In this project I cleaned, visualized, and used linear regression model to see if there is any correlation between a songs popularity and its Spotify's song metrics to have a better understanding of this dataset. Its safe to assume that since amount of users on Spotify has seen exponential growth since the start of the decade (2010), the platforms users has grown from a niche market to a more mainstream market. Thus we see more accurate models in the later half of the decade rather than the beginning.

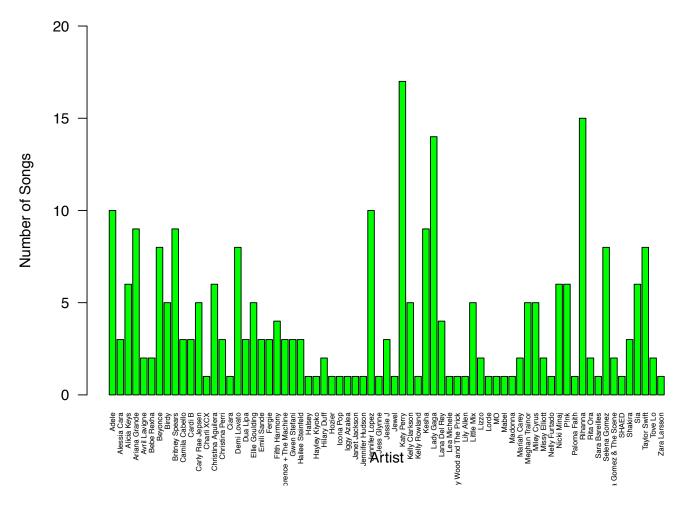
Listed below are all of 184 artists within this dataset, after cleaning levels with special characters:

