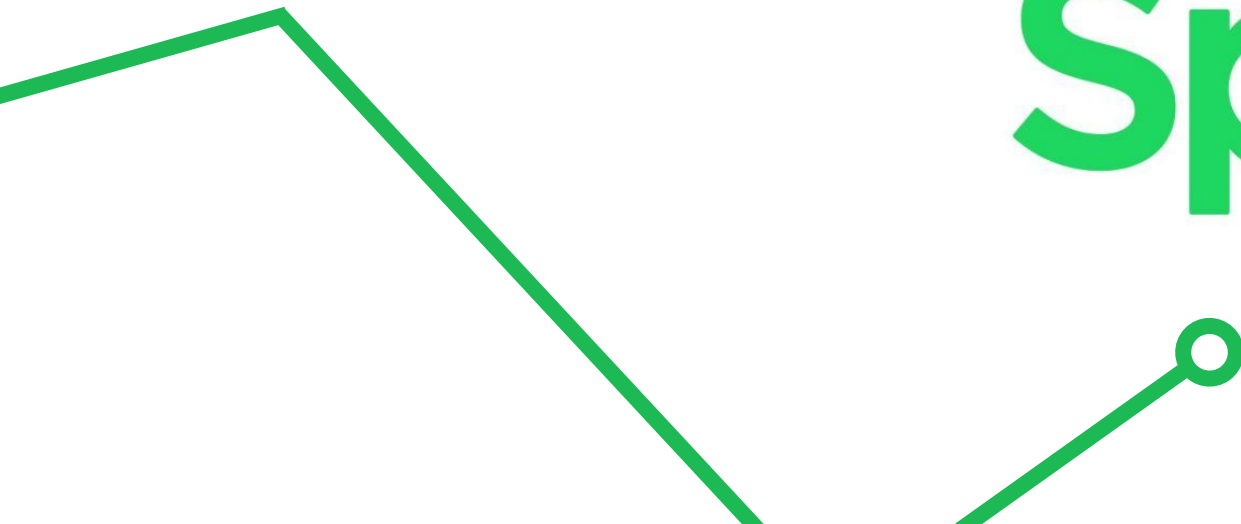COVID on Music Trends

Team 059

What observable trend in popular music characteristics (danceability, valence, and energy) are there in 2020 with relationship to COVID in America?

Definitions from Spotify

Danceability: Danceability describes how suitable a track is for dancing based on a combination of musical elements including tempo, rhythm stability, beat strength, and overall regularity.

Valence: Describes the musical positiveness conveyed by a track.

Energy: Represents a perceptual measure of intensity and activity.

Hypothesis : The pandemic will impact the trends in popularity of music such that there will be a decrease in energy, valence, and danceability.

Collecting Our Data

+ SPOTIPY

= OUR SPOTIFY DATA

```
# Merges Top 100 Charts dataset with audio features dataset
spfy_df = pd.merge(cleaned_Spotify_data, spfy_aud_fts, how='outer', on='Song ID').drop_duplicates().reset_index(drop=True)
spfy_df.head(50)
```

|	Artist	Song ID	Y-M	Streams	danceability	energy	liveness	valence	tempo
0	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-01	93755490.0	0.896	0.586	0.7900	0.642	116.971
1	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-02	72265595.0	0.896	0.586	0.7900	0.642	116.971
2	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-03	55449203.0	0.896	0.586	0.7900	0.642	116.971
3	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-04	38885200.0	0.896	0.586	0.7900	0.642	116.971
4	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-05	30457935.0	0.896	0.586	0.7900	0.642	116.971
5	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2019-12	28913265.0	0.896	0.586	0.7900	0.642	116.971
6	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-06	24209922.0	0.896	0.586	0.7900	0.642	116.971
7	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-07	19990193.0	0.896	0.586	0.7900	0.642	116.971
8	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-08	16065623.0	0.896	0.586	0.7900	0.642	116.971
9	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-09	13294289.0	0.896	0.586	0.7900	0.642	116.971
10	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-12	13293449.0	0.896	0.586	0.7900	0.642	116.971
11	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-10	12410050.0	0.896	0.586	0.7900	0.642	116.971
12	Roddy Ricch	0nbXyq5TXYPCO7pr3N8S4I	2020-11	10815487.0	0.896	0.586	0.7900	0.642	116.971
13	Drake	2XW4DbS6NddZxRPm5rMCeY	2018-02	91577284.0	0.758	0.448	0.5580	0.373	77.176
14	Drake	2XW4DbS6NddZxRPm5rMCeY	2018-03	78842514.0	0.758	0.448	0.5580	0.373	77.176
15	Drake	2XW4DbS6NddZxRPm5rMCeY	2018-04	53438946.0	0.758	0.448	0.5580	0.373	77.176
16	Drake	2XW4DbS6NddZxRPm5rMCeY	2018-01	47776839.0	0.758	0.448	0.5580	0.373	77.176
17	Drake	2XW4DbS6NddZxRPm5rMCeY	2018-05	39806772.0	0.758	0.448	0.5580	0.373	77.176
18	Drake	2XW4DbS6NddZxRPm5rMCeY	2018-06	10378012.0	0.758	0.448	0.5580	0.373	77.176
19	Ariana Grande	2rPE9A1vEgShuZxxzR2tZH	2018-11	72287799.0	0.724	0.647	0.1020	0.435	106.960
20	Ariana Grande	2rPE9A1vEgShuZxxzR2tZH	2018-12	52663259.0	0.724	0.647	0.1020	0.435	106.960
21	Ariana Grande	2rPE9A1vEgShuZxxzR2tZH	2019-01	34807538.0	0.724	0.647	0.1020	0.435	106.960
22	Ariana Grande	2rPE9A1vEgShuZxxzR2tZH	2019-02	6403903.0	0.724	0.647	0.1020	0.435	106.960
23	Cardi B	4Oun2ylbjFKMPTiaSbbCih	2020-08	65529628.0	0.935	0.454	0.0824	0.357	133.073
24	Cardi B	4Oun2ylbjFKMPTiaSbbCih	2020-09	56650826.0	0.935	0.454	0.0824	0.357	133.073

