Spotify Playlist Analysis with Song Recommendation

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Overview

This project aims to analyze & compare song features within my curated playlist vs. Spotify playlists

- Followed by selecting a model that can best predict song inclusion in my playlist
- We also explore different song recommendation options

Outline

- Business Problem

- Data

- Methods Used

- Song Recommenders

- Conclusions

- Recommendations

- Next Steps

Business Problem

Spotify is a digital music, podcast, and video service that gives you access to millions of songs and other content from creators worldwide.

Content recommendation is vital for its success and maintaining user satisfaction.

Data

1. My curated playlist

   a. 204 songs & counting

   b. Built up over years

2. Spotify curated

   Playlists

   a. Based on listening history

   b. Inspired by music taste

Based on your recent listening

lofi beats
Let yourself be sunkissed with beats to chill, relax,...

Music for Plants
Mellow vibrations for green leaves, green thumbs and...

Indie Sunshine
Fun in the sun with these indie pop jams!

Lowkey
just chill... respectfully

golden hour with ari elkins
For me, golden hour is all about being surrounded by...

Lofi Hip-Hop
Lofi's crispiest beatmakers. Cover: Cookin Soul

RetroWave / Outrun
Equal parts nostalgic synthwave sounds and...

chill lofi study beats
The perfect study beats, twenty four seven.

Electronica Romantica
Delicate digital expressions of the heart.

Brain Food
Hypnotic electronic for studies and a relax.

Jazz Vibes
The original chill instrumental beats playlist.

metaverses
01110000 01101100 01100001 01111001 0110110...
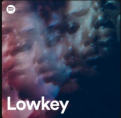
Chill Vibes
Just chill...

Gold Instrumental Beats
Beats inspired by the golden era of hip hop.

The Lofi Garden
beats + birds = <3

More of what you like

Lowkey
just chill... respectfully

golden hour
For me, golden hour is all about being surrounded by...
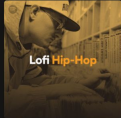
Lofi Hip-Hop
Lofi's crispiest beatmakers. Cover: Cookin Soul
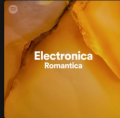
Electronica Romantica
Delicate digital expressions of the heart.
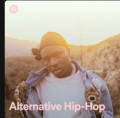
Alternative Hip-Hop
New, leftfield, and for the real hip-hop stans! Cover:...
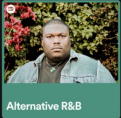
Alternative R&B
These progressive R&B and soul tracks can't be put in a...

floating
Lay back. Chill out.

Serotonin
100% good vibes.
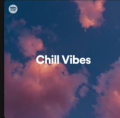
Chill Vibes
Just chill...

Poolside Disco
Disco, house, funk and soul for the good times.

Gold Instrumental Beats
Beats inspired by the golden era of hip hop.

French Touch
Some of the biggest french touch classics! Cover: Daft...

park hangs
Spring has SPRUNG. Time to vibe outside

POLLEN
Genre-less. Quality first always. Cover: Flume

Modern Psychedelia
The best of modern psychedelic rock, neo-...

'fit check

Nu-Funk
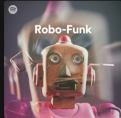
Robo-Funk
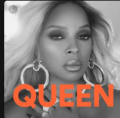
Queen

Levitate

Methods Used

- Spotify API

- Feature Evaluation on both datasets

- Feature Correlation

- Scikit Learn

- Content Based Recommendation

Conclusions

What I Discovered in my Playlist

- Energy, instrumentalness, acousticness, & loudness have the most impact on playlist inclusion.

- Valence & danceability are a key feature

- Song length, speechiness, popularity & time signature are least relevant

- Energy & loudness are highly correlated
  - Songs with high energy tends to have an increasing rhythmic complexity

Conclusions

The best model is the Random Forests Classifier

- Random Forests had the best overall performance

- Highest ROC Curve & AUC Score

- SVM has fewer false positives than Logistic Regression while maintaining a similar True Positive rate.

- In this case, Decision Trees, despite accounting for class imbalances, seem to rely on automatically predicting for 0: songs not being in my playlist.

