



Mapping the Billboard Song Trends: Analyzing Lyrics and Genres across Time

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Introduction



- People in the US spend nearly 4 hours of music listening per day
- People tend to choose music that matches their current emotional state



- Gain a better understanding of the prevalent themes and emotions in music
- Better understand how the emotional content could impact music listeners
- Target specific audiences more effectively and build better music recommendation systems

Data Collection

- Wikipedia: Billboard Year-End Hot 100 Chart
 - Title, Artist, Year

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List of songs on *Billboard*'s 2011 Year-End Hot 100 chart^{[1][2]}

No.	Title	Artist(s)
1	"Rolling in the Deep"	Adele
2	"Party Rock Anthem"	LMFAO featuring Lauren Bennett and GoonRock
3	"Firework"	Katy Perry
4	"E.T."	Katy Perry featuring Kanye West
5	"Give Me Everything"	Pitbull featuring Ne-Yo, Afrojack and Nayer
6	"Grenade"	Bruno Mars
7	"F**K You (Forget You)"	CeeLo Green
8	"Super Bass"	Nicki Minaj
9	"Moves like Jagger"	Maroon 5 featuring Christina Aguilera



Adele's "Rolling in the Deep" was the number 1 song of the year, topping the *Hot 100* for 7 consecutive weeks.





Data Collection

- Music Genre Finder: <https://www.chosic.com/music-genre-finder/>
 - Genre, Sub-Genre

The screenshot shows the Chosic website interface. At the top is a navigation bar with menu, search, and social icons. The main content area displays the song 'Rolling in the Deep' by Adele, with a play button and album cover. Below the song title are tabs for 'Find Similar', 'In Playlists', and social media links. A 'Genres on Spotify' section shows tags for 'uk pop', 'pop soul', 'pop', and 'british soul'. On the right, there is a 'Donate' button and a '28-DAY WORKOUT CHALLENGE' for ages 18-24, which includes a list of exercises for each day of the week.

Data Collection


- Musixmatch: <https://www.musixmatch.com>
 - Lyrics

The screenshot shows a web browser window with the URL [musixmatch.com](https://www.musixmatch.com). The page displays the lyrics for the song "Rolling In The Deep" by Adele. The lyrics are presented in two stanzas. On the right side of the page, there is a promotional banner for "Podcasts Beta" with a red button labeled "Discover Podcasts". Below the banner, there is a small image of Adele and the text "21 Jan 19th 2011" and "Rolling In The Deep".

There's a fire starting in my heart
Reaching a fever pitch, it's bringing me out the dark
Finally I can see you crystal clear
Go ahead and sell me out and I'll lay your ship bare

See how I'll leave with every piece of you
Don't underestimate the things that I will do
There's a fire starting in my heart
Reaching a fever pitch and it's bringing me out the dark

Podcasts Beta
Listen to Podcasts talking about **Adele**.
Discover Podcasts

 21
Jan 19th 2011
• Rolling In The Deep

Data Collection

- Last.fm API: <https://www.last.fm/api>
 - Length of songs

The screenshot shows the Last.fm website interface. The top navigation bar includes links for Live, Music, Charts, Events, Features, Log In, and a SIGN UP button. The main content area displays the XML response for the 'chart.getTopTracks' API endpoint. The XML structure is as follows:

```
<tracks>
  <track rank="1">
    <name>Believe</name>
    <duration>239</duration>
    <mbid/>
    <url>http://www.last.fm/music/Cher/_/Believe</url>
    <streamable fulltrack="0">1</streamable>
    <artist>
      <name>Cher</name>
      <mbid>bfc6d75-a6a5-4bc6-8282-47aec8531818</mbid>
      <url>http://www.last.fm/music/Cher</url>
    </artist>
  </track>
```



Research Questions

01

What is the sentiment of lyrics by genre? Is there a trend through the past 20 years?

02

How has the use of positive and negative words in lyrics evolved across different music genres during the selected two periods?

03

What topics do the lyrics mainly present?

04

Did the technology, society, or the public affect the change of sentiment or genres?

