
POPULARITY	0.888399
ACOUSTICNESS	1.103000
INSTRUMENTALNESS	3.869145

dtype: float64



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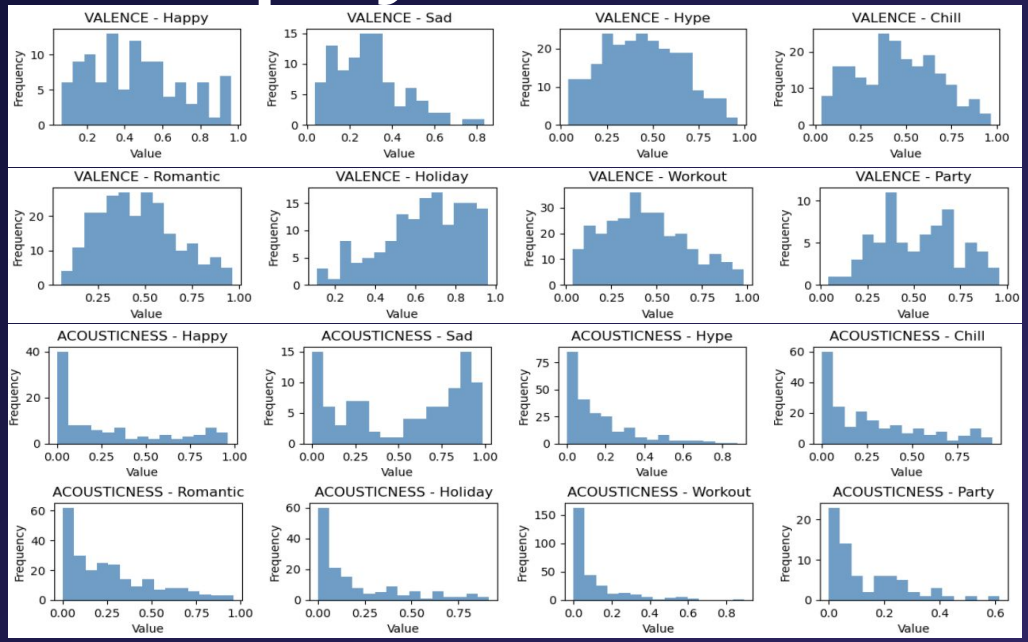
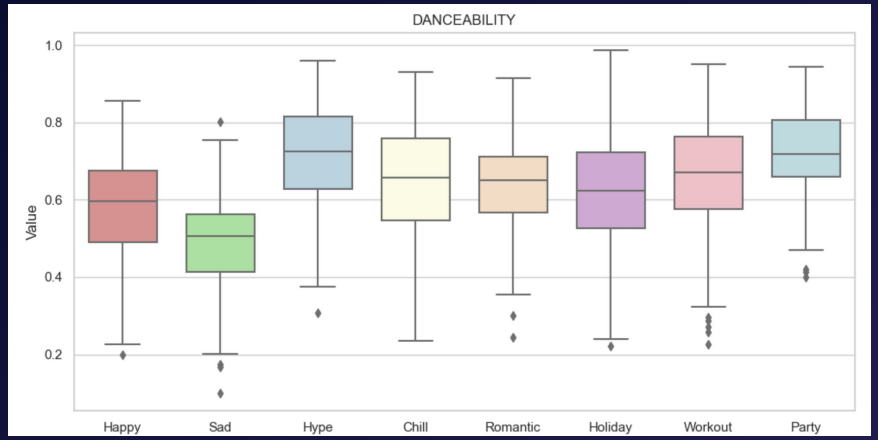