Cleaning✨
✨Our Data

COVID DATA
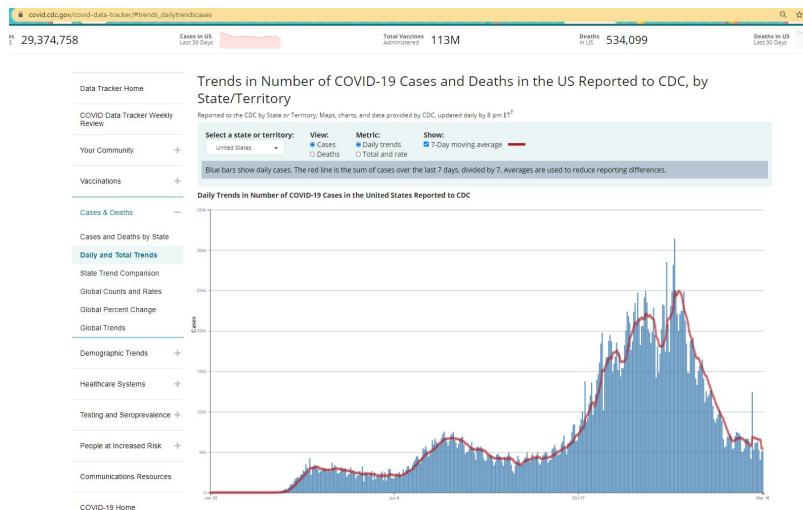
	New Cases
January	7
February	19
March	185738
April	875874
May	725045
June	839720
July	1923978
August	1471428
September	1214505
October	1917063
November	4435050
December	6355178
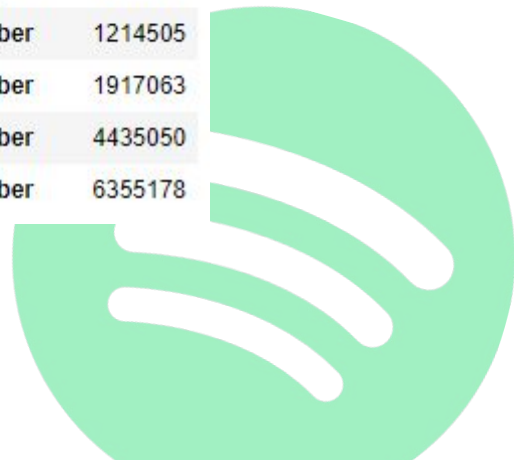
Creating Dataframe with Weighted Scores

Averaging the Scores per Month Weighed by Popularity

$$\text{Average Score} = \frac{\sum(\text{\# of streams in month} * \text{the characteristic score})}{\text{Total \# of streams in month}}$$

*Observing the months from all three years: 2018, 2019, 2020

Observing Characteristics Over Time
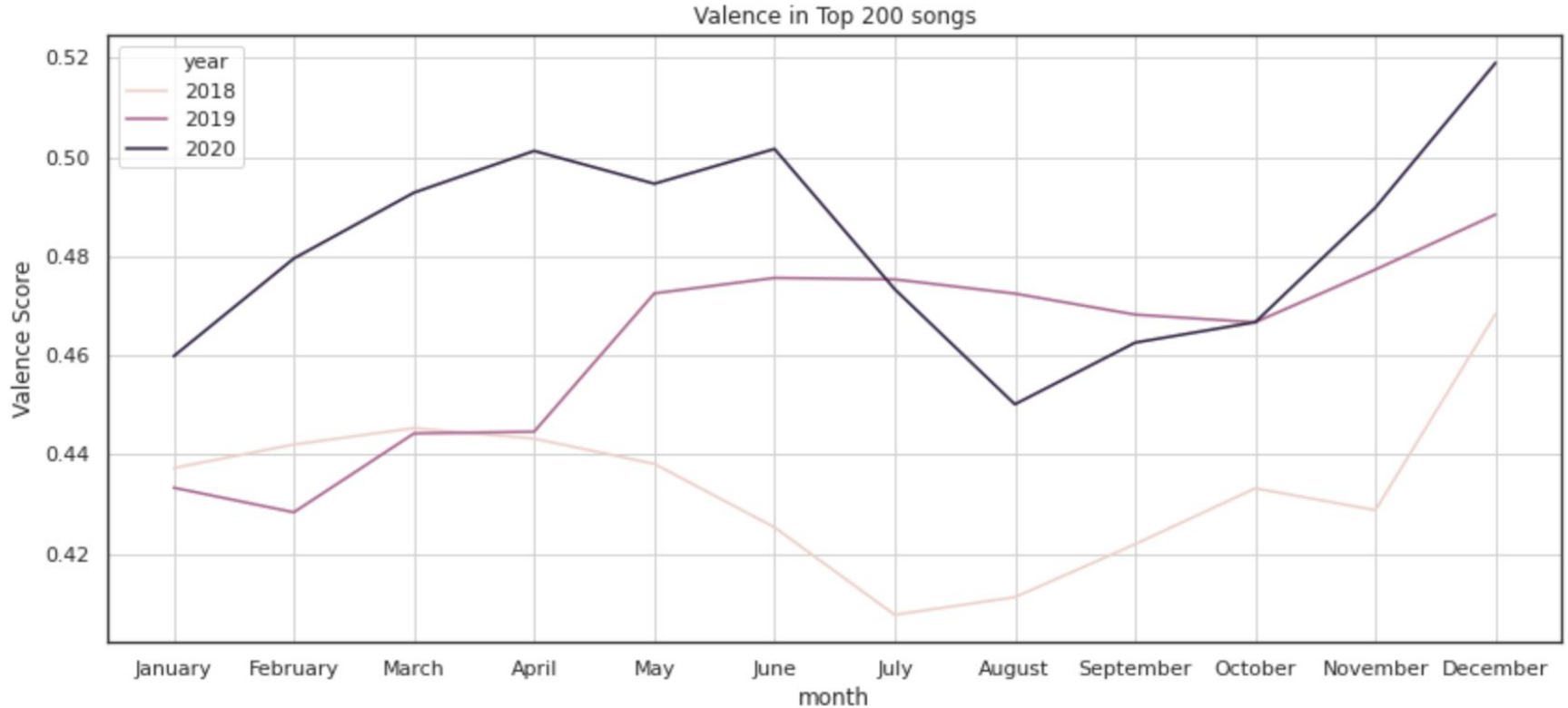
Valence in Top 200 songs

