

Project Description

I plan to create a neural network for generating drum tracks for songs. The idea being that you can input an entire song (in MIDI) and the system will create a drum track for the song using information extracted from the file (rhythm analysis, bar/beat intensity, etc...) The system would consist of two parts; an algorithmic extractor for MIDI files, which feeds into the second part, the neural network, to generate drums specific for the input. The system could also be used to extend a short drum loop across the entire song, with appropriate modifications and fills added. An extension to the project could be to generate drum tracks based on specific genres of music.

How will this be Achieved?

I plan to use Python, specifically the TensorFlow/Keras library (as used in COMP6685: Deep Learning) to implement the neural network. The algorithm will also be implemented in Python. For training the model, I plan to use publicly available MIDI datasets available online. These MIDI files can be processed using the MIDO and PrettyMIDI Python libraries. I plan to use the School of Computing's Hydra cluster to train the network (although it should not be too complex to be able to be trained on an average computer). The system can be implemented in an iterative manner by following these steps, each with increasing complexity:

1. A neural network to generate basic drum patterns from a given input.
2. Extract relevant information from MIDI files and generate distinct drum patterns based on the extracted information.
3. Extend to output an entire drum track and append to the input MIDI file.

Background & Links to Creativity

There are already several types of systems which create similar outputs, but none that attempt to generate a drum track for an entire song. Most existing systems only generate a small loop given some starting input¹. The closest is "DrumRNN" by Magenta², which can generate drum tracks of arbitrary length, however, it does not consider any existing MIDI information. By using information extracted from the MIDI file, the system can react to what the other instruments are playing, much in the same way that real-life drummers do.

Evaluation

Regarding Colton's creative tripod (2008), the proposed system could be seen to satisfy all three criteria (at least to some extent):

- Skill – The network should produce output that is appropriate to the input. This is handled by how the algorithm transforms the input MIDI before it is sent to the network.
- Appreciation – The system should be able to assess the suitability of any drum track for any MIDI song by inputting the song and comparing the actual drum track to the output of the system (although this will depend on the skill of the system).
- Imagination – By using a neural network, the system can generate drum tracks which do not appear in the input dataset and can do more than simply combine existing patterns into a longer track.

1 See <https://towardsdatascience.com/neural-networks-generated-lamb-of-god-drum-tracks-45d3a235e13a>

2 https://github.com/magenta/magenta/tree/main/magenta/models/drums_rnn