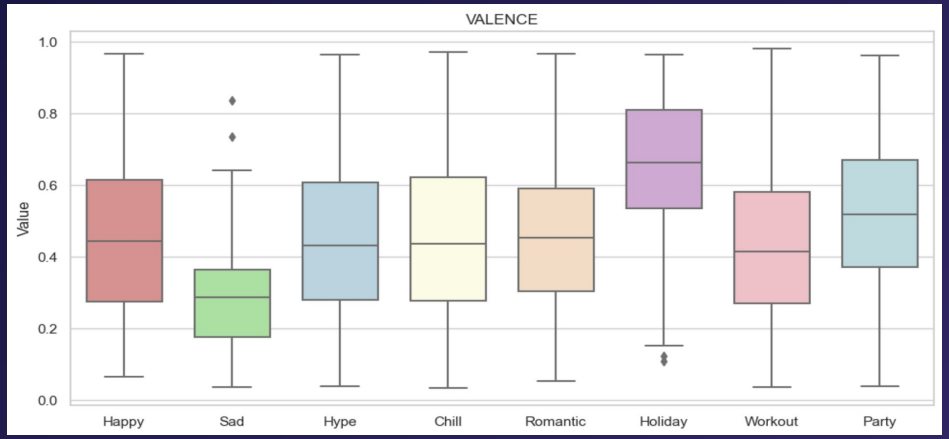
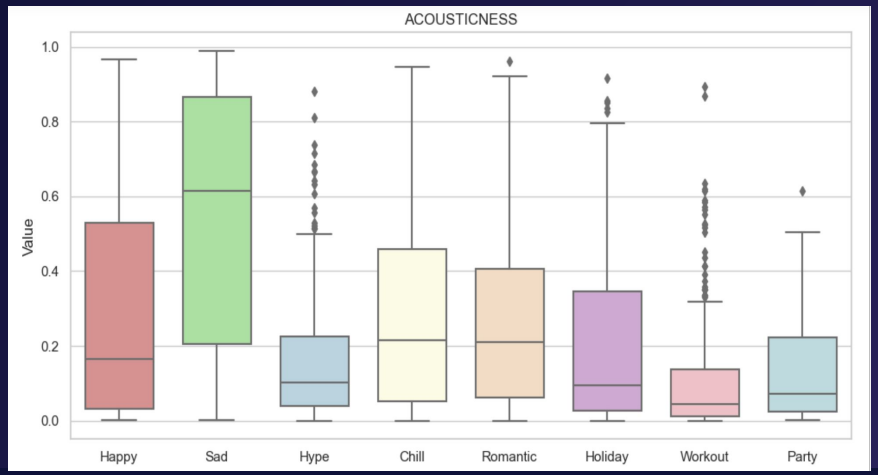
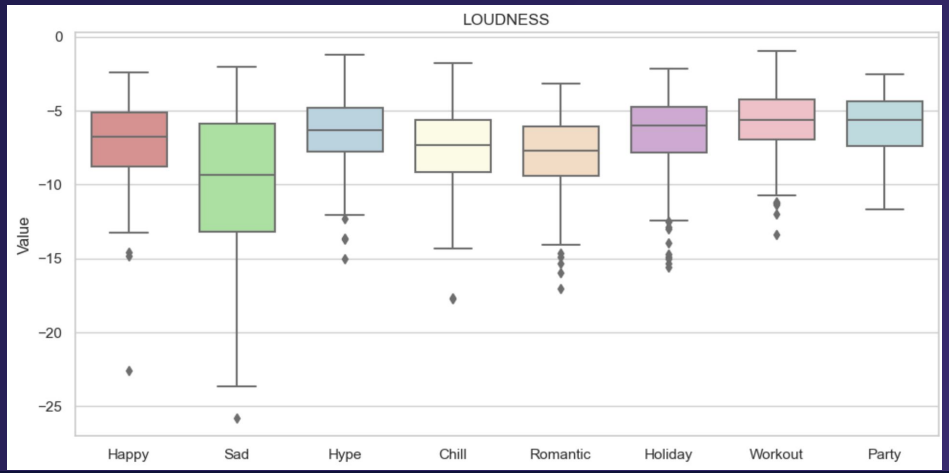
Which features determine differentiation of mood in a playlist?











