Music Information Retrieval

Genre Recognition

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Goal

Use Music Information Retrieval (MIR) to classify songs by their genre based on their spectral features

The Free Music Archive

A collection of 106k music audio files with detailed information about each track and a breakdown of the sound files by Librosa and Echonest

EDA

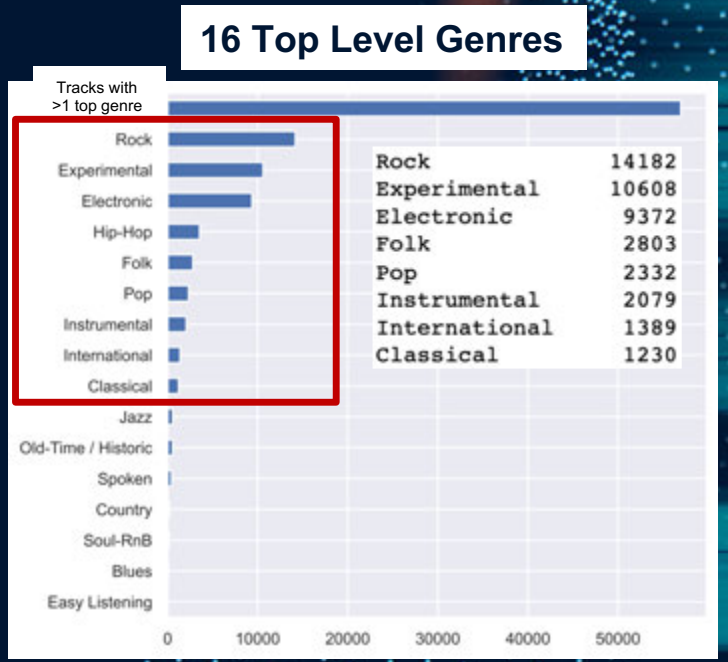
- Genres were in a hierarchical structure, with 16 “top genres”
- Songs often had multiple top and sub genres

Data Cleaning

I selected a subset of tracks that met the following criteria:

- They had a single top level genre
- Each genre had at least 1000 tracks of data

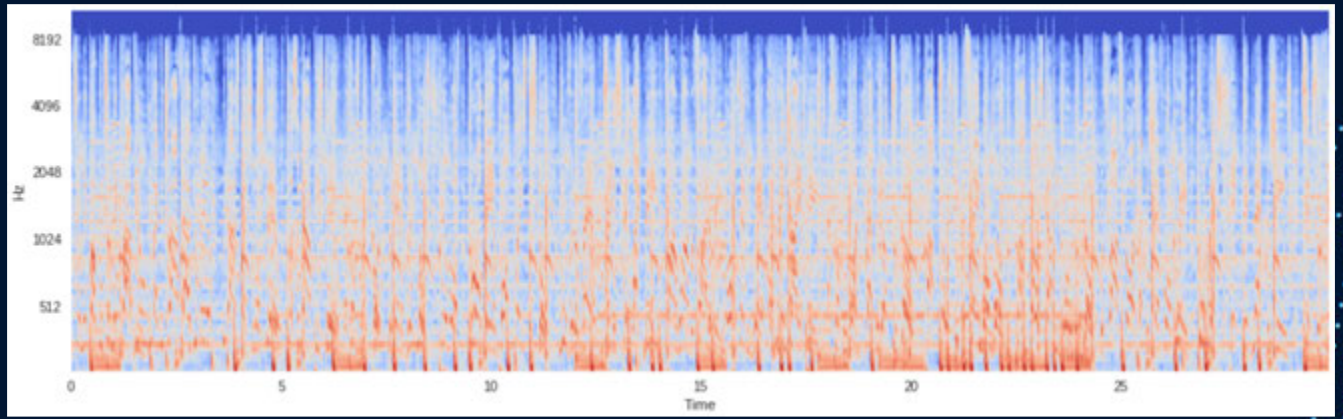
My final dataset included 44k music tracks covering 8 genres.