[4] "Adam Lambert" "Alessa Cara" "Alesso" "Alicia Keys" [10] "Ansel Elgort" "Ariana Grande" "Alstin Mahone" [13] "Avicii" "Avrii Lavigne" "BoRNS" [16] "Bastille" "Bebe Rexha" "Beyonce" [19] "Birdy" "Britney Spears" "Bruno Mars" [22] "Carly Rae Jepsen" "Cashmere Cat" "Charli XCX" [28] "Charli Eputh" "Chris Brown" "Charli XCX" [28] "Charli Puth" "Chris Brown" "Christina Aguilera" [31] "Christina Perri" "Ciara" "Clean Bandit" [34] "CNCO" "Coldplay" "Daddy Yankee" [37] "Daft Punh" "Dan + Shay" "David Guetta" [40] "Demi Lovato" "Disclosure" "DJ Khaled" [43] "DJ Snake" "DNCE" "Drake" [49] "Emili Sande" "Eminem" "Eminem" "Enrique Iglesias" "Fift Hamony" "Fiorence + The Machine" "Guen Stefani" "Giara" "Guen For" "Guen Fund Fund Fund Fund Fund Fund Fund Fun	[1] "30H!3"	"5 Seconds of Summer"	"A Great Big World"
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[10]				
[13] "Avricii"				
[16] "Bastille" "Bebe Rexha" "Bruno Mars" [19] "Birdy" "Britney Spears" "Bruno Mars" [25] "Carly Rae Jepsen" "Cashmere Cat" "Charli E Puth" [28] "Charlie Puth" "Chris Brown" "Christina Aguilera" [31] "Christina Perri" "Ciara" "Clean Bandit" [34] "CNCO" "Coldplay" "Daddy Yankee" [37] "Daft Punk" "Dan + Shay" "David Guetta" [40] "Demi Lovato" "Disclosure" "DJ Khaled" [43] "DJ Snake" "DNCE" "Drake" [46] "Dua Lipa" "Ed Sheeran" "Ellie Goulding" [49] "Emili Sande" "Eminem" "Enrique Iglesias" [52] "Far East Movement" "Fergie" "Fifth Harmony" [55] "Flo Rida" "Florence + The Machine" "fun." [58] "G-Eazy" "Galantis" "Hallee Steinfeld" "Halsey" [61] "Gym Class Heroes" "Hallee Steinfeld" "Halsey" [64] "Harry Styles" "Hayley Kiyoko" "Hilary Duff" [67] "Hot Chelle Rae" "Joss Glynne" "Jonas Parthur" [73] "Jamet Jackson				
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[76] "Jennifer Lopez" "Jess Glynne" "Jessie J" [79] "Jewel" "Joey Montana" "John Legend" [82] "John Newman" "Jonas Blue" "Jonas Brothers" [85] "Justin Bieber" "Justin Timberlake" "Kanye West" [88] "Katy Perry" "Kelly Clarkson" "Kelly Rowland" [91] "Kesha" "Khalid" "Kygo" [94] "Labrinth" "Lady Gaga" "Lana Del Rey" [97] "Lea Michele" "Lewis Capaldi" "Liam Payne" [100] "Lilly Wood and The Prick" "Lily Allen" "Little Mix" [103] "Lizzo" "Luris Fonsi" "Lukas Graham" [109] "Mo" "Mabel" "Macklemore & Ryan Lev [112] "Madonna" "MAGIC!" "Major Lazer" [115] "Mariah Carey" "Mark Ronson" "Maroon 5" [118] "Marshmello" "Martin Garrix" "Martin Solveig" [121] "Meghan Trainor" "Michael Jackson" "Mike Posner" [122] "N.E.R.D" "Naughty Boy" "Ne-Yo" [130] "Nelly Furtado" "Neon Trees" "Niall Horan" [131] "Nick Jonas" "Nicki Minaj" "Olly Murs" [136] "One Direction" "OneRepublic" "Owl City" [139] "P!nk" "Passenger"	[70]	"Iggy Azalea"	"J Balvin"	"James Arthur"
[79] "Jewel""Joey Montana""John Legend"[82] "John Newman""Jonas Blue""Jonas Brothers"[85] "Justin Bieber""Justin Timberlake""Kanye West"[88] "Katy Perry""Kelly Clarkson""Kelly Rowland"[91] "Kesha""Khalid""Kygo"[94] "Labrinth""Lady Gaga""Lana Del Rey"[97] "Lea Michele""Lewis Capaldi""Liam Payne"[100] "Lilly Wood and The Prick""Lily Allen""Little Mix"[103] "Lizzo""Luis Fonsi""Lukas Graham"[106] "Lost Frequencies""Luis Fonsi""Lukas Graham"[109] "MO""Mabel""Macklemore & Ryan Lev[112] "Madonna""MAGIC!""Major Lazer"[115] "Mariah Carey""Mark Ronson""Maron 5"[118] "Marshmello""Martin Garrix""Martin Solveig"[121] "Meghan Trainor""Michael Jackson""Mike Posner"[124] "Miley Cyrus""Missy Elliott""Mr. Probz"[127] "N.E.R.D""Naughty Boy""Ne-Yo"[130] "Nelly Furtado""Neon Trees""Niall Horan"[133] "Nick Jonas""Nicki Minaj""Oily Murs"[136] "One Direction""OneRepublic""Owl City"[139] "P!nk""Paloma Faith""Passenger"	[73]	"Janet Jackson"		"Jennifer Hudson"
[82] "John Newman""Jonas Blue""Jonas Brothers"[85] "Justin Bieber""Justin Timberlake""Kanye West"[88] "Katy Perry""Kelly Clarkson""Kelly Rowland"[91] "Kesha""Khalid""Kygo"[94] "Labrinth""Lady Gaga""Lana Del Rey"[97] "Lea Michele""Lewis Capaldi""Liam Payne"[100] "Lilly Wood and The Prick""Lily Allen""Little Mix"[103] "Lizzo""Luris Fonsi""Lorde"[106] "Lost Frequencies""Luis Fonsi""Lukas Graham"[109] "MO""Mabel""Macklemore & Ryan Lev[112] "Madonna""MAGIC!""Major Lazer"[115] "Mariah Carey""Mark Ronson""Maroon 5"[118] "Marshmello""Martin Garrix""Martin Solveig"[121] "Meghan Trainor""Michael Jackson""Mike Posner"[124] "Miley Cyrus""Missy Elliott""Mr. Probz"[127] "N.E.R.D""Naughty Boy""Ne-Yo"[130] "Nelly Furtado""Neon Trees""Niall Horan"[133] "Nick Jonas""Nicki Minaj""Olly Murs"[136] "One Direction""OneRepublic""Owl City"[139] "P!nk""Paloma Faith""Passenger"				
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[106] "Lost Frequencies" "Luis Fonsi" "Lukas Graham" [109] "MO" "Mabel" "Macklemore & Ryan Lev [112] "Madonna" "MAGIC!" "Major Lazer" [115] "Mariah Carey" "Mark Ronson" "Maroon 5" [118] "Marshmello" "Martin Garrix" "Martin Solveig" [121] "Meghan Trainor" "Michael Jackson" "Mike Posner" [124] "Miley Cyrus" "Missy Elliott" "Mr. Probz" [127] "N.E.R.D" "Naughty Boy" "Ne-Yo" [130] "Nelly Furtado" "Neon Trees" "Niall Horan" [133] "Nick Jonas" "Nicki Minaj" "Olly Murs" [136] "One Direction" "OneRepublic" "Owl City" [139] "P!nk" "Paloma Faith" "Passenger"				
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[124] "Miley Cyrus""Missy Elliott""Mr. Probz"[127] "N.E.R.D""Naughty Boy""Ne-Yo"[130] "Nelly Furtado""Neon Trees""Niall Horan"[133] "Nick Jonas""Nicki Minaj""Olly Murs"[136] "One Direction""OneRepublic""Owl City"[139] "P!nk""Paloma Faith""Passenger"				
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[139] "P!nk" "Paloma Faith" "Passenger"				
-				
			"Pitbull"	"R3HAB"
[142] "Pharrell Williams" "Pitbull" "R3HAB" [145] "RedOne" "Ricky Martin" "Rihanna"				
[143] "Rita Ora" "Robin Schulz" "Robin Thicke"				
[210] Made of Modern Condition (Condition Condition Cond	[110]	1.100 010	nozin bonatz	nozii ilitone