05

What's the similarity between the genres? How is it changing through the 20 years?



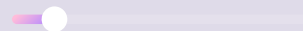


01

Sentiment Analysis

What is the sentiment of lyrics by genre?

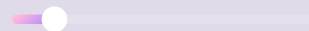
Is there a trend through the past 20 years?





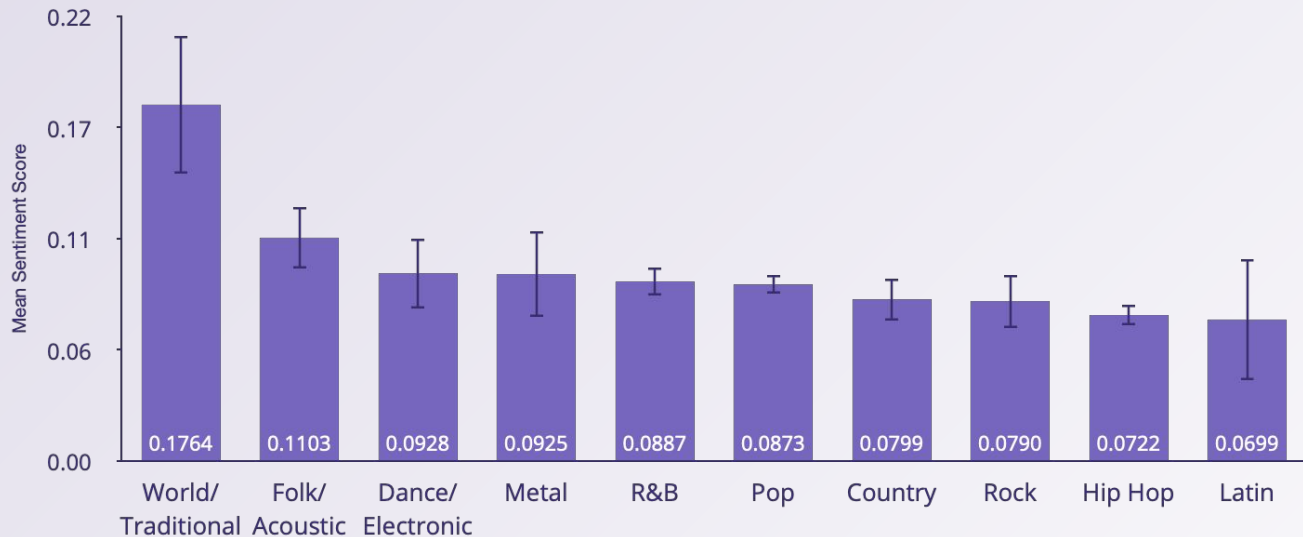
RQ1: What is the sentiment of lyrics by genre? Is there a trend through the past 20 years?

- Model used: TextBlob
- Sentiment score range: -0.7 ~ 0.764
- Mean sentiment score for all 2000 songs: 0.0824