Librosa

A python package that breaks down audio tracks into spectral and temporal features

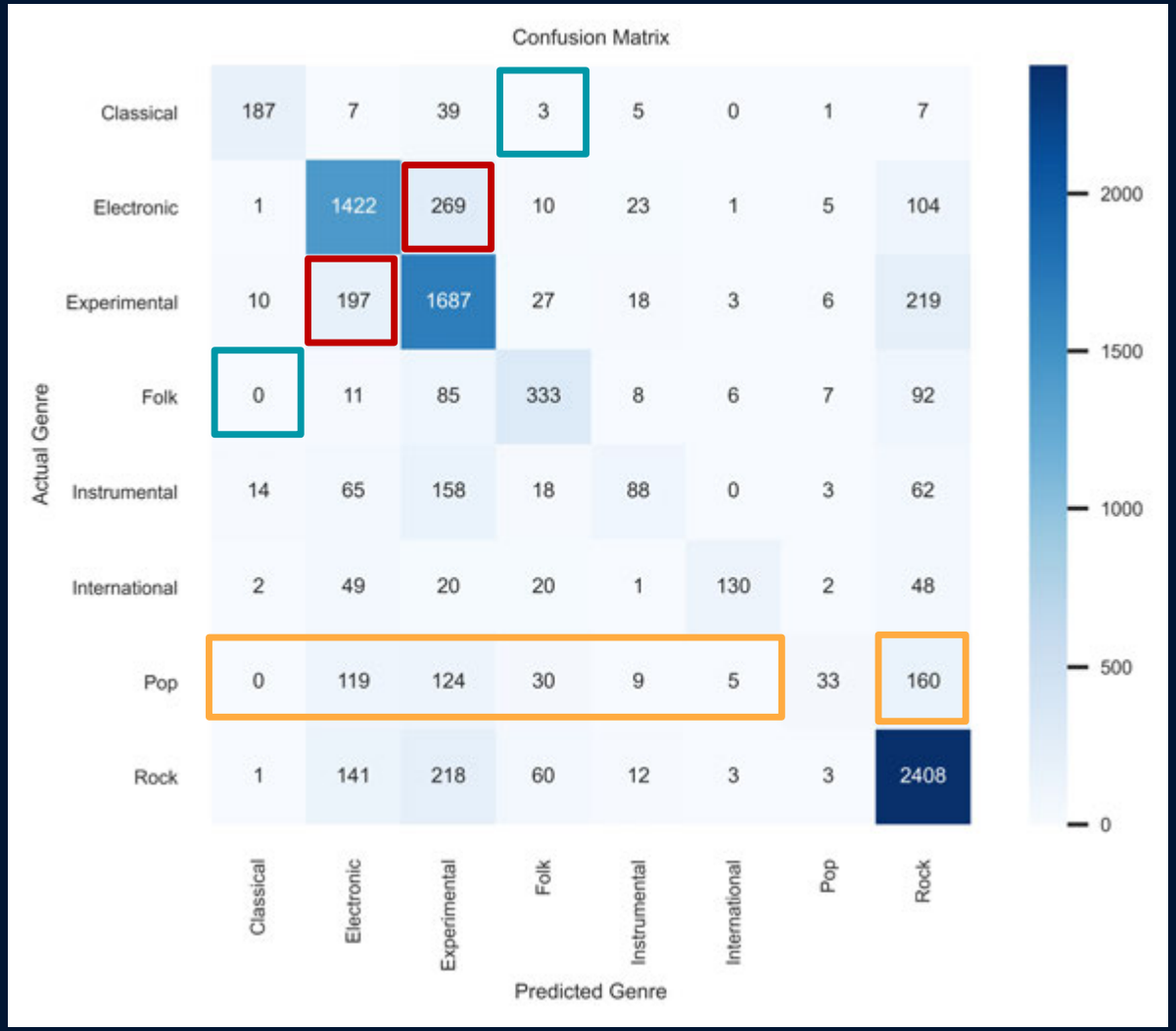
30 second audio clips broken down into 11 spectral features with 7 -140 dimensions each, for a total of 518 dimensions



chroma cens
chroma cqt
chroma stft
mfcc
rmse
spectra bandwidth
spectral centroid
spectral contrast
spectral rolloff
tonnetz
zcr