Observing Characteristics Over Time

Energy in Top 200 songs

Observing Characteristics Over Time

Danceability in Top 200 songs
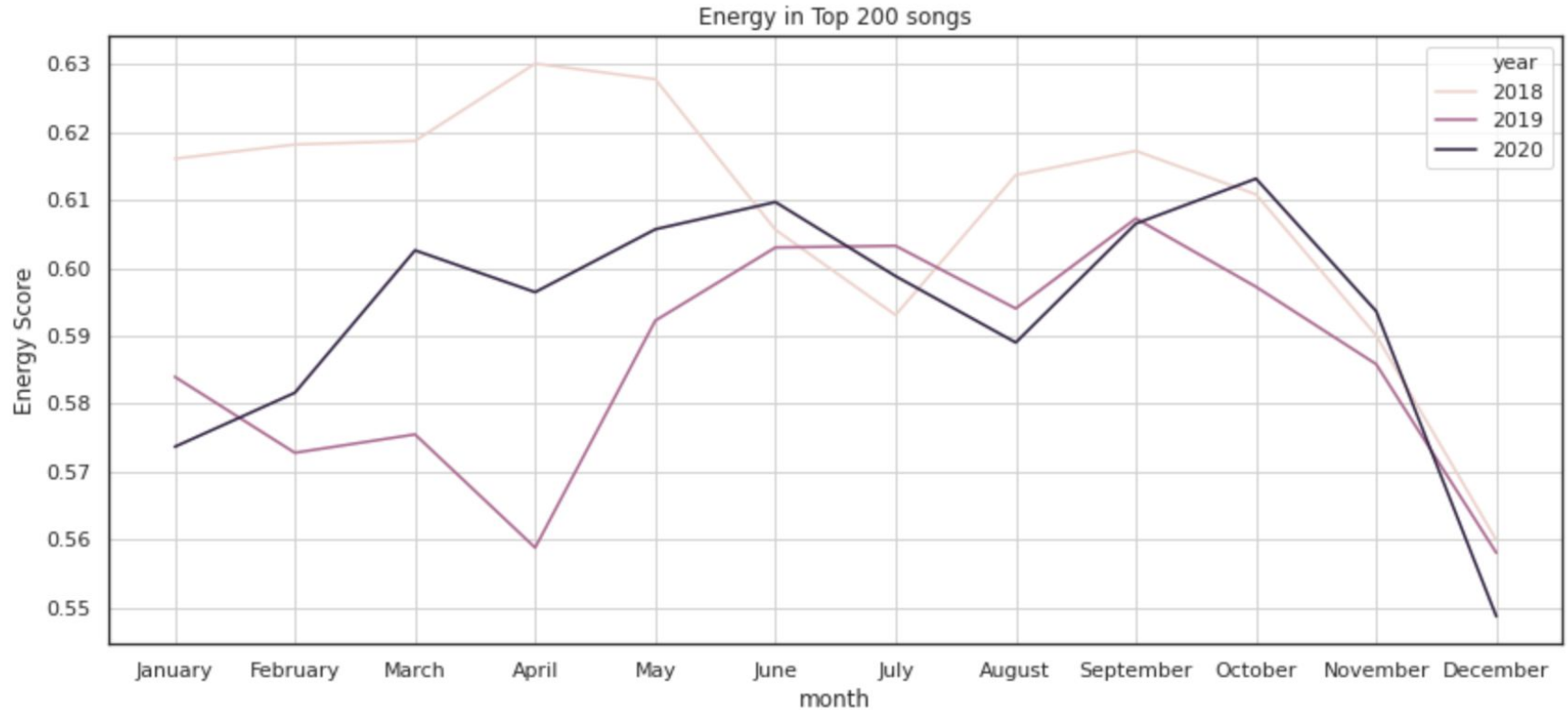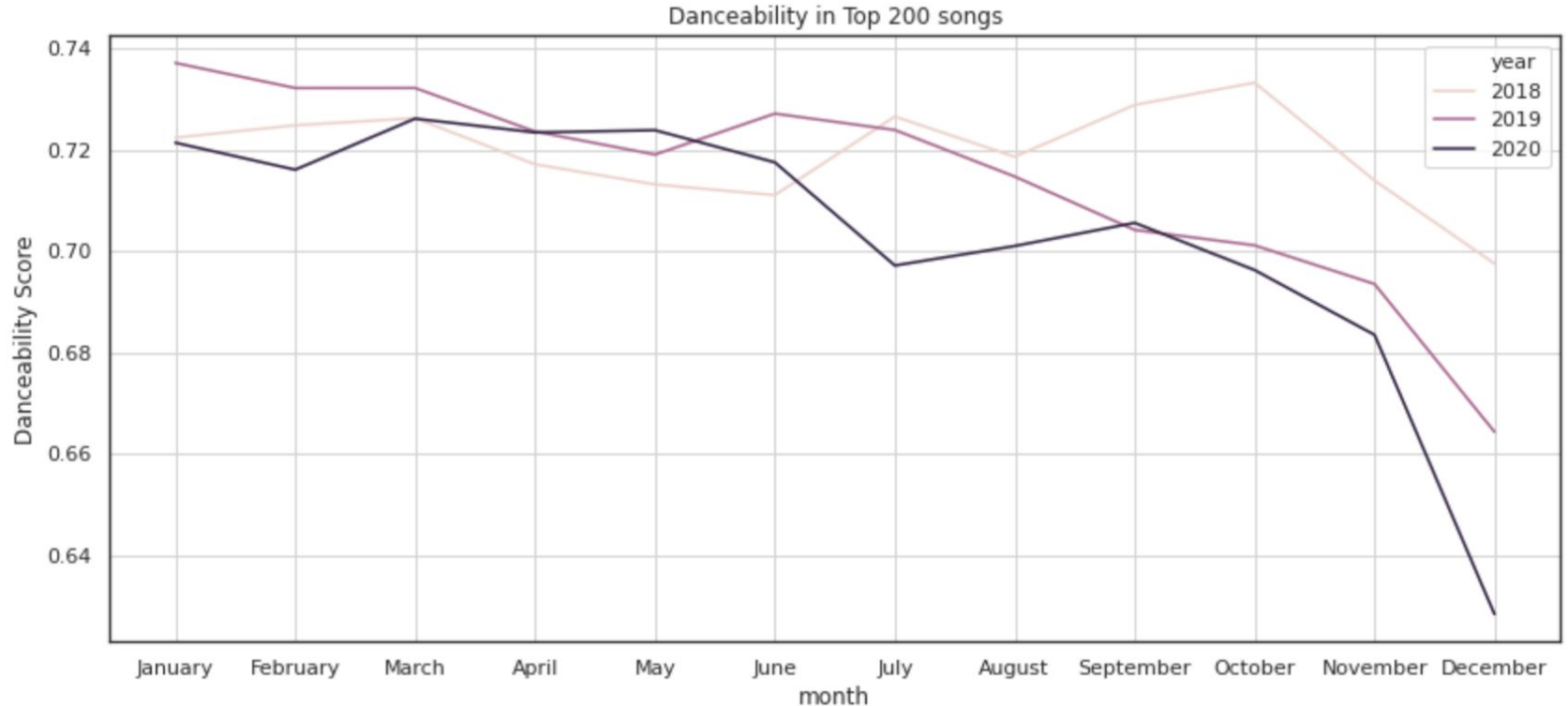
Creating Prediction Models using 2018 and 2019 Data

