TV-Show Classification Based on the Opening Theme Song

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INTRODUCTION

TV shows have had a theme song, a song at the beginning that shows short clips of the show while also displaying the production team and the main actors' names. This song not only characterizes the show but also becomes something that everyone who knows the show can recognize.

When watching different genres of TV shows, there also seems to be a correlation between the theme song and the genre of the show. This study explored the relationship between TV shows' opening theme songs and their musical characteristics (symbolic and audio representation), to understand how TV shows set the tone to their genre.

THE PROJECT

The objective of this project was to create a for TV shows based on their opening theme song features - of length, croma STFT, spectral centroid, spectral bandwidth, spectral rolloff, RMS, zero crossing rate,tempo, beat, and MFCC features.

The classifiers used were Support Vector Machine (SVM) and a neural network model of Convolutional Neural Network (CNN).

109 audio files were analyzed and classified according to IMDb database.

IMDb

METHODOLOGY & RESULTS

Action:

lenght	54.406144
chroma_stft	0.492671
spectral_centroid	1991.529457
spectral_bandwidth	2553.376784
spectral_rolloff	4133.210352
rms	0.079130
zero_crossing_rate	0.041705
tempo	117.506751
beat	0.129930

Adventure:

lenght	39.088474
chroma_stft	0.413390
spectral_centroid	1894.835677
spectral_bandwidth	2281.769903
spectral_rolloff	3643.793652
rms	0.121010
zero_crossing_rate	0.040282
tempo	119.722625
beat	0.128570

Drama:

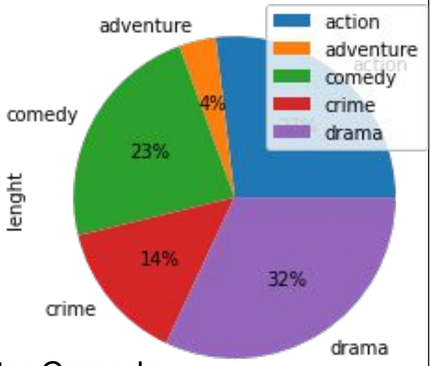
lenght	51.021654
chroma_stft	0.462428
spectral_centroid	1703.423916
spectral_bandwidth	2260.144258
spectral_rolloff	3436.443272
rms	0.076241
zero_crossing_rate	0.035840
tempo	123.805780
beat	0.120124

Comedy:

lenght	37.015586
chroma_stft	0.426085
spectral_centroid	2450.981571
spectral_bandwidth	2818.666178
spectral_rolloff	5068.360783
rms	0.081458
zero_crossing_rate	0.055409
tempo	111.901644
beat	0.144031

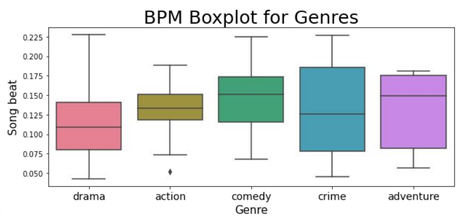
Crime:

lenght	62.429152
chroma_stft	0.416250
spectral_centroid	1842.101786
spectral_bandwidth	2446.004669
spectral_rolloff	3744.337265
rms	0.064702
zero_crossing_rate	0.036057
tempo	126.203058
beat	0.127853



Highest
- Length: Crime
- Chroma: Action
- Spectral centroid: Comedy
- RMS: Adventure
- Zero Crossing Rate: Comedy
- Tempo: Crime
- Beat: Comedy

There is very little difference between all features across all five genres



RESTRICTIONS:
- All TV shows were labeled with a single genre
- Only the first genre given by IMDb was taken into consideration
- IMDb labeling might differ from other sources

RESULTS - low performance
Accuracy of SVM: 0.54545

CNN:
The test loss is 5.942616939544678
The best accuracy is: 41.66666567325592

Weight	Feature
0.0455 ± 0.0000	spectral_bandwidth
0.0455 ± 0.0000	mfcc_10
0.0182 ± 0.0727	mfcc_18
0.0091 ± 0.0680	mfcc_5
0.0091 ± 0.0364	mfcc_2
0.0000 ± 0.0813	spectral_rolloff
0.0000 ± 0.0575	mfcc_15
0.0000 ± 0.0575	mfcc_12
0.0000 ± 0.0575	chroma_stft
0.0000 ± 0.0813	mfcc_7
-0.0091 ± 0.0891	mfcc_14
-0.0091 ± 0.0364	lenght
-0.0091 ± 0.0680	mfcc_16
-0.0091 ± 0.0364	mfcc_4

CONCLUSION

The SVM classifier and the CNN showed a poor performance. This result could be the due to the fact TV shows are labeled with multiple genres Therefore, it is possible to conclude that:
- A classification of a TV show based on their theme song is not an efficient method
- There are multiple overlaps of features that makes it hard to differentiate the genres
- Little data to efficiently train the classifier
- width and MFCC 10 showed more importance

IMPLICATIONS & APPLICATIONS

This study can lead to:
- A better and more precise classification of TV shows.
  - Remove unnecessary extra genre labeling
- Implementation in other fields, such as music genre classification of streaming platforms

REFERENCES

Ma, B., Greer, T., Knox, D., & Narayanan, S. (2021). A computational lens into how music characterizes genre in film. PLOS ONE, 16(4), e0249957. https://doi.org/10.1371/journal.pone.0249957