Search for the best classification model

	dimensions	lr	weighted lr	knn	dt	rf	ada	nb	svc
chroma_cens	84	44%	43%	43%	39%	36%	35%	18%	52%
chroma_cqt	84	43%	42%	44%	39%	38%	37%	5%	53%
chroma_stft	84	46%	45%	47%	44%	41%	39%	8%	53%
mfcc	140	61%	60%	57%	51%	47%	49%	45%	67%
rmse	7	44%	43%	46%	44%	45%	43%	25%	46%
spectral_bandwidth	7	41%	40%	46%	44%	44%	42%	40%	46%
spectral_centroid	7	42%	41%	47%	45%	45%	44%	39%	47%
spectral_contrast	49	55%	55%	53%	48%	48%	46%	44%	63%
spectral_rolloff	7	43%	42%	47%	46%	46%	44%	39%	47%
tonnetz	42	45%	44%	45%	41%	39%	39%	32%	51%
zcr	7	42%	41%	47%	45%	45%	43%	37%	46%
mfcc/spectral_contrast	189	64%	63%	58%	53%	50%	49%	47%	70%
mfcc/spectral_contrast/chroma_cqt/chroma_stft	357	65%	65%	56%	53%	47%	49%	11%	70%
chroma_cens/chroma_cqt/chroma_stft/mfcc/ spectral_centroid/spectral_contrast/tonnetz	490	67%	67%	55%	53%	44%	49%	14%	71%
ALL	518	68%	68%	55%	53%	44%	49%	14%	72%
run time (minutes)		16	22	2	1	1	2	1	55