Mean Sentiment Score of Lyrics by Genre

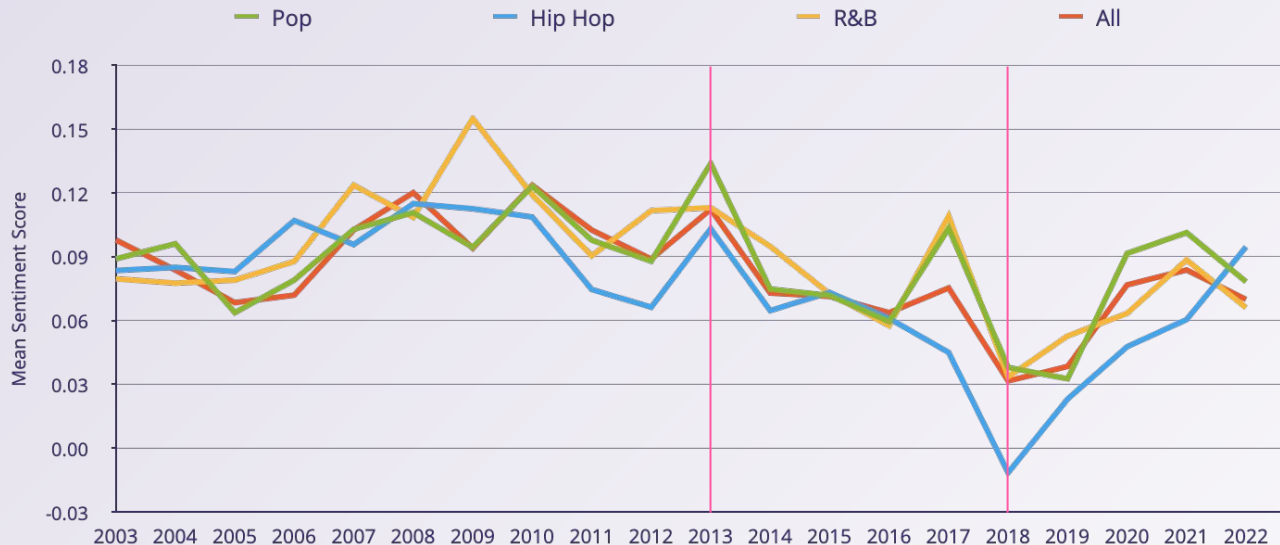


- there's no huge difference between most genres
- World/Traditional has the highest score
- Latin has the lowest score

*Genre with too less songs were not considered



Mean Sentiment Score for Top 3 Genres



- Every genre has an increase in 2013
- Significant drop for every genre in 2018
- 2010 has the highest overall score
- Hip Hop is rather undulate compared with the others



02

Sentiment Analysis

How has the use of positive and negative words in lyrics evolved across different music genres during the selected two periods?





RQ2: How has the use of positive and negative words in lyrics evolved across different music genres during the selected two periods?

- Two time periods were chosen to analyze
 - 2013
 - 2018
- Model used: VADER
- Generate the word clouds for each genre in this two specific years





Findings for Word Choice from Top 3 Genres of 2013 and 2018

- Positive and negative words across genres and selected periods are quite similar
- "love" and "heart" are the two most common positive words
- "fuck" and "shit" are the two most common negative words
- Year comparison (Pattern)
 - More variation in positive words between 2013 and 2018 than negative words





03

Topic Modeling

What topics do the lyrics mainly present?





RQ3: What topics do the lyrics mainly present?

- Model used: LDA Topic Modeling
 - Get the top words of every year by genre
- Summarization tool: ChatGPT
 - Abstract topics from the top words



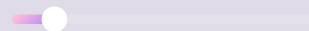
Topics for Pop Songs between 2013 and 2018

Genre	Year	Topic	Top Words
Pop	2013	Celebration and Fun	drum, suckers, thing, applause, strangers, baby, ball, momma, cristal, love
		Home and Parties	time, home, hey, darkness, party, waves, catch, shovin, women, end
		Love and Dancing	love, hey, team, come, time, daylight, party, sound, mirror, bit
		Nightlife and Adventure	night, trouble, whoa, highway, beast, huh, shout, body, twenty, aw
		Memories and Challenges	eh, girl, sail, fire, things, gucci, memory, 사나이(man/guy), problem, stone
	2018	Fashion and Lifestyle	girl, sorority, stars, sneaker, haunt, maybelline, styles, way, taste, steam
		Controversy and Provocation	baby, ayy, god, lights, bitch, something, say, blood, time, shit
		Love and Relationships	ooh, love, baby, name, someone, smokin, middle, spears, ground, way
		Success and Bragging	goodbyes, money, album, young, friday, rhymes, closet, bebé, chicken, punchlines
		Youth and Emotions	youngblood, feels, kiki, saudi, tu, alcohol, woo, kind, havana, eyes