Popular Song Characteristics of 2018

Training Data

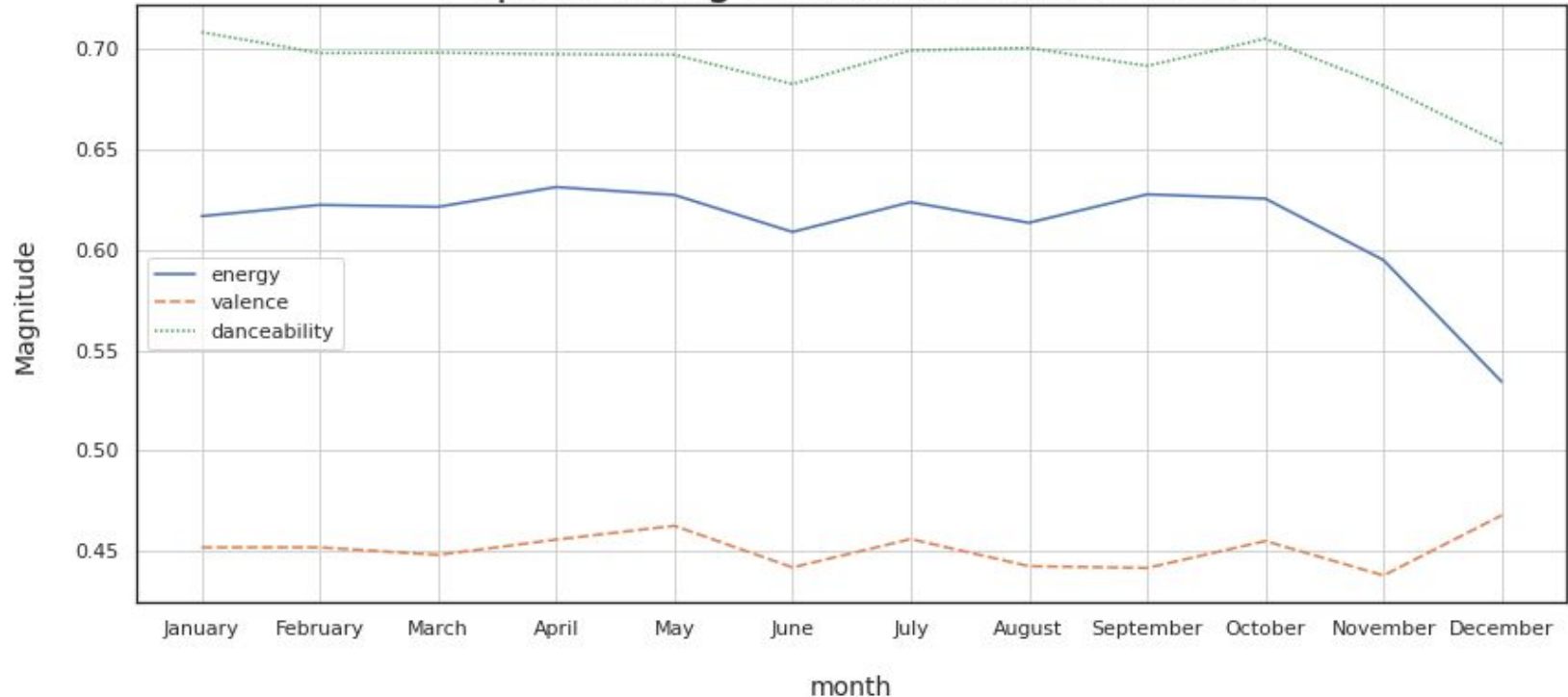|	Y-M	Streams	danceability	energy	liveness	valence	tempo	year	month
0	2018-01	6.339670e+06	0.703231	0.626394	0.162790	0.465629	122.368439	2018	1
1	2018-02	6.080714e+06	0.699052	0.626265	0.159527	0.450323	121.680185	2018	2
2	2018-03	6.973427e+06	0.706458	0.624494	0.160966	0.446990	121.333956	2018	3
3	2018-04	7.379541e+06	0.700762	0.631885	0.162830	0.455984	123.469019	2018	4
4	2018-05	6.873759e+06	0.704158	0.634152	0.168036	0.450590	123.543713	2018	5
5	2018-06	6.510328e+06	0.687520	0.611768	0.172345	0.441165	123.060591	2018	6
6	2018-07	6.774355e+06	0.702800	0.624400	0.163808	0.450406	124.721665	2018	7
7	2018-08	6.347477e+06	0.705790	0.618890	0.161552	0.440625	125.387524	2018	8
8	2018-09	6.483066e+06	0.695596	0.631386	0.177626	0.439938	123.775465	2018	9
9	2018-10	6.565752e+06	0.710465	0.618027	0.180601	0.447600	123.531236	2018	10
10	2018-11	5.359221e+06	0.681706	0.597148	0.184165	0.439475	120.678217	2018	11
11	2018-12	6.135555e+06	0.667853	0.552151	0.172433	0.467763	121.724368	2018	12
12	2019-01	7.637782e+06	0.720253	0.605091	0.166987	0.452427	124.130356	2019	1
13	2019-02	7.450329e+06	0.715320	0.588305	0.159622	0.425358	122.208201	2019	2
14	2019-03	7.113443e+06	0.711204	0.601513	0.172869	0.444520	122.552204	2019	3
15	2019-04	7.081687e+06	0.695689	0.601958	0.176968	0.443421	120.932923	2019	4
16	2019-05	6.483490e+06	0.688556	0.629700	0.182094	0.472998	120.428149	2019	5
17	2019-06	6.179680e+06	0.706309	0.611712	0.170097	0.474281	119.572765	2019	6
18	2019-07	6.361440e+06	0.702709	0.623016	0.178264	0.485097	120.016724	2019	7