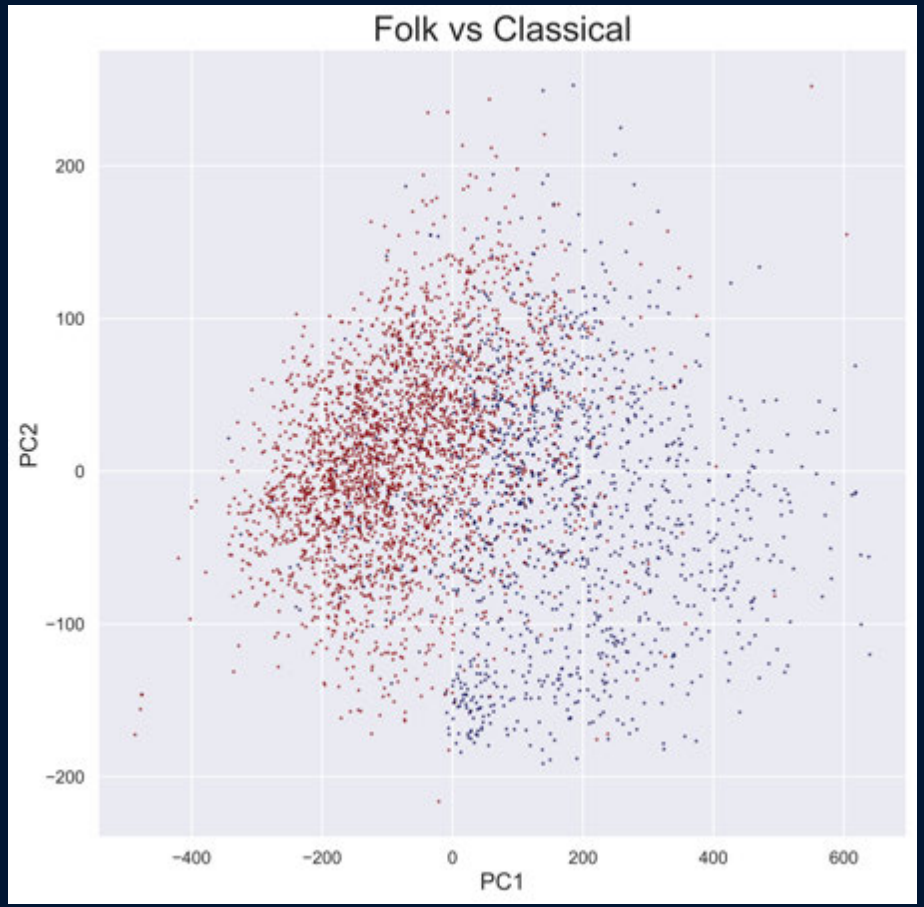


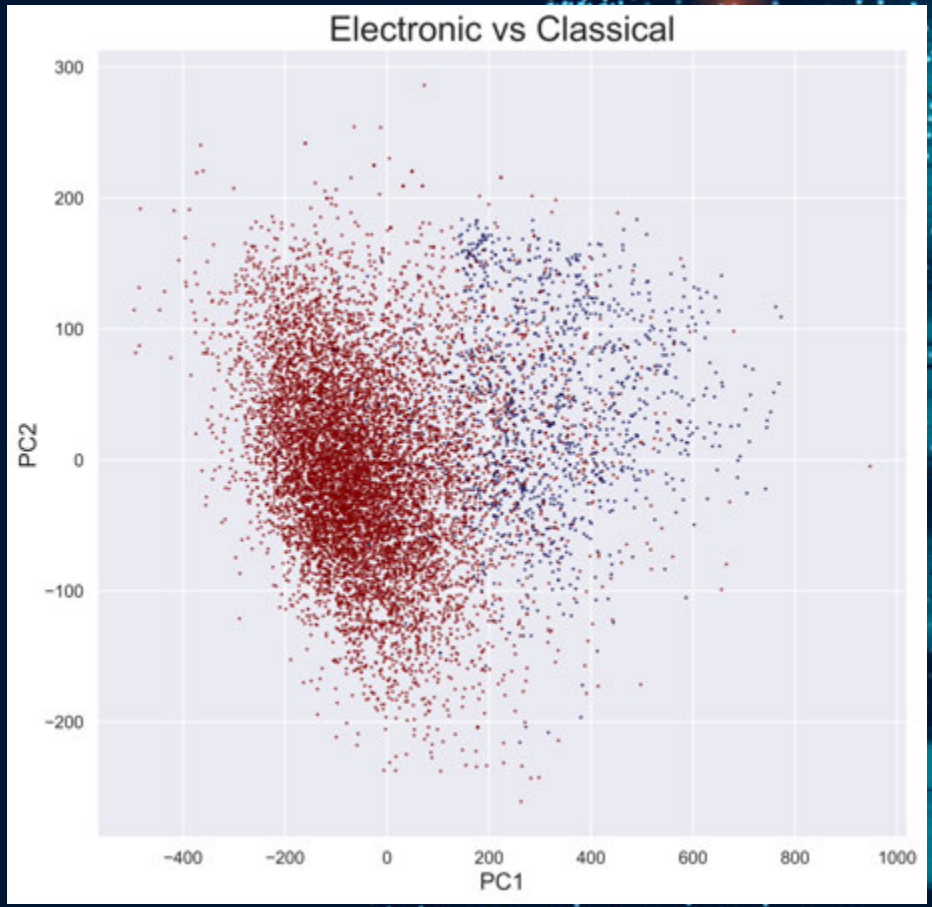
Experimental and Electronic
Often misclassified as each other