Topics for R&B Songs from 2013 and 2018

Genre	Year	Topic	Top Words
R&B	2013	Love and Sentimentality	hey, come, light, forever, legend, voy, feeling, keith, olvides, dad
		Fashion and Style	act, handin, shoes, berry, contigo, keeps, clown, chic, dad, hell
		Sex and Relationships	bitches, beast, whoa, collides, case, yeah, problem, key, raygun, scars
		Youth and Rebellion	woah, bit, ground, comin, vice, shame, boy, babies, beatles, que
		Nightlife and Adventure	night, girl, body, dealer, trouble, takers, mo, hay, beginning, constant
	2018	Money and Success	woo, bank, shiftin, comme, matador, los, monch, elliot, noodle, pit
		Mind and Perception	checked, mind, catch, piguets, time, color, ray, corrupted, scratch, god
		Love and Romance	ooh, lights, raygun, rodeo, ten, name, boo, meechy, jit, ayy
		Sex and Sensuality	love, years, chicken, woo, wrist, ah, goin, king, wet, bass
		Violence and Chaos	drive, shooters, landslide, lies, lift, fork, armageddon, elliot, magnum, campos





Topics for Hip Hop Songs from 2013 and 2018

Genre	Year	Topic	Top Words
Hip Hop	2013	Hip Hop Culture and Competition	night, treasure, bit, time, roof, college, power, champion, mcs, rain
		Relationships and Struggles	hey, woah, cares, time, bust, olvides, side, hands, nights, quiero
		Music Production and Creativity	sound, pharcyde, portal, fox, dum, week, ba, leagues, hallway, big
		Money and Success	troublemaker, come, daylight, dollar, validation, tú, head, ayy, tu, light
		Party and Nightlife	pull, head, things, cornrows, yeah, drank, ho, scream, wrapping, dream
	2018	Gangsta Lifestyle and Success	ayy, picnics, ho, clothes, ex, pensándolo, pocket, plug, wet, rockstar
		Fame and Paparazzi	bank, havana, rappers, dick, manuscrito, meth, grind, somethin, paparazzi, Instagram
		Drugs and Party Culture	yeah, black, te, droppin, hoopin, rears, drink, despacito, woo, zod
		Events and Nightlife	someone, night, yeah, things, kimmel, end, wedding, shot, source, matador
		Money and Checks	middle, taste, ten, pills, gang, gucci, cansé, ball, reaction, checks

Music
Culture



Social
Issues



RQ3: What topics do the lyrics mainly present?

Hip Hop Topics			
2003	Shoes and babies	2013	Lifestyle and finance
2004	Fitness and self-improvement	2014	Music, entertainment, and life
2005	Love and relationships	2015	Food, music, and lifestyle
2006	Fitness and social change	2016	Emotions, music, and lifestyle
2007	Music and culture	2017	Lifestyle, music, and love
2008	Self-improvement and social issues	2018	Party culture, drugs and nightlife
2009	Party culture and sports	2019	Music, entertainment, and relationships, drugs
2010	Fashion and love	2020	Drugs and vulgar language related to reproductive organs
2011	Music and dance	2021	Life and struggle
2012	Music, entertainment, and emotions	2022	Guns, drugs, and the lower class lifestyle

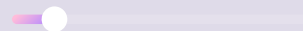
Love, Entertainment, Music (2003-2012) → Lifestyle (2003-2017) → Struggle (2018-2022)