Model Output

Interpretation of Playlist Inclusion with a Support Vector Machine classifier:

- **506 True Negatives:** Songs not in my playlist
- **46 False Positives:** Predicted songs to be in my playlist, but are not present
- **20 False Negatives:** Predicted songs to not be in my playlist, but are present
- **24 True Positives:** Songs in my playlist
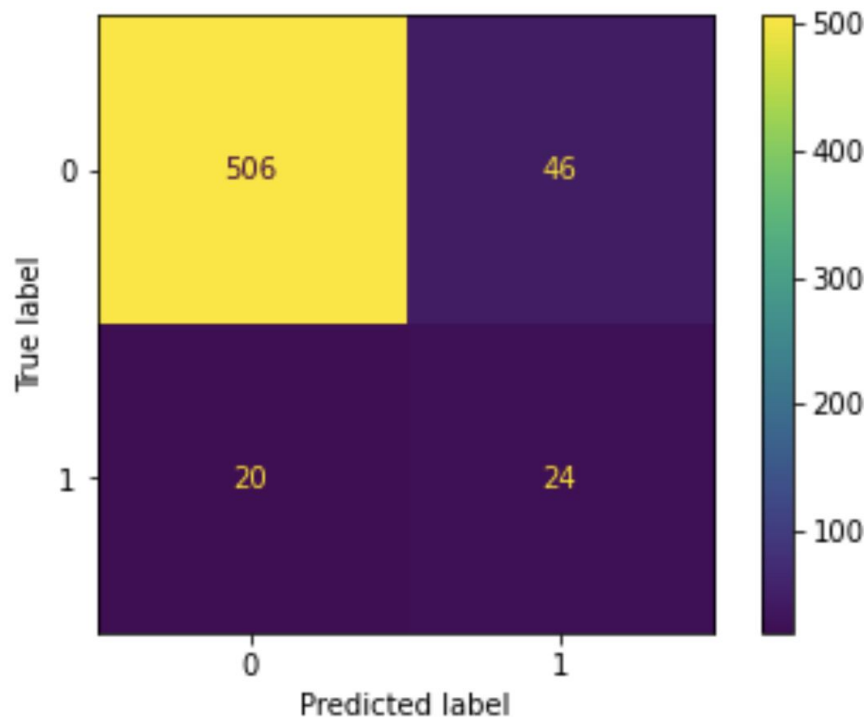
Recommender Conclusions

Though the two different recommenders return different results, there appears to be an agreement with some songs in their results.

Due to the songs having similar features throughout all variables, tracks that appear in both recommenders must be reliable matches

There are also some instances of recommended songs that are already present in my playlist. But that can be attributed to them being present in this dataset.

Recommender Comparisons

```
generate_recommendation('5:32pm',cosine)
```

```
Recommended Songs:
2688                 Tessin
2810            Hit Snooze
1500                 Kalmar
1599                   Nest
1192            Moving Day
2648              Aquarell
1569              Slanger
3746              Cruisin'
3687    pole mokotowskie
1546        Beside Myself
Name: name, dtype: object
```

```
recommender.get_recommendations('5:32pm', 10)
```

`100%|████████| 3968/3968 [00:00<00:00, 22409.02it/s]`

	name	artist
798	Retro Jam	Blu Tone
1274	Coolin'	Snazzy
1192	Moving Day	Paul Lovett
1599	Nest	don C
3877	intentions	shawn pink
1569	Slanger	pesto tree
1248	Sunset	Clifford
3931	Latitude	Xyla
1006	Padron Peppers	Burrito Eats
1175	When The Past Turned Present	Sebastian Kamae

```
generate_recommendation('Caliber',cosine)
```

```
Recommended Songs:
3647               Liza waited
2643              Sleepwalking
3744               florida keys
822                   Crescent
1155                     Algud
3818    City Lights Spell Your Name
2672              Portal Beach
974                  Head High
1417                 Memories
27            I'll Be Loving You
Name: name, dtype: object
```

```
recommender.get_recommendations('Caliber', 10)
```

`100%|████████| 3968/3968 [00:00<00:00, 31779.03it/s]`

	name	artist
3647	Liza waited	Sail & Weep
3744	florida keys	Kolorama
1545	RU-LAX	Steven Lamar Moore
1109	Afternoon Break	Raouf Beats
1614	Jaunt	Lizlov
1484	Mellow Mood	Stereo Fear
974	Head High	Glimlip
249	Kindness	HNNY
3543	At Night	Mylo B
27	I'll Be Loving You	Yellow Days

```
generate_recommendation('Space Cowboy',cosine)
```

```
Recommended Songs:
115                Samui Sunrise
573                      Keep On
2594                Sweet Sunset
851                    va y viene
3606                  As a friend
2451          no song without you
4144              Certain People
1109            Afternoon Break
2164                Out All Night
72                        sunny
Name: name, dtype: object
```

```
recommender.get_recommendations('Space Cowboy', 10)
```