Classical and Folk
Rarely misclassified as each other

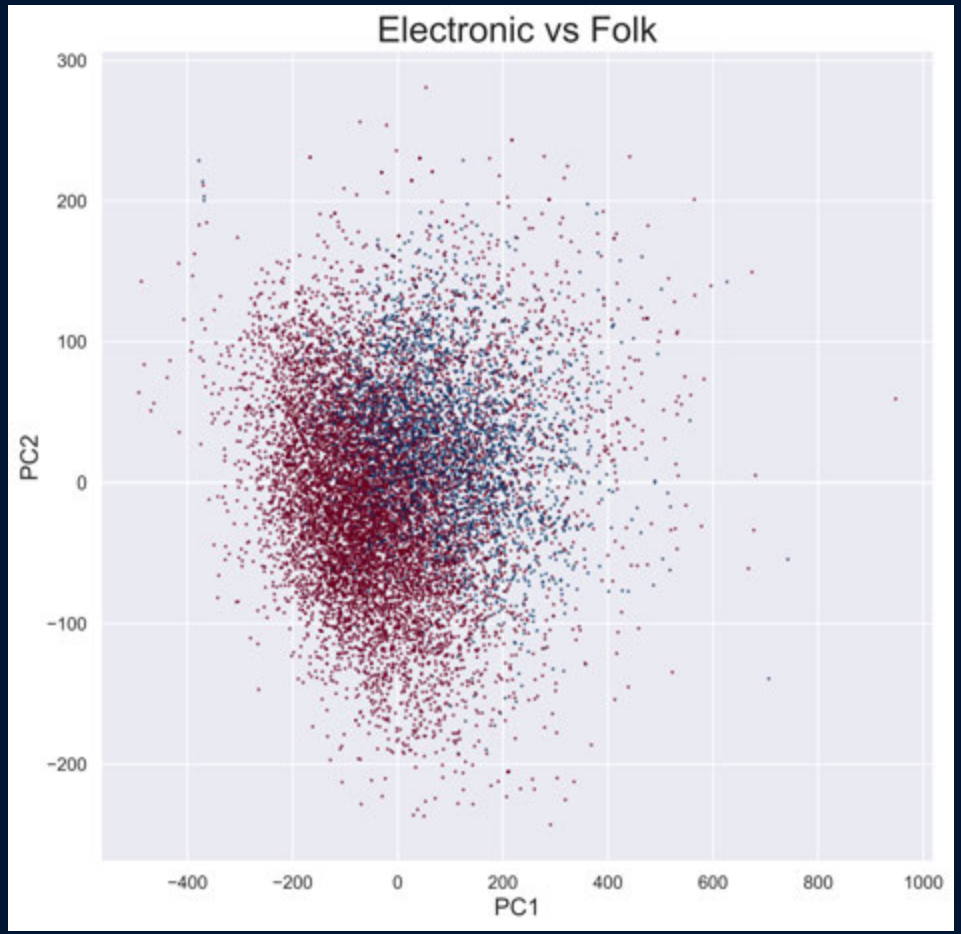
Pop is often misclassified as other genres