04

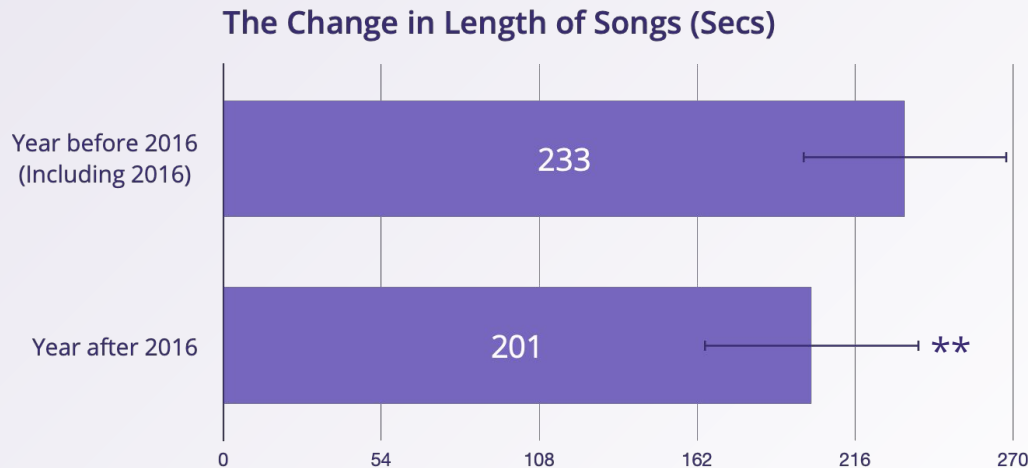
Event Correlation

Did the technology, society, or the public affect the change of sentiment or genres?



Technology: Impact of Streaming Platforms on Song Length

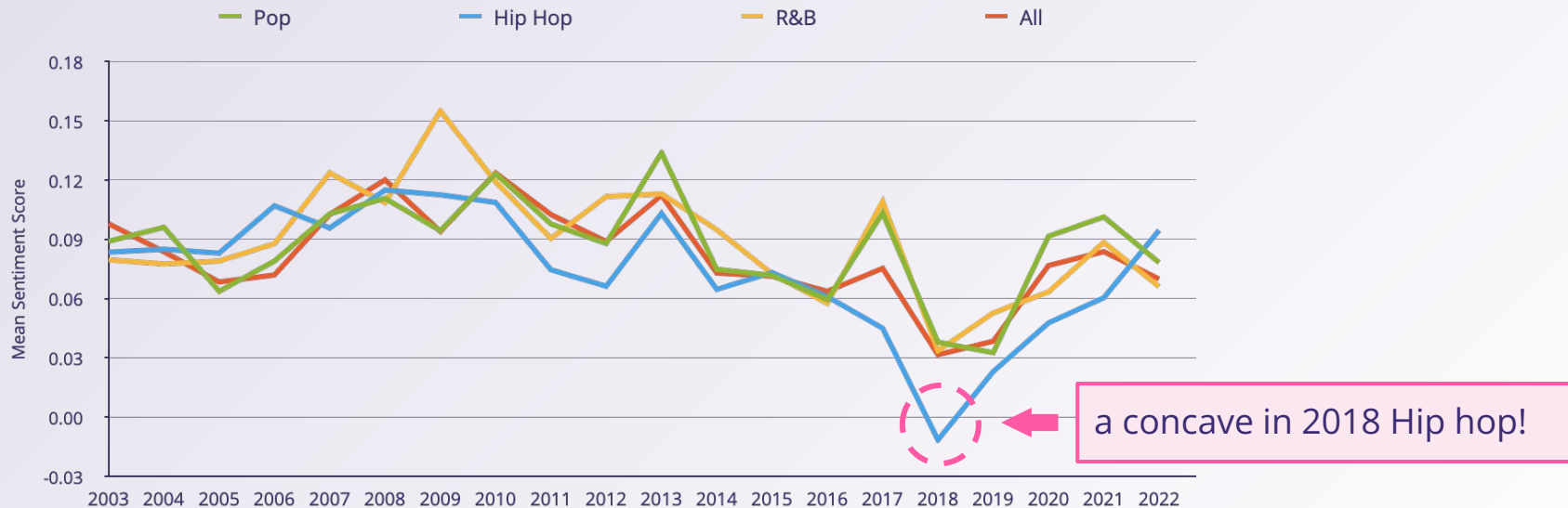
- With the arising of streaming platform such as Spotify, the length of songs shortened significantly



P-value < 0.01, T-statistic = 10.59



Culture Impact on Hip hop Songs



Cultural Impact on Hip hop Songs

But, is the concave caused by sample error?

- In common sense, Hip hop songs:
 - negative
 - underground in the past
- So, not enough sample in the early years?
 - Cannot indicate the negative instinct?