Using Prophet

- "Prophet is an open source library published by Facebook that is based on decomposable (trend+seasonality+holidays) models."
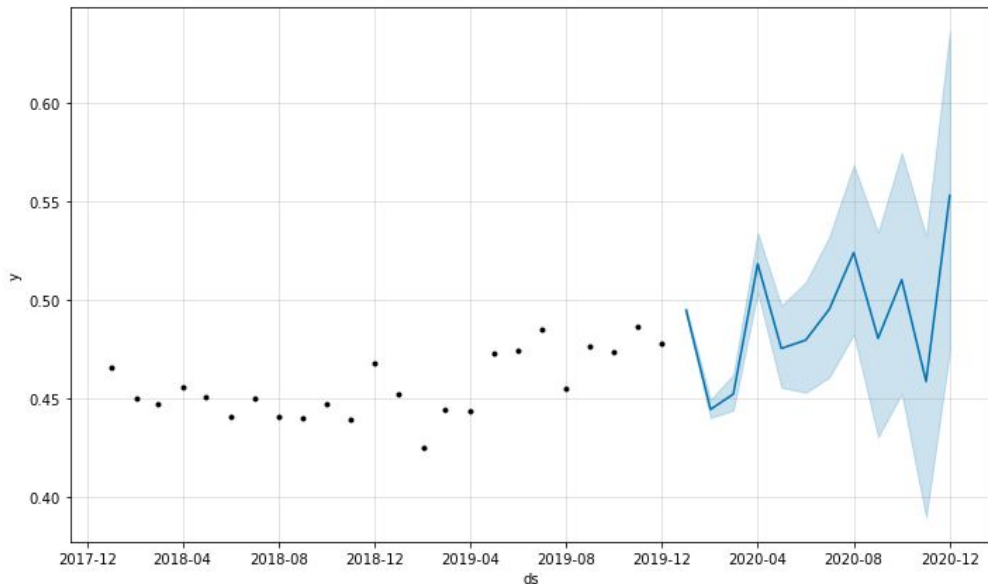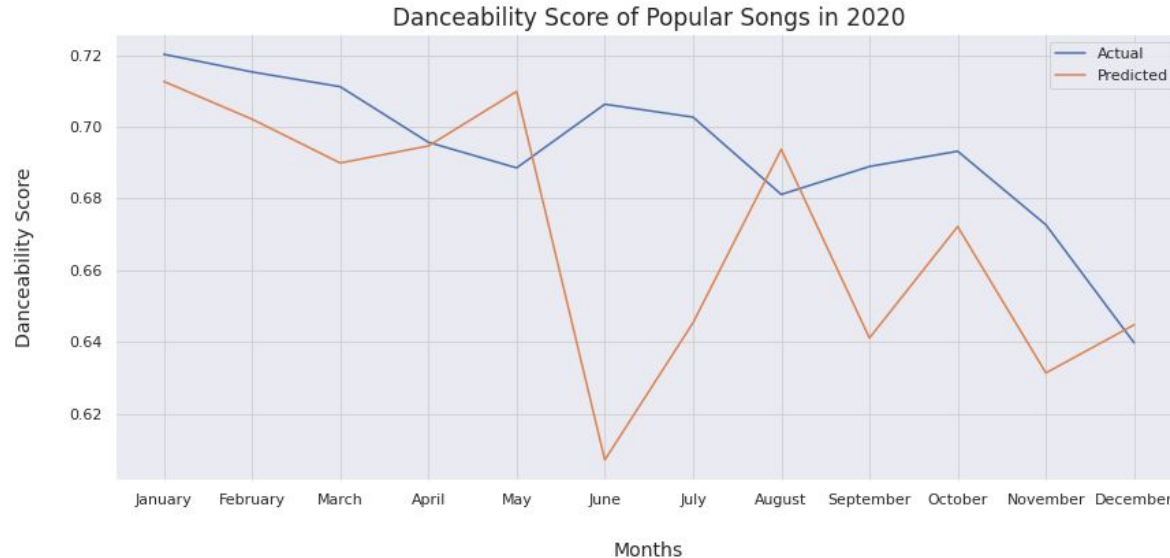
Valence, 2020 Prediction vs Actual

