

INVESTIGATING AUDIO ARTIFICIAL INTELLIGENCE

Prepared by Aysha Araien, Preet Parmar, & Letian Ren

OVERVIEW

1. Introduction
2. Genre Classification
 - a. Methods, Results, Improvements
3. Recommendation System
 - a. Methods, Results, Improvements
4. Conclusion and Future Directions



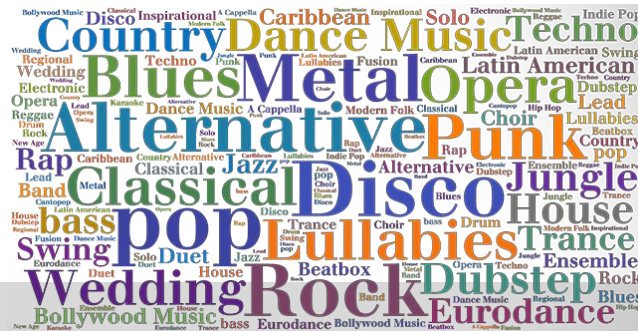
INTRODUCTION

- Spotify has transformed music listening since it launched in 2008. It currently offers 70 million tracks, including more than 3.2 million podcast titles to users for free [1].
- Have you ever noticed a pattern to the “shuffle” features in-app such as similar BPM songs playing in succession or a song coming on by the same artist?
- Our project will focus on investigating audio artificial intelligence by creating the following:
 1. Genre classification system using Neural Network
 2. Recommendation system for Music



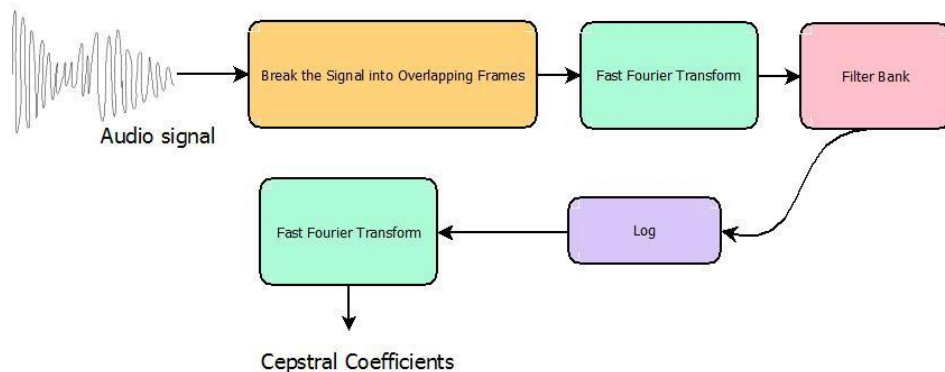
ABOUT THE DATA

- 2 Datasets - Different Data
- Neural Network
 - GTZAN dataset - widely used for audio classification
 - 1000 audio files of 10 different genre songs
 - Further split into 10 samples per song -- 10000 samples
- Recommendation System
 - Music dataset
 - Descriptive features about songs