Slightly more Hip hop songs in 2018

Number of Hip Hop Songs

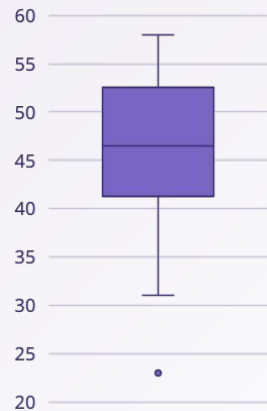


Cultural Impact on Hip hop Songs

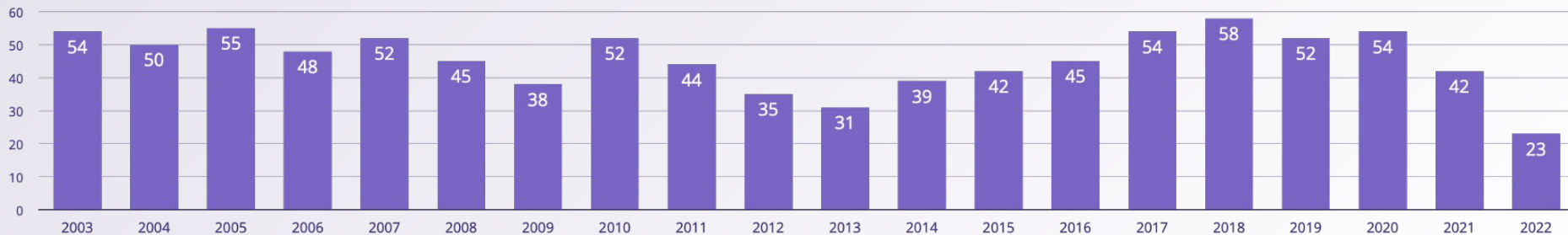
Not because of the sample error!

- Standard deviation and mean indicate a moderate variance

Mean	Variance	Standard Deviation
45.65	82.55	9.08



Number of Hip Hop Songs



Arising of Emo Rap

- Only in 2017, 2018, and 2019 contains **emo rap**
- Particular singers: **XXXTentacion, Lil Pump, 6ix9ine**
- Lil Peep died in 2017, XXXTentacion died in 2018

Year	Title	Artist(s)	Sub-genres
2017	Look at Me!	XXXTentacion	emo rap
2018	Sad!	XXXTentacion	emo rap
2018	Moonlight	XXXTentacion	emo rap
2018	Gucci Gang	Lil Pump	emo rap
2018	Gummo	6ix9ine	emo rap
2018	Fefe	6ix9ine ft. Nicki Minaj & Murda Beatz	emo rap
2019	Swervin	A Boogie wit da Hoodie ft. 6ix9ine	emo rap

Reasons Behind the Change of Hip hop Songs

- Gen Z led an arising of emo rap
- Singers: XXXTentacion, Lil Pump, 6ix9ine



XXXTentacion



Lil Pump



6ix9ine



05

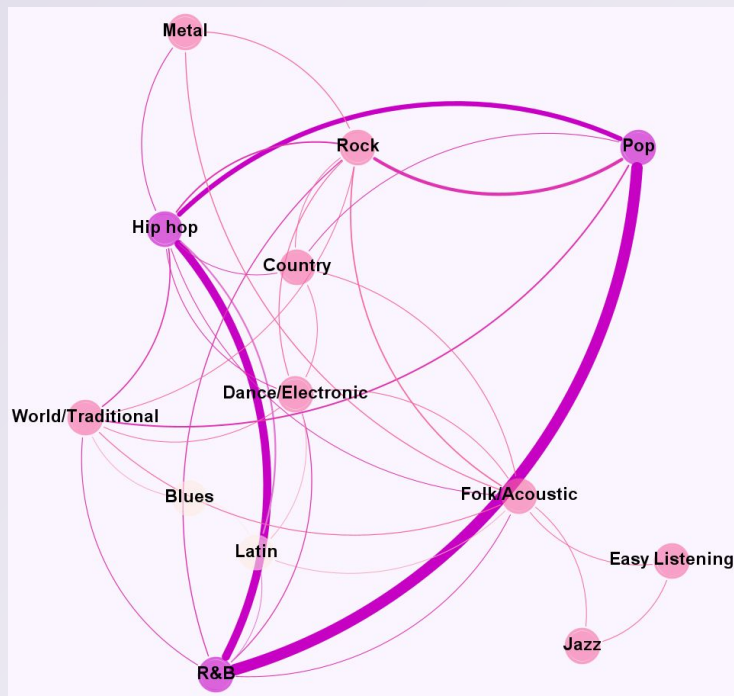
Network Analysis

What's the genre similarity in artists?