Valence Score of Popular Songs in 2020
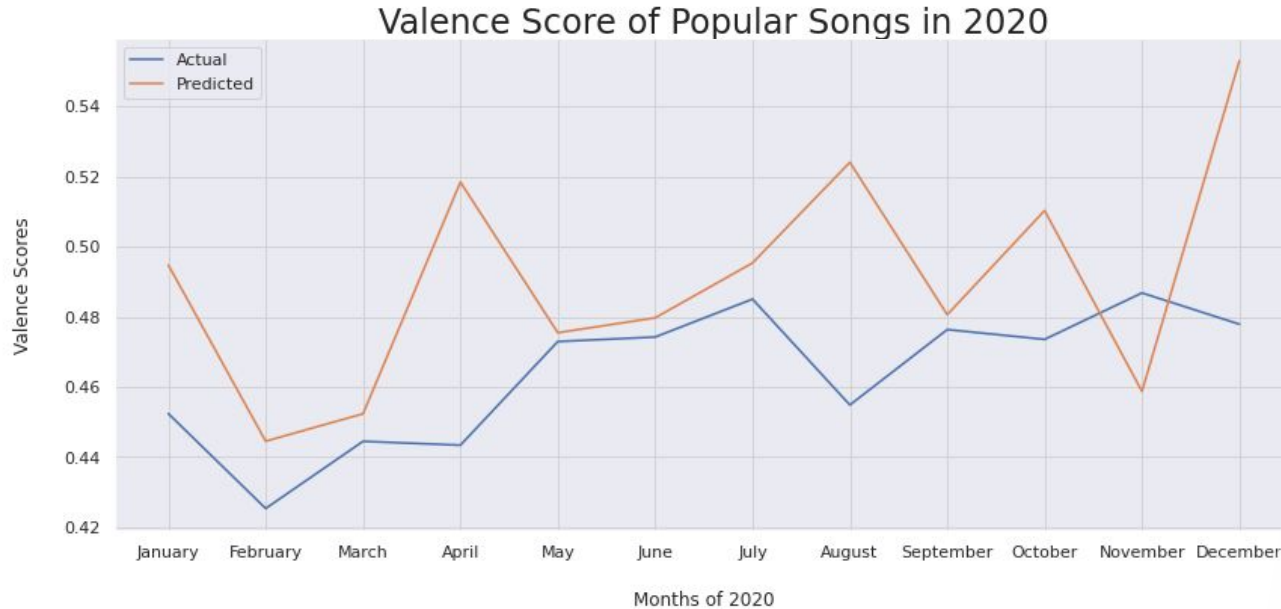
KS t-test for distributions:
t(11) = 0.5, p > 0.05 (n.s.)

Spearman's R for correlation:
r(11) = 0.13, p > 0.05 (n.s.)
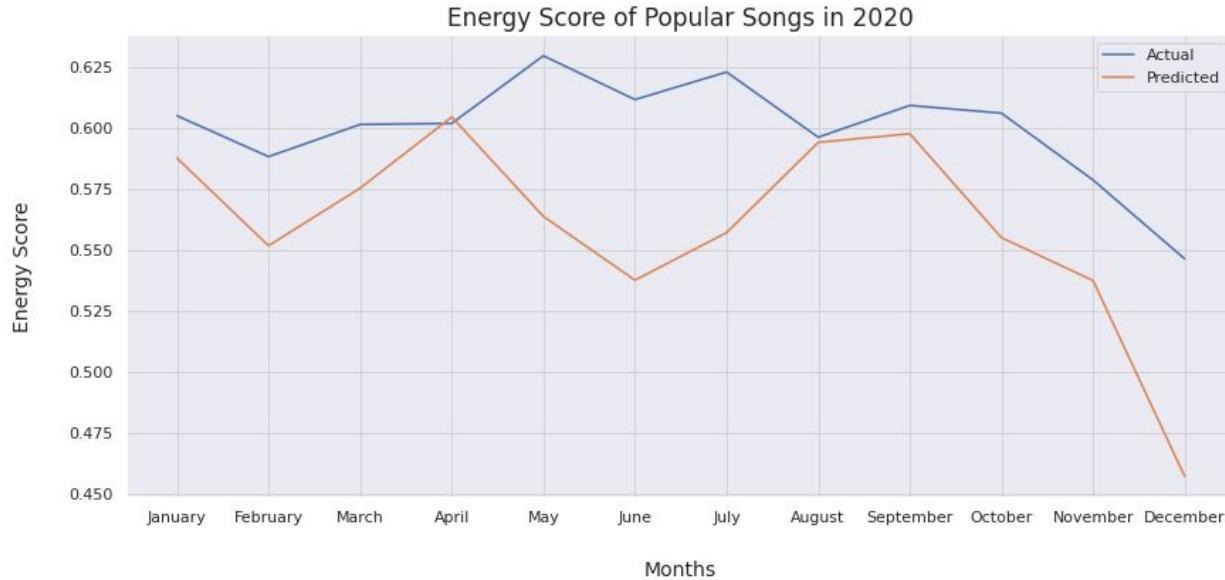
Danceability, 2020 Prediction vs Actual

Danceability Score of Popular Songs in 2020

KS t-test for distributions:
t(11) = 1.0, p < 0.05 (significant)

Spearman's R for correlation:
r(11) = -0.44, p > 0.05 (n.s.)

