Spotifying Trends in Popular Music

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Motivation

- What is common about top tracks every year?
- Have trends changed across years
- Data available for audio features for analyses on Spotify
- Make prediction on the next popular songs based on audio features

Relevant work

- GitHub Spotipy
 - People utilize Spotify API for interesting projects such as automatically creating
 playlists by comparing scores of each feature around
- Spotify used their workflow manager software, luigi, to accurately predict 4 of the 6
 Grammy winners taking into account the user's listening habits

Dataset

- Billboard top 100 songs from 2012 to 2016
- Used Spotify API to collect audio features for each track
- We created own GitHub library to collect the data
- Billboard top 50 songs in 2017 for prediction
 - Machine learning assume we are in 2016 and don't have 2017 list
- Saved as .csv files

Key Description Examples

Key	Value Description
acousticness	0.0 to 1.0; 1.0 represents high confidence the track is acoustic.
danceability	0.0 to 1.0; 0.0 is least danceable and 1.0 is most danceable.
energy	0.0 to 1.0; For example, death metal has high energy.
instrumentalness	0.0 to 1.0; Absence of vocals. Values above 0.5 are likely instrumental tracks.
liveness	0.0 to 1.0; A value above 0.8 provides strong likelihood that the track is live.
loudness	Values typical range between -60 and 0 db.
speechiness	Values above 0.66 describe tracks that are probably made entirely of spoken words.
tempo	Beats per minute (BPM)
valence	A measure from 0.0 to 1.0 describing the musical positiveness. Tracks with high valence sound more positive.

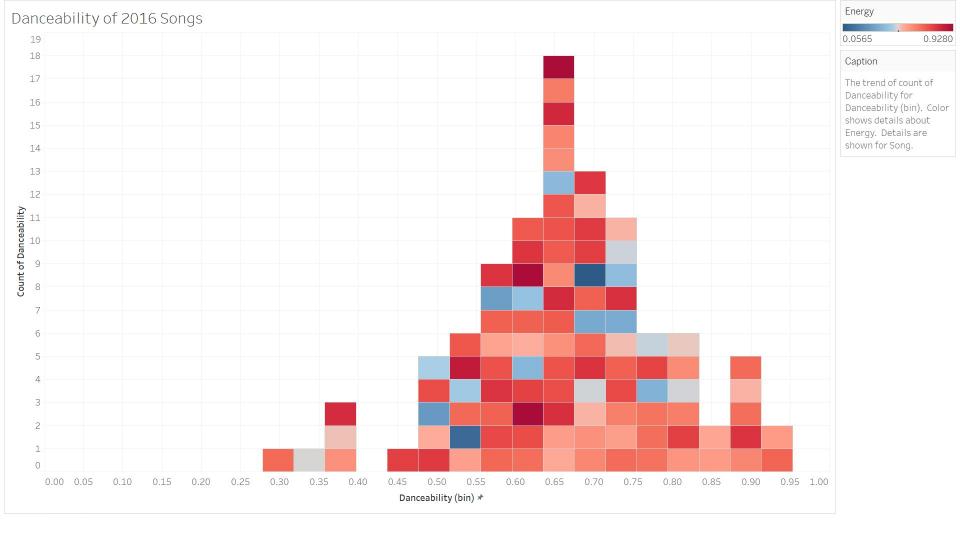


Demo

Data Collection

Assumptions and Challenges

- We assume Spotify feature scoring system is correct
- When we were collecting data
 - Some tracks have same names by different artists
 - Different versions
- We solved by recording a specific Spotify ID for each track
 - Name is not unique but ID is
- Used IDs instead of names to extract features using API and Jupyter Notebook



Speechiness of 2016 Songs

Love Yourself Justin Bieber	679 Fetty Wap featuring Remy Boyz Sucker for Pain	Needed Me Rihanna Luv Tory Lanez	Cheap Thrills Sia featuring Sean Paul	For Free DJ Khaled featuring Drake	Don't Bryson Tille		npman ake and ure	Exchi Bryso Tiller	on	Don't Let Me Down The		Here Alessia Cara	
Panda Desiigner	Lil Wayne, Wiz Khalifa and Imagine Dragons with Logic and Ty Dolla \$ign featuring X Ambassadors	Back to Sleep Chris Brown	Just Like Fire Pink	Too Good Drake featuring Rihanna	Stitches Shawn Mendes	Send Love Your New Love	(To N	le Too leghan rainor	Into Yo Ariana Grand	e My	yself elena	Sorry Beyoncé Sorry Justin	
All the Way Up Fat Joe, Remy Ma and Jay Z featuring French Montana and Infared	l Hate U, I Love U Gnash featuring Olivia O'Brien	Cinis Brown	Stressed Out Twenty One Pilots	Me, Myself G-Eazy and Bebe Rexh	Away		Ex Of Ell Kii	n's le	See You Again Wiz		Say It Tory Lanez	Low Life	
		Side to Side Ariana Grande featuring Nicki Minaj	In the Night The Weeknd	Work Rihanna featuring	Wicked		Roses	Never	On	Cold	Lost	All In	
2 Phones Kevin Gates	Starboy The Weeknd featuring Daft Punk	Treat You Better Shawn Mendes	Watch Me Silentó	I Know Wh You Did Las Summer	55.00	400	The	Be Like Whe We	2008		Boy Ruth	My Head Like I'm	
Gold Kiiara	Drake Drake	Pop Style	We Don't Talk Anymore Charlie Puth	O.T. Genas featuring What Do You Mean?	Nick Jo Ou Can't S	Jonas 7 Y				Ride	Le [*]		
Don't Mind		Drake featuring The Throne	Broccoli D.R.A.M. featuring Lil	Really Rea Kevin Gate	Lean Oi								
Kent Jones	Daya	No Meghan Trainor	I Took a Pill in Ibiza Mike Posner	Starving Hailee	No Lim	My H		Se Mid	dle	lello	Let It G		

