Machine Learning at Spotify

MOOSIC

Data Scientists

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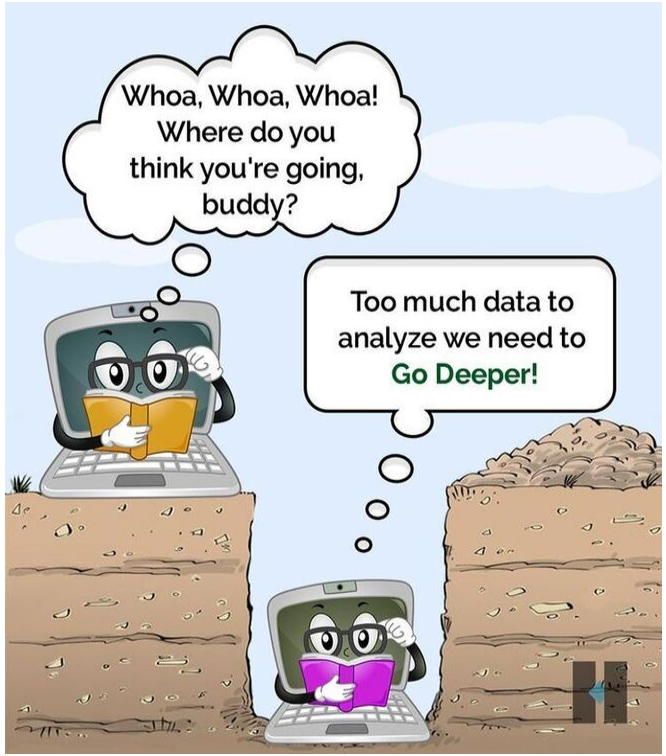
Unveiling Patterns: Our Clustering Strategies for a Large Set of Musical Compositions



Scaling

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K-Means Method

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Clustering

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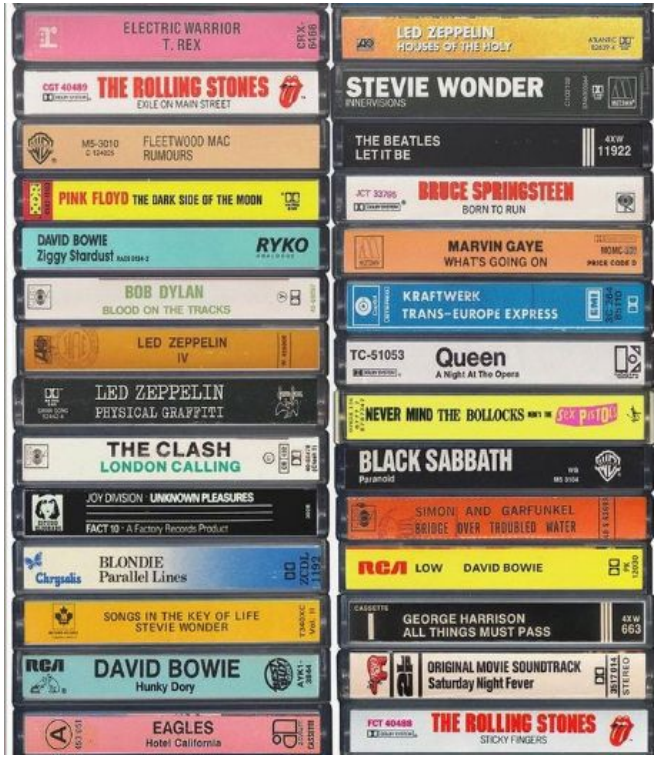
Reclustering

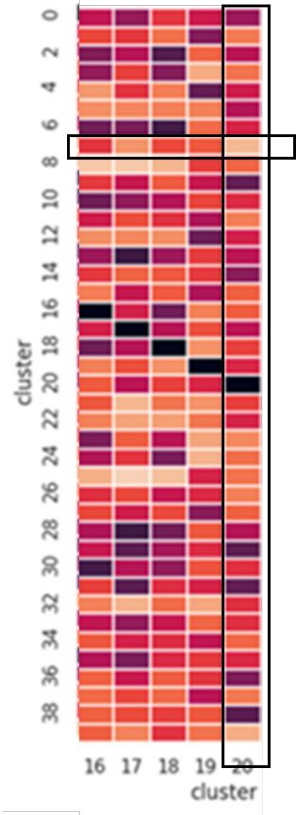
From Chaos to Harmony: Revealing Hidden Patterns in Extensive Music Libraries