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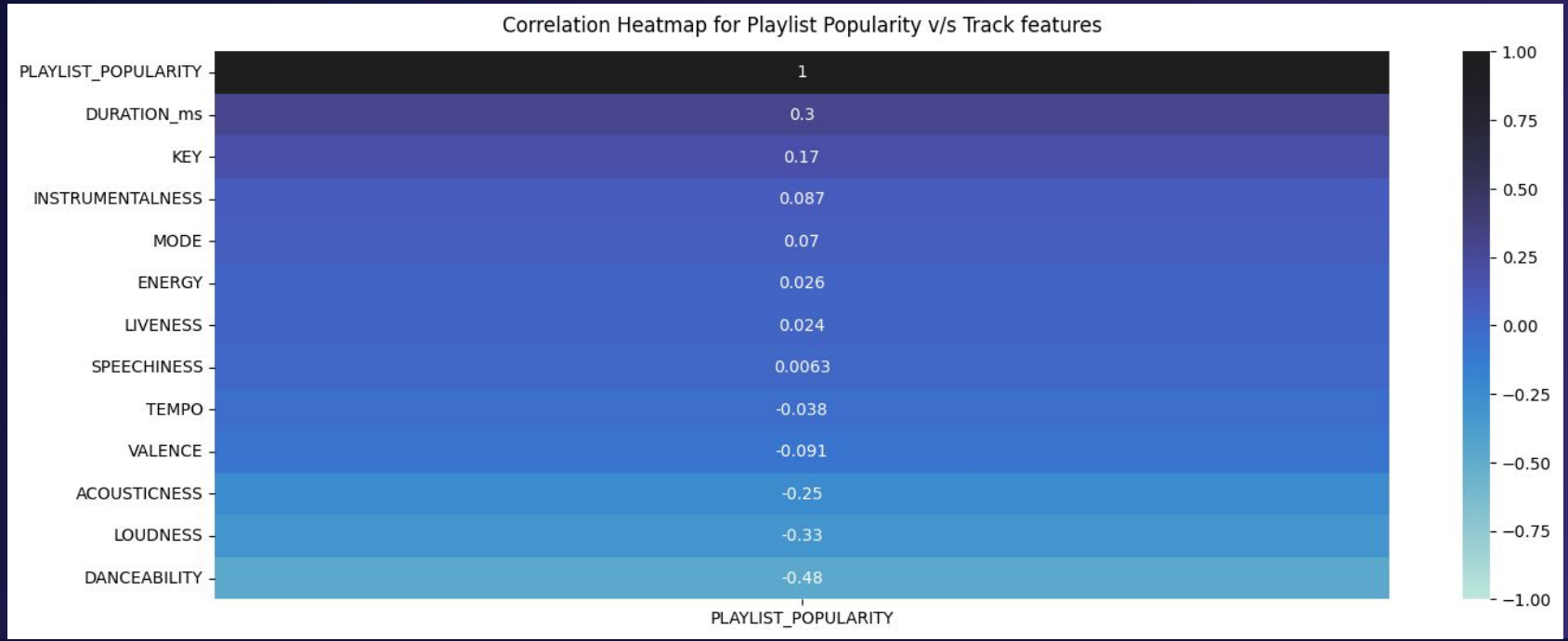
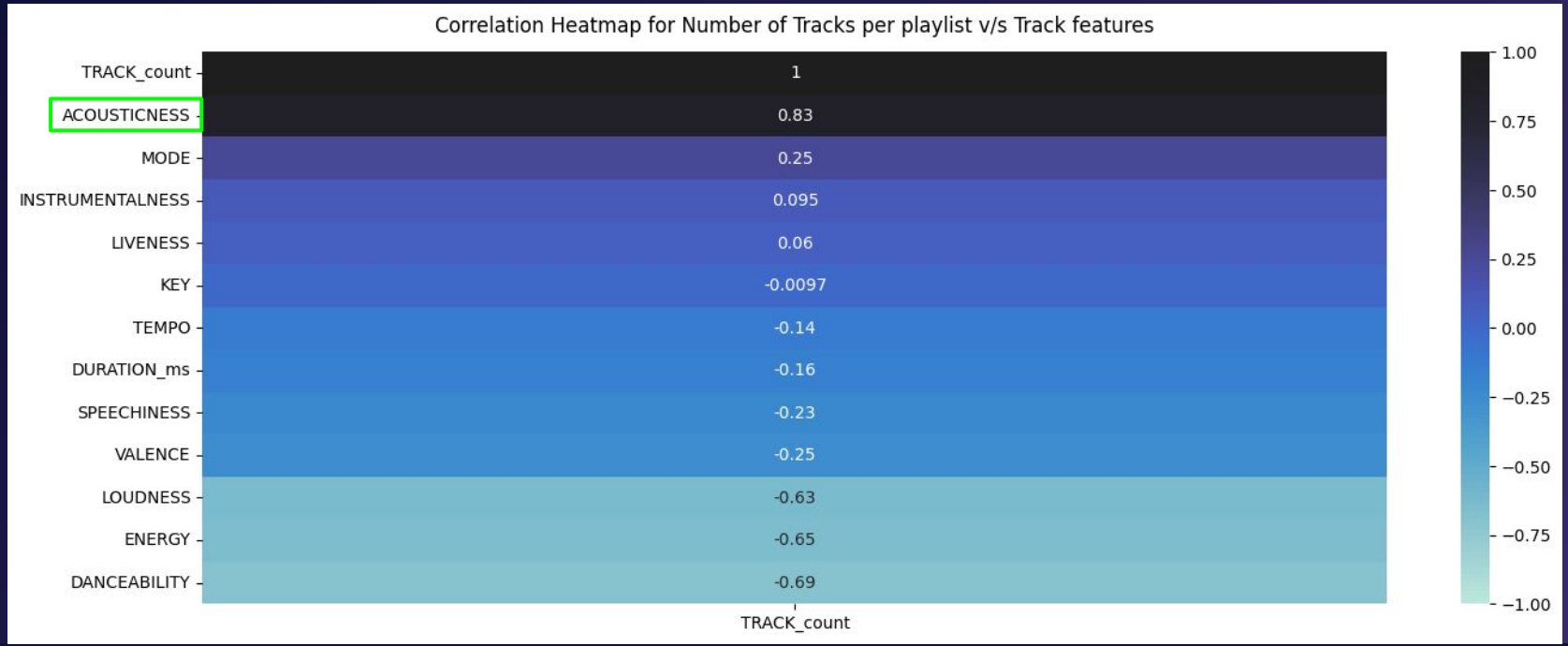
Which features determine the popularity of a playlist?



What kind of songs do longer playlists have?



Conclusions

- Features that are highly correlated: Danceability, Loudness and Accousticness
- Features that determine the mood of a playlist?
  - Hype playlists: higher speechiness, danceability, and popularity
  - Happy and hype playlists: higher loudness and energy
  - Sad playlists: higher acousticness

Conclusions

- Features that vary the least within a playlist?
  - Danceability, tempo, energy
- Features that determine the playlist popularity?
  - Doesn’t depend on audio features of track
  - Depends on number of times a track has been played and recency of plays
- Features that determine the length of the playlist?
  - Longer playlists - More Acoustic songs, Less party songs

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References

1. https://www.aicrowd.com/challenges/spotify-million-playlist-dataset-challenge
2. https://developer.spotify.com/documentation/web-api

Thank you for watching!

Questions?

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