[151] "Rudimental"	"Sam Smith"	"Sara Bareilles"
[154] "Sean Kingston"	"Selena Gomez"	"Selena Gomez & The Scene"
[157] "SHAED"	"Shakira"	"Shawn Mendes"
[160] "Sia"	"Sigala"	"Silk City"
[163] "Sleeping At Last"	"Snakehips"	"Swedish House Mafia"
[166] "T.I."	"Taio Cruz"	"Taylor Swift"
[169] "The Black Eyed Peas"	"The Chainsmokers"	"The Script"
[172] "The Wanted"	"The Weeknd"	"Tinie Tempah"
[175] "Tove Lo"	"Train"	"Troye Sivan"
[178] "Usher"	"will.i.am"	"Wiz Khalifa"
[181] "Years & Years"	"Zara Larsson"	"ZAYN"
[184] "Zedd"		

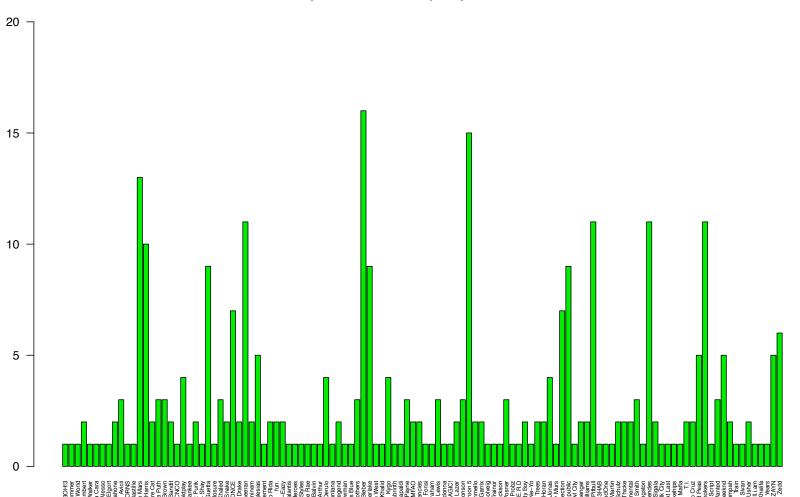
I wanted to see which artist had the most Top 50 songs and the top genre throughout the decade. To organize the data I subsetted the artist by genders, used the plot function to visualize, included the summaries of each gender, and followed with a graph of the top genres.