K-means Method

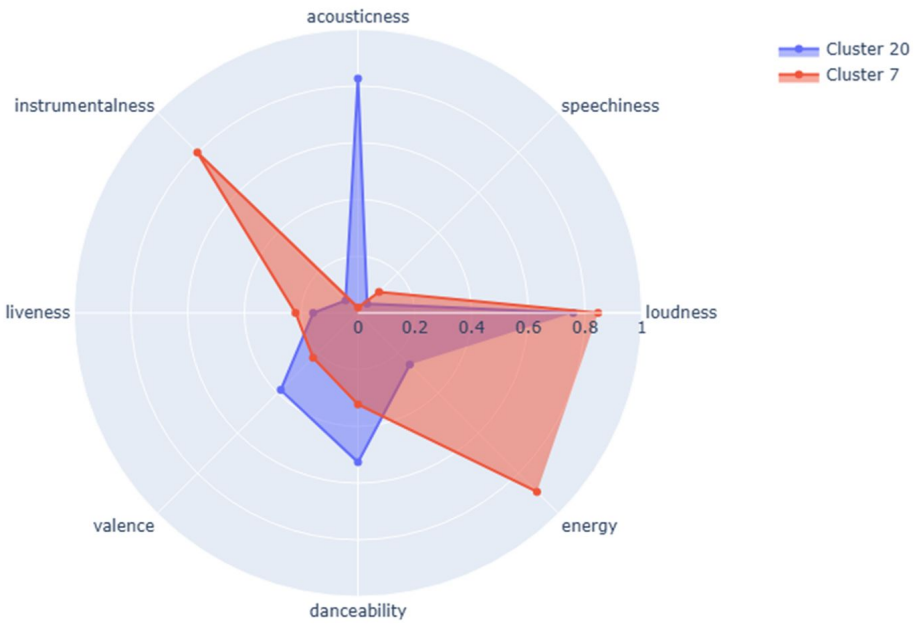
5160 songs

40 clusters...