How is it changing throughout the 20 years?



Genres' artist-overlap from 2003 to 2022



- Nodes: Genres
- Edge weights: Count of overlap artists

Get Busy
by: Sean Paul Artist
from compilation album: Dutty Classics Collection (June 02, 2017)

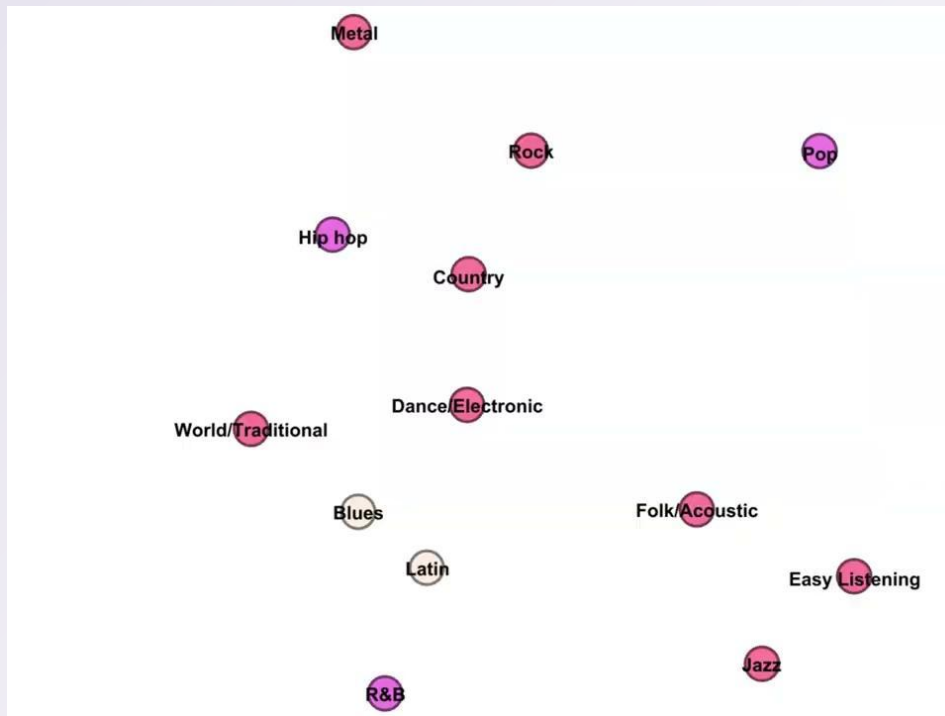
Find Similar In Playlists

Genres on Spotify Parent Genres: Hip Hop, Pop

pop rap dancehall dance pop

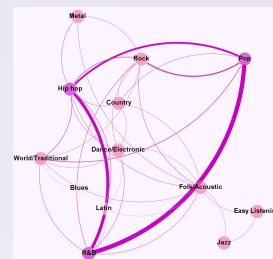
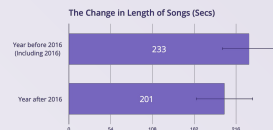
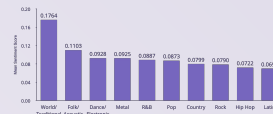


Changes of Genres Network from 2003 to 2022



Summary

- Notable decrease in sentiment score in 2018
- Positive and negative words across genres and selected periods share many similarities, but positive words exhibit greater variation than negative words
- Genres are gradually fusing through the years, especially Hip Pop, Pop, and R&B
- Social issues (such as the COVID-19) are correlated with not only the sentiment of genres but also their fusion trend





Thank you!

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