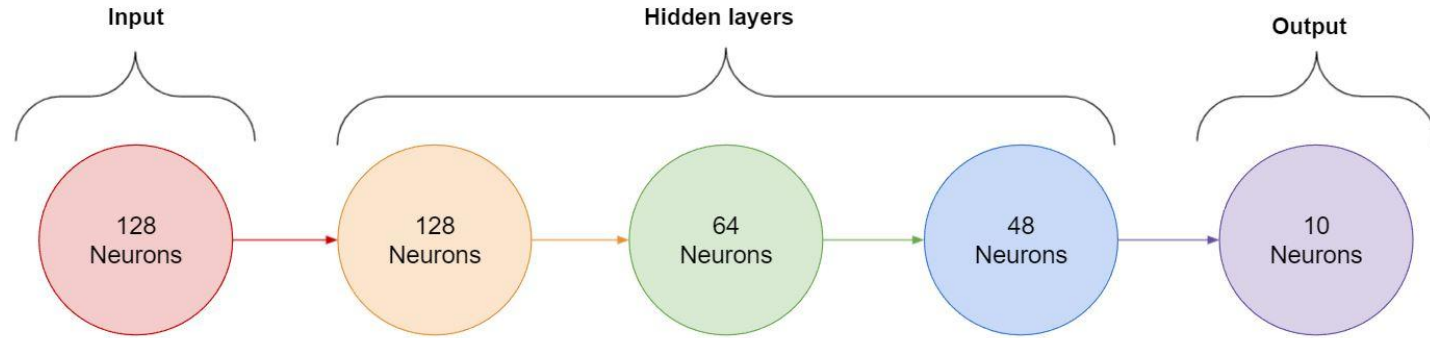
GENRE CLASSIFICATION SYSTEM - METHODS

- MFCC (melfrequency cepstrum coefficients) Features Used as Input
- MFCC are extracted from audio signal
- Very mathematically heavy to calculate, Librosa in Python calculates automatically



GENRE CLASSIFICATION SYSTEM - METHODS

- Neural Network architecture

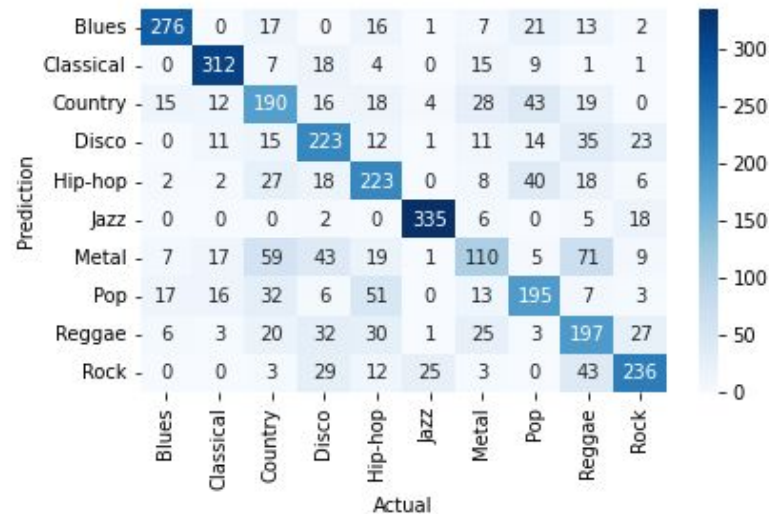


GENRE CLASSIFICATION SYSTEM - RESULTS

- Accuracy - 72%, Validation - 66%
- Good performance
 - Number of classes
 - Small dataset size
- Metal category - wrongly classified
- Reggae - hard to classify
- Blues & Classical - easily classified

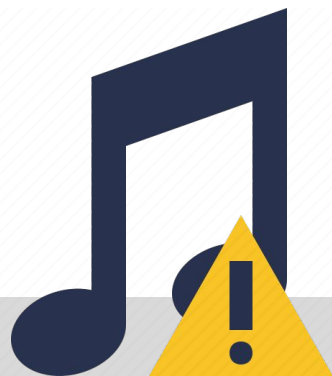
Model	Sensitivity	Specificity	Precision	Accuracy	Validation
Genre Classifier	66	65	66	72	66

Table 1: Model metrics



GENRE CLASSIFICATION SYSTEM - IMPROVEMENTS AND LIMITATIONS

- More data needed to produce higher accuracy
 - FMA Data
- Full songs were split into samples
 - There are nuances in the songs which could be lost
- There is likely more optimal architecture than we used
- Ran locally, could be improved by running remotely with more computational resources



RECOMMENDATION SYSTEM - METHODS

- Features - fields in dataset
 - Topic, Lyrics, Artist Name, Genre
- Preprocessing - NLP techniques
 - Lowercase all words, remove commas from features
 - Vectorize the data in features
 - Converting text to feature vectors
- Model - cosine similarity using matrix of the features
- Recommendations are generated based on which items are most similar to the input song