Cluster 7 & Cluster 20

Dual Perspectives: A Deep Dive into Two Music Clusters

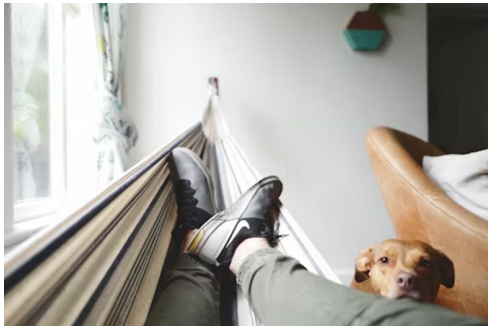


Cluster 7

Pulse-Pounding dance hits

Cluster 20

Mellow Lounge Melodies



Randomly Selected Gems: Detailed Analysis of 3 Clusters from a Pool of 40

Cluster 2

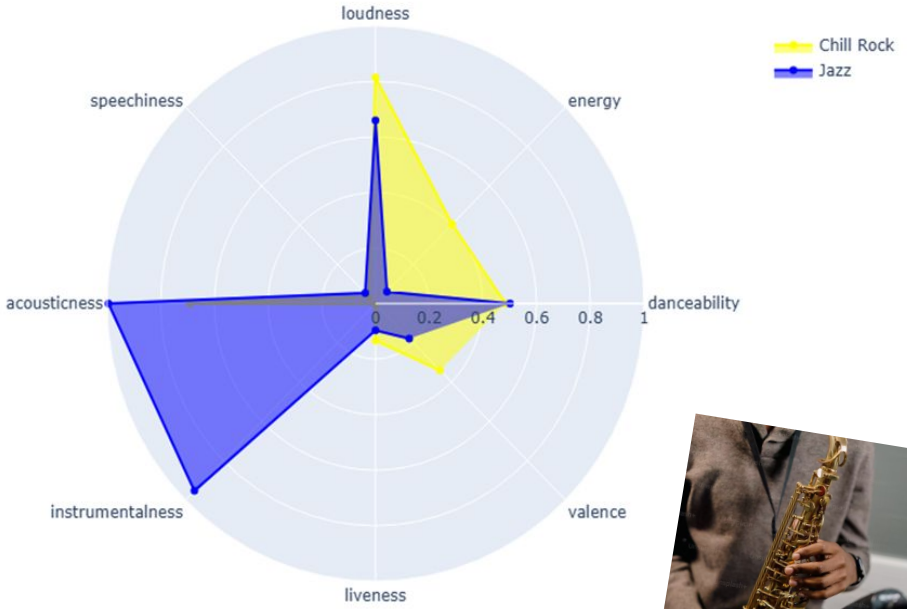
Cluster 20

Cluster 35

Cool Lounge

(Jazzy Nights, Smooth Jazz Grooves)

Artist	Song name
Miles Davis	'Round Midnight (feat. John Coltrane, Red Garl...
Billie Holiday	All of Me ...
Billie Holiday	Blue Moon
Nat King Cole	Unforgettable
Louis Armstrong	What A Wonderful World
Frank Sinatra	Come Fly With Me - Remastered 1998
Ray Charles	Georgia on My Mind - Original Master RecordingRay Charles
Ella Fitzgerald	It's Only A Paper Moon
Frank Sinatra	Love Is Here To Stay - Remastered 1998
Nat King Cole	Unforgettable
Dean Martin	That's Amore
Elvis Presley	Always On My Mind
Dean Martin	Mean To Me - Remastered/1998
Billie Holiday	Blue Moon
The Rolling Stones	Wild Horses - 2009 Mix
Eric Clapton	Wonderful Tonight
Dolly Parton	I Will Always Love You
Elvis Presley	In the Ghetto
Elvis Presley	Love Me Tender - From the 20th Century-Fox CinemaScope Production, "Love Me Tender"
Adele	Someone Like You
Bee Gees	To Love Somebody
Whitney Houston	I Have Nothing - Film Version



Epic, Unique, and Brutal!

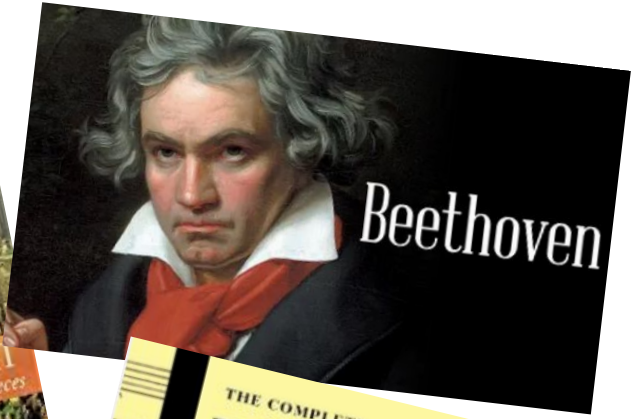
(Heavy metal, Alternative Rock, Punk Rock)

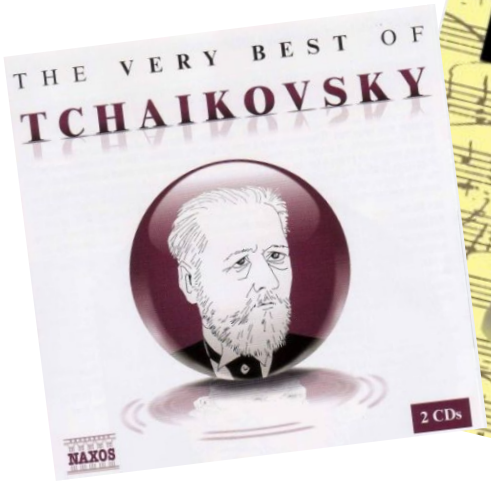
	Artist	Song Name
1	Cannibal Corpse	The Bleeding
2	Necrophobic	Before the Dawn
3	Nirvana	Mourning
4	Hate Eternal	Behold Judas
5	Nocturnus	Visions from Beyond the Grave
6	Gorefest	The Glorious Dead
7	Grave	Morbid Way to Die - remastered 2001
8	Vader	The One Made Of Dreams
9	Necrophobic	The Nocturnal Silence
10	Asphyx	My Beloved Enemy
11	Demilich	The Faces Right Below the Skin of the Earth
12	Demilich	Emptiness of Vanishing
13	General Surgery	Ominous Lamentation
14	Opeth	Demon Of The Fall
15	Nihilist	Severe Burns - Drowned Demo '8
16	Seance	Sin
17	Necrophagia	Ancient Slumber