Top Female Artist on Spotify: 2010-2019



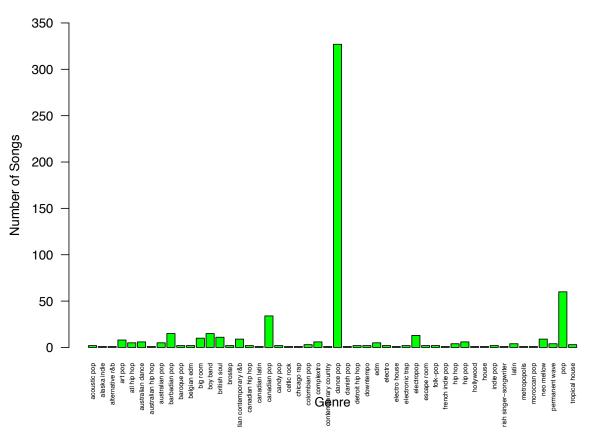
x			title		artis	t	top.	genre
Min. : 3.0	A Little Party	Never Killed No.	body (All We Got): 2 1	Katy Perry	: 17	dance	pop :185
1st Qu.:128.8	All I Ask			: 2 1	Rihanna	: 15	barbad	ian pop: 15
Median :270.5	Here			: 2	Lady Gaga	: 14	britis.	h soul : 11
Mean :280.9	We Are Never E	ver Getting Back	Together	: 2 1	Adele	: 10	pop	: 11
3rd Qu.:418.2	Ready For I	t? - BloodPop\xa	8 Remix	: 1 .	Jennifer L	opez: 10	art po	p:8
Max. :587.0	#Beautiful			: 1 2	Ariana Gra	nde : 9	canadi	an pop : 7
	(Other)			:266	(Other)	:201	(Other) : 39
year	bpm	nrgy	dnce	di	В	liv	re	val
Min. :2010	Min. : 0.0	Min. : 0.00	Min. : 0.00	Min.	:-60.000	Min. :	0.00	Min. : 0.00
1st Qu.:2012	1st Qu.:100.0	1st Qu.:60.00	1st Qu.:56.00	1st Qu.	: -6.000	1st Qu.:	9.00	1st Qu.:33.00
Median :2014	Median :120.0	Median :73.00	Median :65.00	Median	: -5.000	Median :	13.00	Median :51.00
Mean :2014	Mean :120.4	Mean :69.23	Mean :63.53	Mean	: -5.641	Mean :	17.92	Mean :50.16
3rd Qu.:2016	3rd Qu.:130.0	3rd Qu.:81.00	3rd Qu.:73.00	3rd Qu.	: -4.000	3rd Qu.:	24.00	3rd Qu.:68.25
Max. :2019	Max. :206.0	Max. :96.00	Max. :97.00	Max.	: -2.000	Max. :	74.00	Max. :96.00
dur	acous	spch	pop	gender				
Min. :157.0	Min. : 0.0	Min. : 0.000	Min. : 0.00	F:276				
1st Qu.:203.8	1st Qu.: 1.0	1st Qu.: 4.000	1st Qu.:56.75					
Median :221.0	Median : 5.0	Median : 5.000	Median :66.00					
Mean :225.8	Mean :14.2	Mean : 8.362	Mean :63.06					
3rd Qu.:243.0	3rd Qu.:16.0	3rd Qu.:10.000	3rd Qu.:73.25					
Max. :403.0	Max. :97.0	Max. :48.000	Max. :97.00					