Genres RARELY Misclassified as Each Other

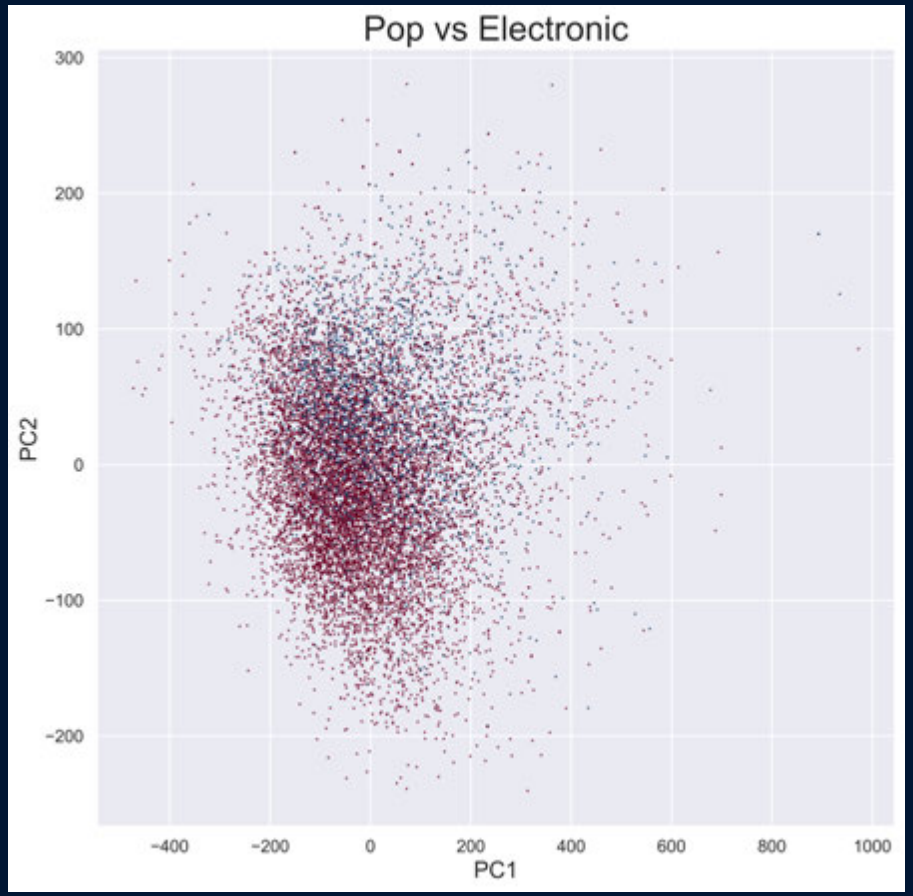


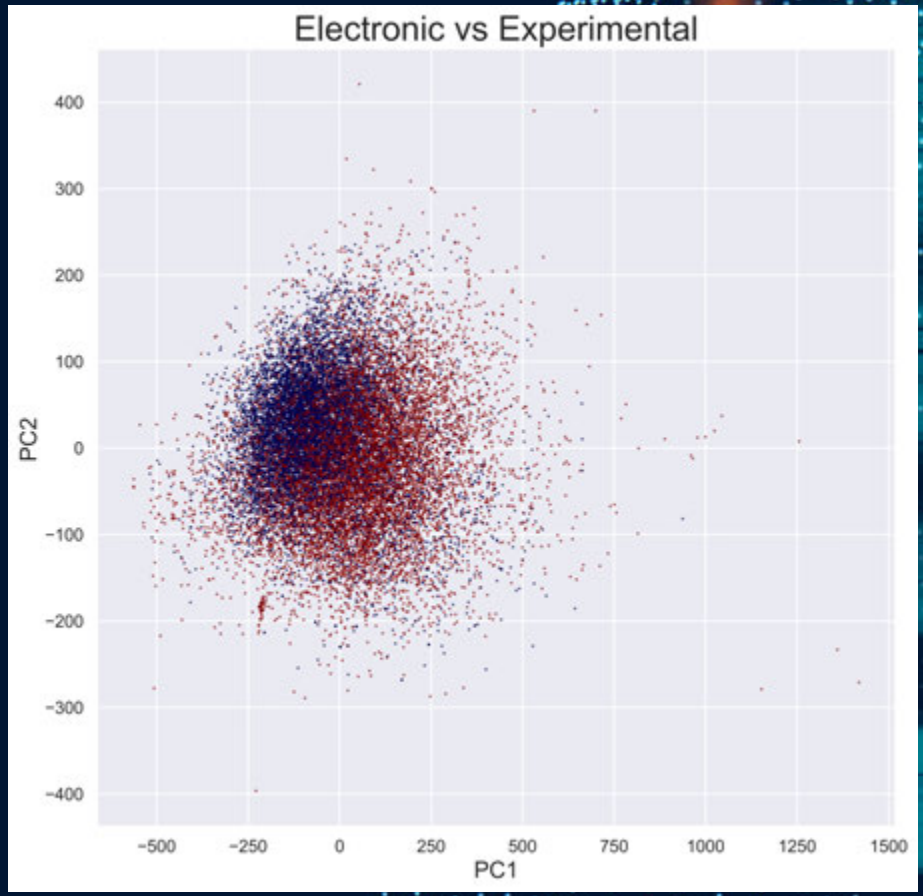


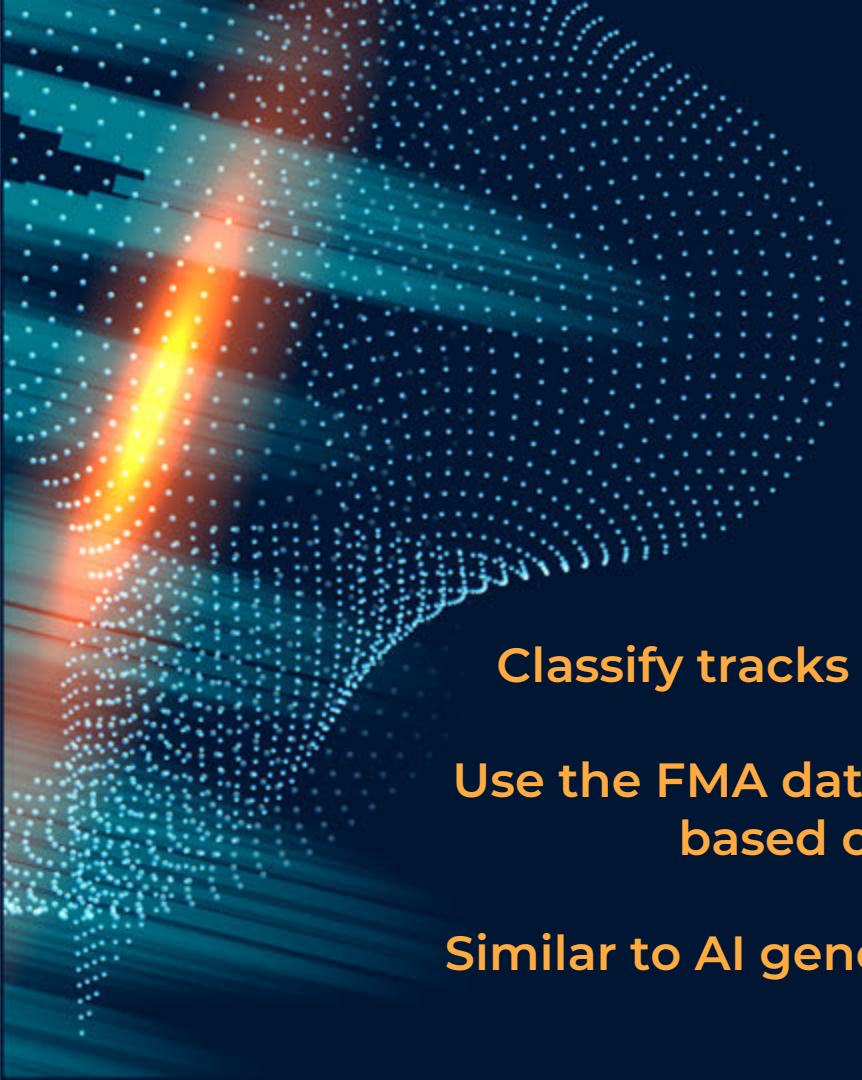
Genres SOMETIMES Misclassified as Each Other



Genres OFTEN Misclassified as Each Other







Future Ideas

Classify tracks that have multiple top level genres

Use the FMA dataset to build a recommender system based on a song's spectral features

Similar to AI generated art, create AI generated music