Energy, 2020 Prediction vs Actual

Energy Score of Popular Songs in 2020

KS t-test for distributions:
t(11) = 0.92, p < 0.05 (significant)
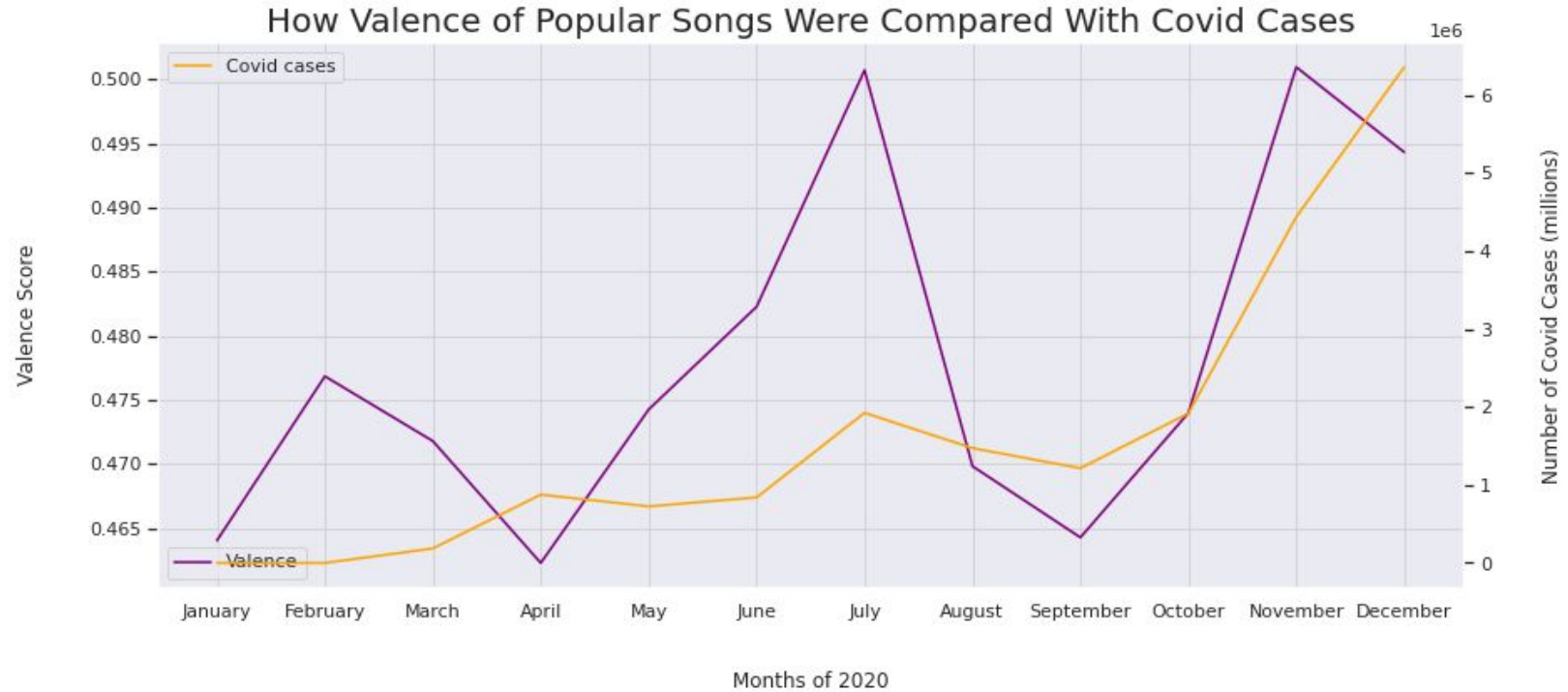
Spearman's R for correlation:
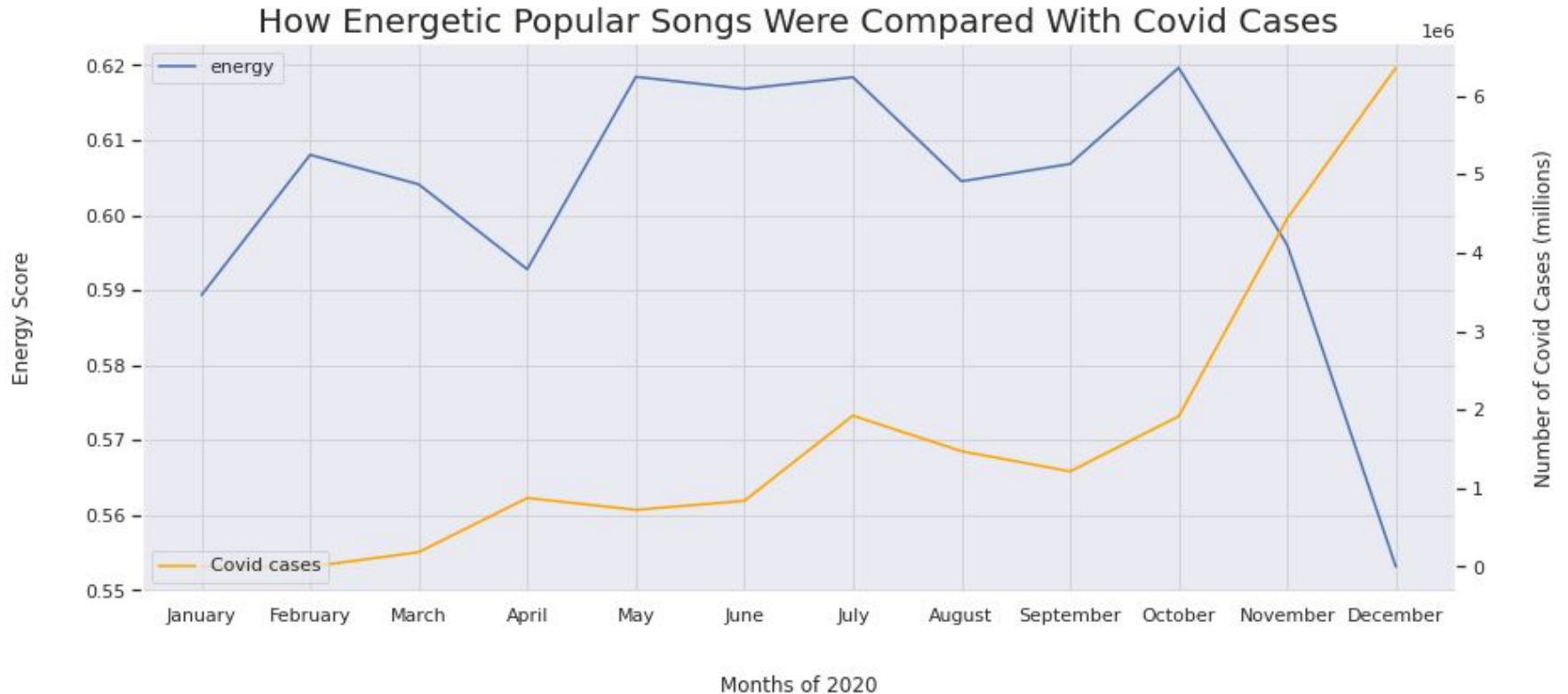r(11) = -0.09, p > 0.05 (n.s.)