Top Male Artist on Spotify: 2010-2019



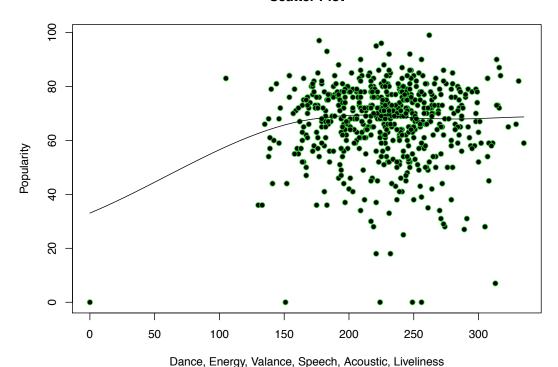
X			title	artist	top.genre	year
Min. : 1.0	Castle Walls (fe	eat. Christin	a Aguilera): 2	Justin Bieber: 16	dance pop :142	Min. :2010
1st Qu.:168.5	Company		: 2	Maroon 5 : 15	pop : 49	1st Qu.:2013
Median :323.0	First Time		: 2	Bruno Mars : 13	canadian pop: 27	Median :2015
Mean :319.8	Just the Way You	u Are	: 2	Ed Sheeran : 11	boy band : 15	Mean :2015
3rd Qu.:480.5	Kissing Stranger	rs	: 2	Pitbull : 11	electropop : 12	3rd Qu.:2017
Max. :603.0	Love Yourself		: 2	Shawn Mendes : 11	big room : 10	Max. :2019
	(Other)		:315	(Other) :250	(Other) : 72	!
bpm	nrgy	dnce	dB	live	val	dur
Min. : 65	Min. : 4.00 M	in. :26.0	Min. :-15.000	Min. : 2.00 N	4in. : 4.00 Min	: :134.0
1st Qu.:100	_	st Qu.:59.0	1st Qu.: -7.000		_	Qu.:202.0
Median :120		edian :67.0	Median : -5.000			lian :220.0
Mean :117		ean :65.1	Mean : -5.526		Mean :53.97 Mea	n :223.8
3rd Qu.:128	_	rd Qu.:74.0	3rd Qu.: -4.000	-	_	l Qu.:236.0
Max. :192	Max. :98.00 Ma	ax. :93.0	Max. : -2.000	Max. :70.00 N	Max. :98.00 Max	:. :424.0
acous	spch	pop	gender			
Min. : 0.00	-	Min. : 0.	3 · · · ·			
1st Qu.: 2.00		1st Qu.:64.				
Median : 7.00	_	Median :72.				
Mean :14.43	Mean : 8.355	Mean :69.	44			
3rd Ou.:17.50	3rd Qu.: 9.000	3rd Ou.:78.	00			
Max. :99.00		Max. :99.	00			





In my R code I go in depth with the analysis' and visualization by doing the same graphing process each year in the decade. But to avoid redundancy, we can skip to the the multiple linear regression models. The first model was built comparing popularity to Spotify's song metric variables which are listed as Danceability, Energy, Valance, Spechiness, Acousticness, and Liveliness. I used a scatter plot to observe the initial data, and I can see that there are some outliers. I created our first linear model, and summary to identify those outliers and remove them.

Scatter Plot



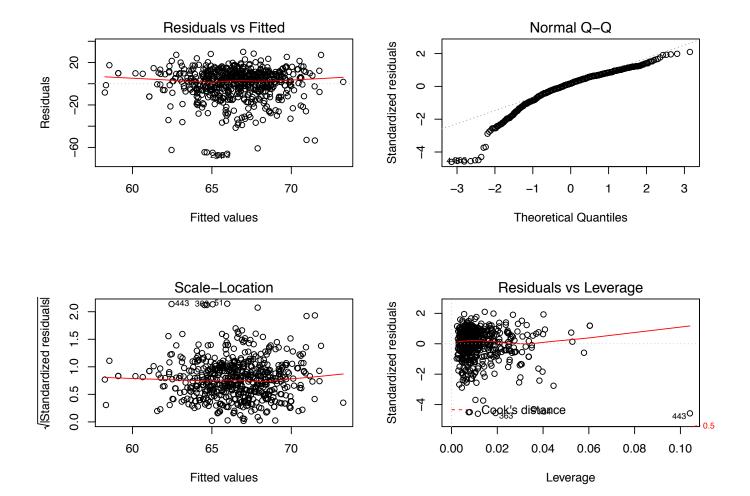
Call:
lm(formula = spotify\$pop ~ spotify\$dnce + spotify\$nrgy + spotify\$val +
spotify\$spch + spotify\$acous + spotify\$live, data = spotify)