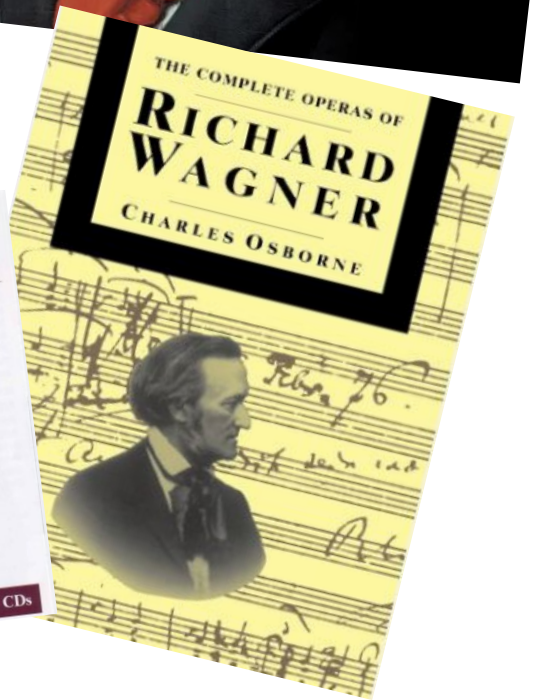
Elegant Euphony

(Classic, Symphony, Opera)

Artist	Song Name
Toots Thielemans	Coracao Vagabundo
Caetano Veloso	Coração Vagabundo
Caetano Veloso	Lindeza
Phil Phillips	Sea Of Love
Buddy Holly	True Love Ways
Vic Damone	On The Street Where You Live
Johnny Mathis	Misty
Dolly Parton	I Will Always Love You
Elton John	Can You Feel the Love Tonight
Lionel Richie	Endless Love
Amy Beach	Romance for Violin and Piano, Op. 23
Ernesto de Curtis	Orchestra by Giancarlo Chiaramello)
Gaetano Donizetti	L'elisir d'amore / Act 2: "Una furtiva lagrima"
Francesco Cilea	son l'umile ancella"
Giuseppe Verdi	Aida / Act 1: "Celeste Aida"
Richard Wagner	Die Walküre, WWV 86B / Act 1
Wolfgang Amadeus Mozart	Così fan tutte, K.588 / Act 1
Ludwig van Beethoven	Fidelio op.72 - Edited Helga Lühning & Robert Didio
Wolfgang Amadeus Mozart	Vado, ma dove? oh Dei!, K. 583
Richard Wagner	Schritten"
John Coltrane	Dedicated To You
Miles Davis	Stella By Starlight (feat. John Coltrane & Bill Evans)
Anita O'Day	You Don't Know What Love Is
Dave Holland Quartet	Conference Of The Birds
Sarah Vaughan	I'll Never Smile Again
Michael Naura Quartet	Soledad de Murcia
Stanley Turrentine	Dorene Don't Cry, I - Remastered
Karol Szymanowski	Symphony No. 3 - "Chant de la nuit", Op. 27: Largo...







Conclusions and recommendations

Conclusion:

K-Means method can provide insights into the patterns and characteristics of the music, however it is not creating comprehensive playlists and human involvement is still needed.

Recommendations:

1. Add some contextual features like Release Year and Genres to enhance pattern detection.
2. Improve the result by
    - Re-clustering
    - Calculating centroids and the distances
    - Increasing the number of clusters.
3. Explore alternative clustering methods.

THANK YOU!