Roberto Noel
Gus Xia
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Progress Report 3: Mutations Complete, Working on Epochs and Discrimination Strategy

The implementation of all four mutations has been completed. I have implemented certain constraints to these mutations, for example, a tree cannot be trimmed past 7 nodes. These provide the necessary degrees of freedom for the algorithm to properly explore the domain of inputs without each child deviating too far from its parent.

With the mutations completed, I am now working on developing a fitness value which will be used for "natural-selection". After reading some literature as to how people have gone about using machine learning to determine musicality, I think tailoring a strategy specific to the type of inputs we are using will be important.

My current approach is to use an API called Librosa to extract spectral and rhythmic features from each sound wave such as "onset times" "mean spectral centroid", "standard deviation of spectral centroid", "tempo" etc. Then I will create a dataset of these features for 1000 expressions which will be both hand picked and generated through mutation. For each of the 1000 expressions, I will listen to the created sound wave and give a rating from 1-10.

Once the expressions are labeled, I will look for the features which have the highest correlation with rating and simplify the data-set to include only those features. This is important due to the limited size of my dataset. Once that is done I will try out different models (likely regression-based) and see what produces the most accurate results for musicality prediction. Once I train the discriminator model I will use it to create epochs.

The first epoch consists of 50 (for simplicity, probably more) expressions. To generate the next epoch, each expression will mutate through one of the above mutation methods to create a child. After this, each of the now 100 expressions will be analyzed based on its spectral and rhythmic features and will receive a fitness value. Based on this fitness value, the algorithm will "kill-off" 50 of the least fit (with some gradient) expressions. The remaining 50 expressions become the next epoch. Based on the time it takes to generate each epoch, I will adjust the epoch size to see what makes the most sense for this experiment.