`100%|████████| 3968/3968 [00:00<00:00, 32077.82it/s]`

	name	artist
2164	Out All Night	Ray Ben Rue
903	Carrousel	Shin-Ski
958	Pode Ser	Chancla
2576	blitzlys	damaa.beats
2526	Valencia	.multibeat
1221	Self Fulfillment	jawima
2594	Sweet Sunset	lassu
4045	In the Cypher	Bonkers Beat Club
851	va y viene	Jiony
871	Green in Blue	Jazzinuf

Recommender Comparisons

```
generate_recommendation('Sugar - Original Mix',cosine)
```

```
Recommended Songs:
117                    When You Call Me
187      How Long Have You Been Away?
2282                         THE BOTTOM
149                        Lost Myself
3185                           ketamine
3124                           The Look
4257                           Doin' It
4173                        Happy Music
4239        Give Life Back to Music
1970          19 - Josh Butler Remix
Name: name, dtype: object
```

```
recommender.get_recommendations('Sugar - Original Mix', 10)
```

```
100%|████████| 3968/3968 [00:00<00:00, 31945.56it/s]
```

	name	artist
117	When You Call Me	STR4TA
187	How Long Have You Been Away?	kryptogram
149	Lost Myself	Eric Krasno
2282	THE BOTTOM	MICHELLE
194	Certified Juice	Beard-o-Bees
3185	ketamine	siouxxie sixxsta
1899	Zdarlight	Digitalism
4257	Doin' It	Herbie Hancock
1948	Seventies	Theo Kottis
173	I Found You (feat. Benjamin Ingrosso) - Dimitr...	Vantage

```
generate_recommendation('Green Lights',cosine)
```

```
Recommended Songs:
787                 Mango Bathing
3990               Rotterdam Rita
786             Light-Hearted Lady
250                       Night Owl
750                  Hour and half
1367                      caperata
2151                   By the Fire
99                        Fireworks
3549                    Vitalization
3375                         Lunar
Name: name, dtype: object
```

```
recommender.get_recommendations('Green Lights', 10)
```

```
100%|████████| 3968/3968 [00:00<00:00, 31697.15it/s]
```

	name	artist
3990	Rotterdam Rita	Fletcher Reed
3375	Lunar	Hotel Pools
786	Light-Hearted Lady	High John
250	Night Owl	Cihangir Aslan
99	Fireworks	Nymano
1267	Summer Sunsets	Aesthetic Sounds
772	Unsung Stories	Alma Animo
3549	Vitalization	Guustavv
3809	Ferrochrome	C-90
779	Hanami	Natasha Ghosh

```
generate_recommendation('Don\'t Give Up',cosine)
```

```
Recommended Songs:
164                              Say Yes
3824                          Slow Gaze
45                               Gardens
1071                             olvido
3159      Asdikte Akal - Yugen Blakrok Remix
4042                    Watch Your Back
990          when i ate a persimmon
1013                    Before the Sun
129                             Night 1
288          Way Ur Touchin Me
Name: name, dtype: object
```

```
recommender.get_recommendations('Don\'t Give Up', 10)
```

```
100%|████████| 3968/3968 [00:00<00:00, 31996.54it/s]
```

	name	artist
129	Night 1	Ta-ku
4193	Baby - Short Version	Girls of the Internet
3159	Asdikte Akal - Yugen Blakrok Remix	Mdou Moctar
1992	Cruel Summer - Part I (feat. Zampera & Muttofunk)	North of Loreto
1577	sundays	Grmmr.126
1013	Before the Sun	Dr. Dundiff
3824	Slow Gaze	SASAF
2542	Warm Flicker	rocomoco
534	Hold On	Axel Boman
1329	Know Pain, Know Gain (Ode To Beatmojo)	Hubert Daviz

Recommendations

- Use the best model to predict songs in other playlists

- Use recommenders in conjunction with each other to find music that's closely related to your favorite songs

- Spotify can employ different techniques at different times in the backend,
  - Running different models and recommender systems on a playlist level as well as on the song level

Suggestions

- We could also implement this on a smaller sample size of songs, thus will impact model performance if necessary

- To further increase model performance:
    - Implement a grid search on all models to discover if higher model performance is probable.
    - Use on a smaller dataset

Next Steps

- One can run a cumulative recommendation for every song in a given playlist.

- Utilize Spotify deep audio analysis & neural networks.

  - In-depth & complex information about tracks
  - An analysis of this type will be based on the actual audio samples of songs.
  - This will lead to a much deeper analysis & model-building methodology.

- Automate radio stations based on playlists or most played songs from the playlist.

Questions?