RECOMMENDATION SYSTEM - RESULTS

- Hard to measure recommendation system performance
 - Do not have reference 'similar songs'
- Eye test - looks like it works
 - Most similar song is cover
 - High time has time in name
 - From the 60's
 - 'Wonderful Christmas Time'
 - Holiday song

	track_name	artist_name
39	it's the most wonderful time of the year	andywilliams
18773	it's the most wonderful time of the year	johnnymathis
13185	high time	pauljones
24435	wonderful christmastime	paulmccartney
8966	take your time	jeffersonstarship
5534	nantes	beirut

RECOMMENDATION SYSTEM - IMPROVEMENTS AND LIMITATIONS

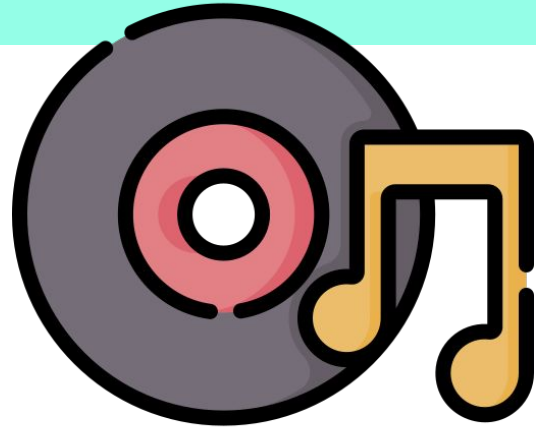
- Currently does not have collaborative filtering
 - If they have listened to a song many times, and given it a positive rating, put it higher than other similar songs
 - Need to find a dataset with user ratings
- More data needed with more descriptive fields



CONCLUSION AND FUTURE DIRECTIONS

- Overall the goals were accomplished - investigated Audio AI by building Genre Classification system and Recommendation system
- Initial impression of the project - linked models
 - Genre already exists in datasets
 - Usefulness of each model
- Music Genre Classifier could be used in a audio recognition project
- Recommendation system could be used to fully develop a shuffle algorithm after adding collaborative filtering





THANK YOU! ANY QUESTIONS?

REFERENCES

- [1] About Spotify. (2021, November 17). Retrieved December 8, 2021, from <https://newsroom.spotify.com/company-info/>
- [2] Moura, L. (2020, August 24). Music Dataset: Lyrics and Metadata from 1950 to 2019. Retrieved from <https://data.mendeley.com/datasets/3t9vbwxgr5/2>
- [3] Olteanu, A. (2020, March 24). GTZAN Dataset - Music Genre Classification. Retrieved December 8, 2021, from <https://www.kaggle.com/andradaolteanu/gtzan-dataset-music-genre-classification>
- [4] Nair, P. (2020, March 24). The Dummy's Guide to MFCC. Retrieved December 8, 2021, from <https://medium.com/prathena/the-dummys-guide-to-mfcc-aceab2450fd>

REFERENCES - IMAGES

- [1] <https://pixabay.com/vectors/music-musical-notes-divider-5734436/>
- [2] <https://freesvg.org/1529291246>
- [3] https://cdn.onlinewebfonts.com/svg/img_666.png
- [4] https://cdn2.iconfinder.com/data/icons/digital-marketing-182/520/48_Analysis_Chart_Data-512.png
- [5] <https://i.pinimg.com/originals/09/2d/d9/092dd994351ee5eacf8149d978a4bd1c.png>
- [6] [https://www.iconfinder.com/icons/1010381/audio multimedia music note sound warning icon](https://www.iconfinder.com/icons/1010381/audio_multimedia_music_note_sound_warning_icon)
- [7] https://cdn.icon-icons.com/icons2/1076/PNG/512/hierarchystructure_77889.png
- [8] https://www.flaticon.com/free-icon/no-music_1661921
- [9] http://cdn.onlinewebfonts.com/svg/img_41065.png
- [10] http://cdn.onlinewebfonts.com/svg/img_41170.png
- [11] https://www.flaticon.com/free-icon/music_2792342