ATTR(Tempo)

7/1 8	100 1
/4.0	190.1

Caption

Song and Artist. Color shows Tempo as an attribute. Size shows Speechiness as an attribute. The marks are labeled by Song and Artist.

Summary Count:

ATTR(Speechiness)
Average: (
Minimum: 0
Maximum: 0

Median: ATTR(Tempo)

Median:

Average:
Minimum:
Maximum:

120.6 74.8 190.1 117.6

100

0.1195

0.0286

0.4530

0.0789

Valence of 2016 Songs

Watch Me Silentó	My House Flo Rida	Don't Mind Kent Jones	Work from My Fa Home The Fifth Week Harmony featuring Sit Still, Look Pretty Daya		ace Justin Bieber		Ride Twenty One Pilots		end My ove (To our ew over)	2 Phones Kevin Gates		Hotline Bling Drake			Yo	ove ourself ustin ieber	
Cake by the Ocean DNCE	Sucker for Pain Lil Wayne, Wiz Khalifa and Imagine Dragons with Logic	Jumpman Drake and Future			Starving Hailee Cold Wate Major Lazer Same Old Love Selena Gomez Pillowtalk Zayn		Cold Wate	r The	irboy	One Ca Away Charlie	Away		This Wha		Wildes Dream Taylor	s (Ex's & Oh's Elle
Me Too Meghan Trainor	Cheap Thrills Sia featuring Sean Paul	Closer The Chainsmokers featuring Halsey	H.O.L.Y. Florida Georgia Line In the Night The Weeknd						Puth	We		Came For		10000		King	
What Do You Mean? Justin Bieber	Stitches Shawn Mendes	No Meghan Trainor					Up One Dance Drake			Don Talk	ı't	Boy Ruth B	The	Ye	ars Kas	in the DM Yo	
Treat You Better Shawn Mendes	Back to Sleep Chris Brown	Stressed Out Twenty One Pilots	Adventure of a Lifetime Coldplay			t Let N	le	Close Nick Jonas		Contro Drake White	lla						Lean On
All In My Head (Flex) Fifth Harmony featuring Fetty Wap	Broccoli D.R.A.M. featuring Lil Yachty	Side to Side Ariana Grande featuring Nicki	Work Rihanna featuring Drake		Like I'm Gonna Lose You		Into You Ariana		lverson Tiimmy Turner					Pa	nda	Luv Tory Lanez	
On My Mind Ellie Goulding	I Took a Pill in Ibiza Mike Posner	679 Fetty Wap featuring Remy	DJ Khaled Hands to Myself		Gold Kiiara		Me, Myself & I G-Eazy and Die a Happy		Dangerous Woman		No Limit		Say	17000	t It T.		
I Know What You Did Last Summer Shawn Mendes and	Can't Stop the Feeling! Justin Timberlake	Oui Jeremih	Just Like Fire		Perfect One Direction Too Good Drake		on	Man Hymn for the Weekend		Adele			Insteady		Don't		Ę

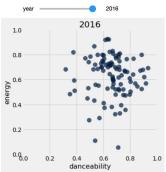
SUM(Energy) 0.0565 0.9280

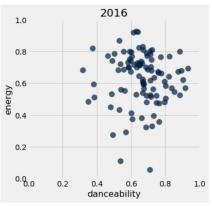
Link to Tableau Public

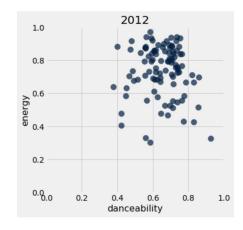
https://public.tableau.com/views/Spotify 10/Sheet1?:embed=y&:display count=yes