Prediction Model Tests Interpretation

- Actual 2020 **<u>Valence</u>** scores are **not significantly** different than the 2020 Prediction. Probably no correlation.

- Actual 2020 **<u>Danceability</u>** scores are **significantly** different than the 2020 Prediction. Probably no correlation.

- Actual 2020 **<u>Energy</u>** scores are **significantly** different than the 2020 Prediction. Probably no correlation.

  - Suggests that the pandemic could have influenced song energy and danceability, but not valence.

Analyzing the Covid Data
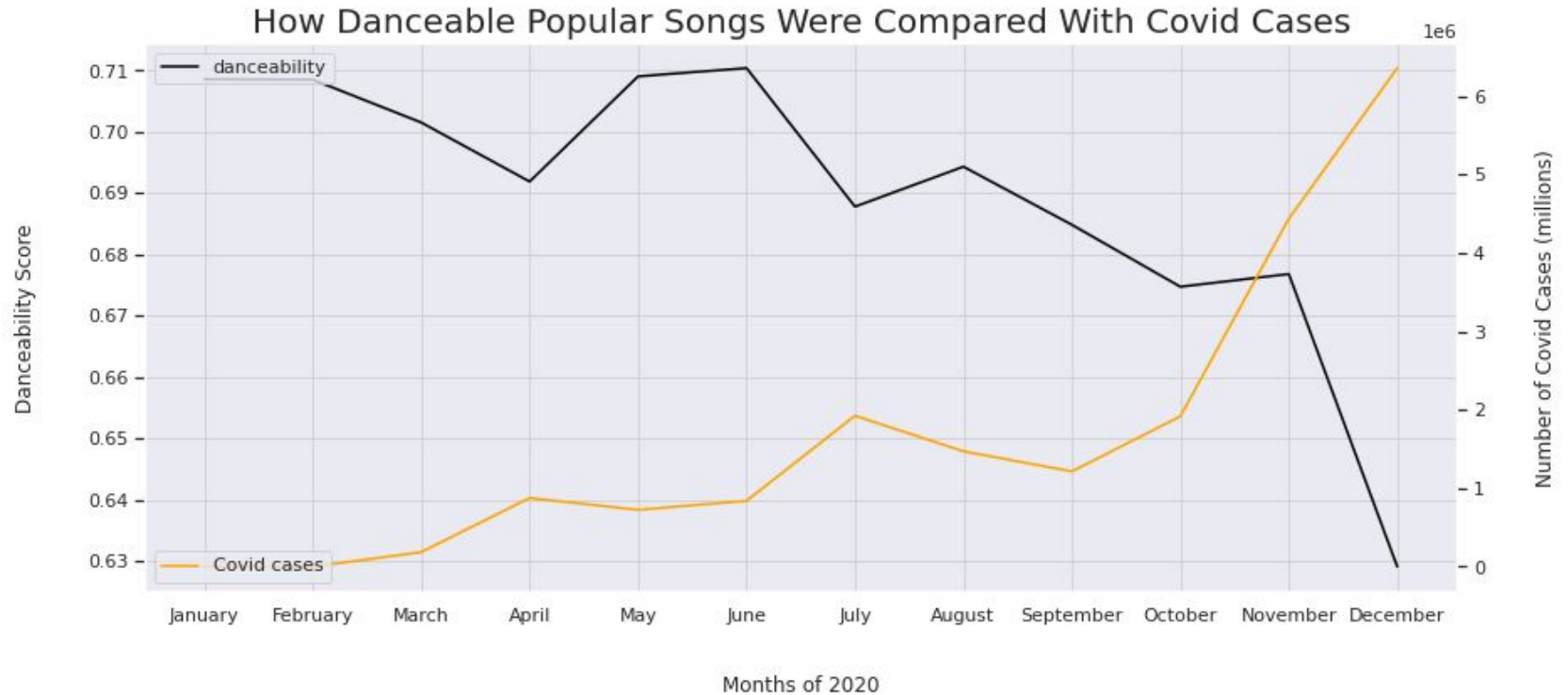

How Valence of Popular Songs Were Compared With Covid Cases

Analyzing the Covid Data

How Energetic Popular Songs Were Compared With Covid Cases

Analyzing the Covid Data

How Danceable Popular Songs Were Compared With Covid Cases

Ethical/Privacy/Bias Concerns

The data we're using is going to be from publicly available Spotify and Covid data. By exclusively using publicly available data, we do not expect to violate any ethical or privacy concerns.

As the result of our study, we are aware of the concern how our dataset may introduce a bias in music tastes. And by no means, do we intend for our data to impact the music that the public listens to satisfy their emotional and musical needs.

In Conclusion

There is a decreasing trend in Danceability and Energy scores in the 2020 top Spotify hits that may be attributed to the Pandemic.

This discovery may inspire further research in what other characteristics may be impacted by historical events and the direction of the population's sentiments.

Music industries may also apply the popular characteristics to better appeal to the mass.