Option 9 Music Classification or Clustering
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Goals: Classify songs - key, artist, instrumentation, genre, tempo???
- Ideally, I would use Spotify ratings from their API (including **danceability**, instrumentality, valence…) and then train categorization of audio recordings based on this
    - I am not sure if I will be able to get access to the wav files that I need though
    - One option here would be to use the works of a specific artist (and one of my favorites): Nicolas Jaar. I could download his 2011-2020 discography (3.1 GB) and analyze this to detect / categorize features
    - Artlist.io and corresponding Spotify playlists could be an option too
- I think that if I could not find data for Spotify stuff, my backup plan would be to classify songs by key
    - It would also be really cool to use ICA or whatever methods are used to separate audio sources, then identify the instruments in the song, but I have no idea where I would find the data for this
- And if I can't find data by key, I will just try to classify by genre and use the dataset provided in one of the later homework assignments
- Another cool idea could be to look at spectrograms and try to identify different parts of the song, be it intro, hook, verse, bridge…
- It would be interesting to try a pretrained network (VGGs)

Data and qualities:
- I would definitely use raw audio for classification because it contains more information and also is easier to find than midi data. Like realistically, how useful would it be to use an auto-classifier on data that you already have a midi file for (chances are the data such as key or artist are easier to find than that).
- I can envision a few important features to pay attention to. Chroma most definitely, likely frequencies over time (and bpm possibly), loudness could be useful for classifying dance music at least (it tends to be sent in at more LUFS).
    - I don't think specifically analyzing timbre will be relevant and actually I think that might happen naturally through the analysis of spectrogram pieces
    - I think a combo of amplitude and frequency domains should be used for analysis in order to make use of as much info as possible - for example, you will probably learn a lot more about the bpm through amplitude - while you will learn more about key from frequency. Both are extremely relevant to what I am trying to classify.
- It might even be worth trying to preprocess the data with ICA or PCA, in order to compress and/or denoise.

How will data be represented as input? What will be noted and ignored?:
- Mel spectrogram - basically a stft but using mel

- Perhaps ICA or PCA can be used beforehand in order to compress the data - would make working with large amounts of wav files a lot more feasible
    - Could also analyze chroma using whatever chroma methods there are - these factors can be thrown into the network in parallel (concatenated)
- In parallel, I will also analyze amplitude… especially for certain features like 'danceability'

Overview of model architecture:
- As of now, I plan on using a CNN. I think the temporal domain and how sounds relate to each other within this are extremely important with anything music, so CNN will probably be better than normal NN.
- An autoencoder, PCA, or ICA will likely be used to preprocess the data

References:
- None really… yet
- https://towardsdatascience.com/do-hit-songs-have-anything-in-common-37599940590
    - Kinda like the first step

9 Music Classification or Clustering
There are many ways we may want to organize music; perhaps by key, by composer/artist, by instrumentation, by genre, by tempo, etc. Can you create a model which accurately classifies musical data (audio, MIDI, or some other form) into your desired groupings?

Alternatively, you can perform the task in an unsupervised manner as a clustering problem. If you are trying to group pieces by one composer, what audio features would you extract to help in your identification? Is it possible to learn clusters that capture the underlying similarity? Clustering by composer, as a possible example, may prove difficult, as a Beethoven Symphony may be more similar to a Mozart Symphony on certain features than a Beethoven String Quartet.