Residuals:							
Min	10	Median	3Q	Max			
-65.968	-5.972	2.518	9.457	30.029			

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 62.459456 4.652240 13.426 <2e-16 ***
spotify\$dnce 0.133895 0.051995 2.575 0.0103 *
spotify\$nrgy -0.051024 0.047467 -1.075 0.2828
spotify\$val 0.006441 0.033010 0.195 0.8454
spotify\$pch -0.048667 0.080512 -0.604 0.5458
spotify\$acous 0.014787 0.034932 0.423 0.6722
spotify\$live -0.062050 0.046159 -1.344 0.1794

--Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

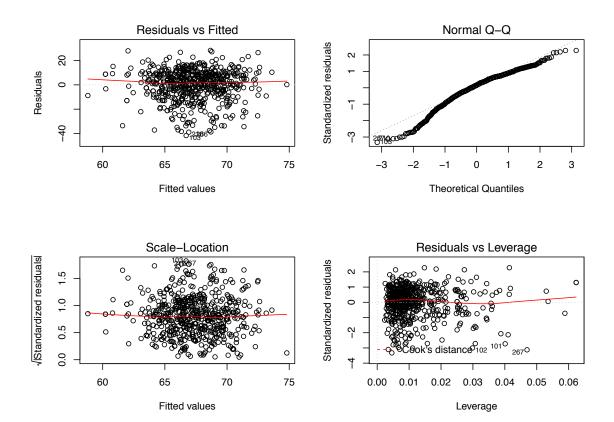
Residual standard error: 14.42 on 596 degrees of freedom Multiple R-squared: 0.02386, Adjusted R-squared: 0.01403 F-statistic: 2.428 on 6 and 596 DF, p-value: 0.02507



From this initial linear model I could clearly see which values are outliers (139,51,363,443,104,268,362,442). All of these have some kind of error in the data, but the majority of them have all values set at zero. These outliers could cause errors in the model, I reduce the dataset down by removing these values and building a new model.

Call: lm(formula = spotify2\$pop ~ spotify2\$dnce + spotify2\$nrgy + spotify2\$val + spotify2\$spch + spotify2\$acous + spotify2\$live, data = spotify2) Residuals: Median 3Q Max 8.665 28.331 -41.709 -6.458 1.981 Estimate Std. Error t value Pr(>|t|) 4.35515 15.997 < 2e-16 ** 69.66831 (Intercept) spotify2\$dnce 0.09859 0.04692 2.101 0.03603 * 0.00992 ** spotify2\$nrgy -0.11207 0.04332 -2.587 spotify2\$val 0.01772 0.02901 0.611 0.54147 spotify2\$spch -0.04911 0.07100 -0.692 -0.522 spotify2\$acous -0.01642 0.03148

Residual standard error: 12.57 on 588 degrees of freedom Multiple R-squared: 0.03374, Adjusted R-squared: 0.02388 F-statistic: 3.422 on 6 and 588 DF, p-value: 0.0025



When looking at the summary and models it is safe to reject the null hypotheses, thus there seems to be no correlations in a songs attributes and its popularity. This is more than likely inferred by the fact that the popularity of a lot of these songs are based on the how popular the artist is. So in conclusion this model would not be efficient to use. However moving forward I will reduce the dataset down to the songs by artist that only appear once. From there I can see if there is any correlations since there will not be any artist popularity bias.