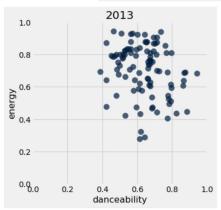
Time segments

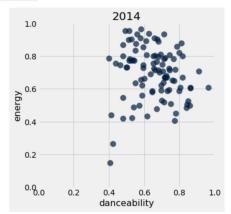


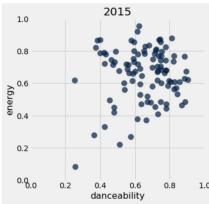




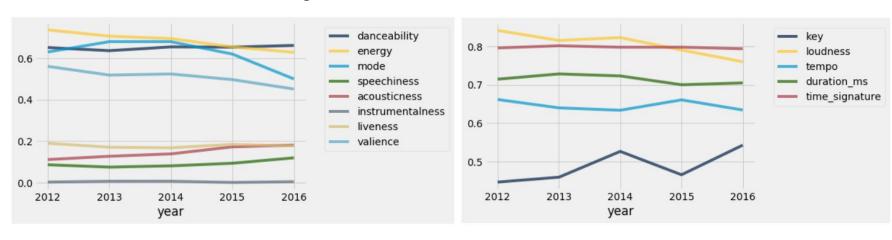








Trends across years



- energy is decreasing over years
- mode is decreasing over years
- valence is decreasing over years

Demo

Line Graphs

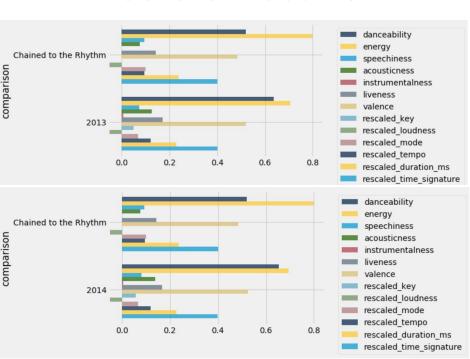
Prediction of the next popular song

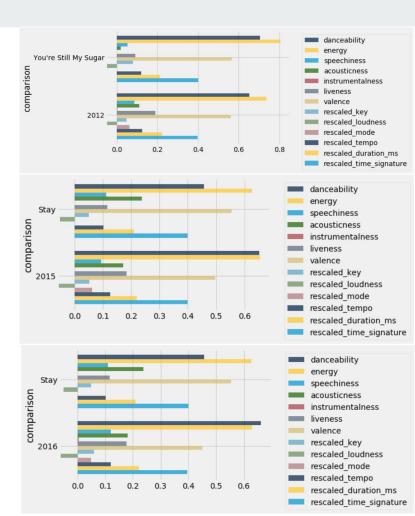
- Take averages of all features in comparison dataset (2012, 2013, etc.)
- Subtract averages from features of each song in 2017 dataset
- Find the song with the smallest total difference that's our predicted most popular song
- Limitation: predictor based solely on features of songs in comparison dataset
 - Doesn't take into account outside factors

Demo

Predictor

Predictor results

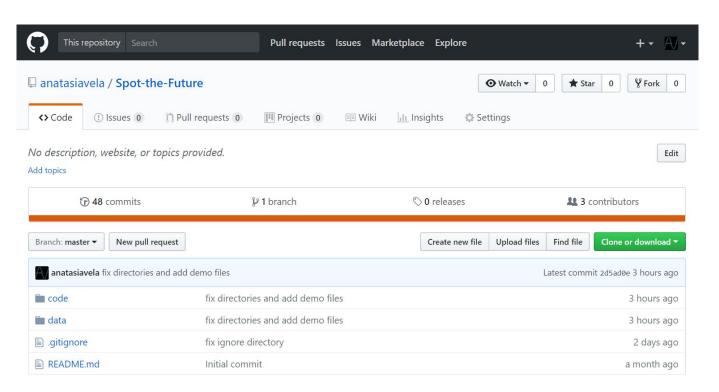




Predictor results

- Using 2016 dataset: Stay Zedd & Alessia Cara
- Using 2015 dataset: Stay Zedd & Alessia Cara
- Using 2014 dataset: Chained to the Rhythm Katy Perry ft. Skip Marley
- Using 2013 dataset: Chained to the Rhythm Katy Perry ft. Skip Marley
- Using 2012 dataset: You're Still My Sugar Maddie Ross





https://github.com/anatasiavela/Spot-the-Future

Findings

- Energy goes down from 2012 to 2016
- Most top songs have 0 instrumentalities
- Most top songs are 4/4
- More songs are having minor keys now at 50%
- ..

Limitations and what else we can do

- We have visualizations for top 100 songs but we don't have data for other songs no comparison
- Data might not be correct
- Generate visualizations across years and use more features on Tableau

Work Citation

https://github.com/plamere/spotipy

https://developer.spotify.com/web-api/get-several-audio-features/

https://www.billboard.com/charts/year-end

https://www.inferentialthinking.com/

http://spotipy.readthedocs.io/en/latest/#module-spotipy.oauth2