Music Composition with Recurrent Neural Networks

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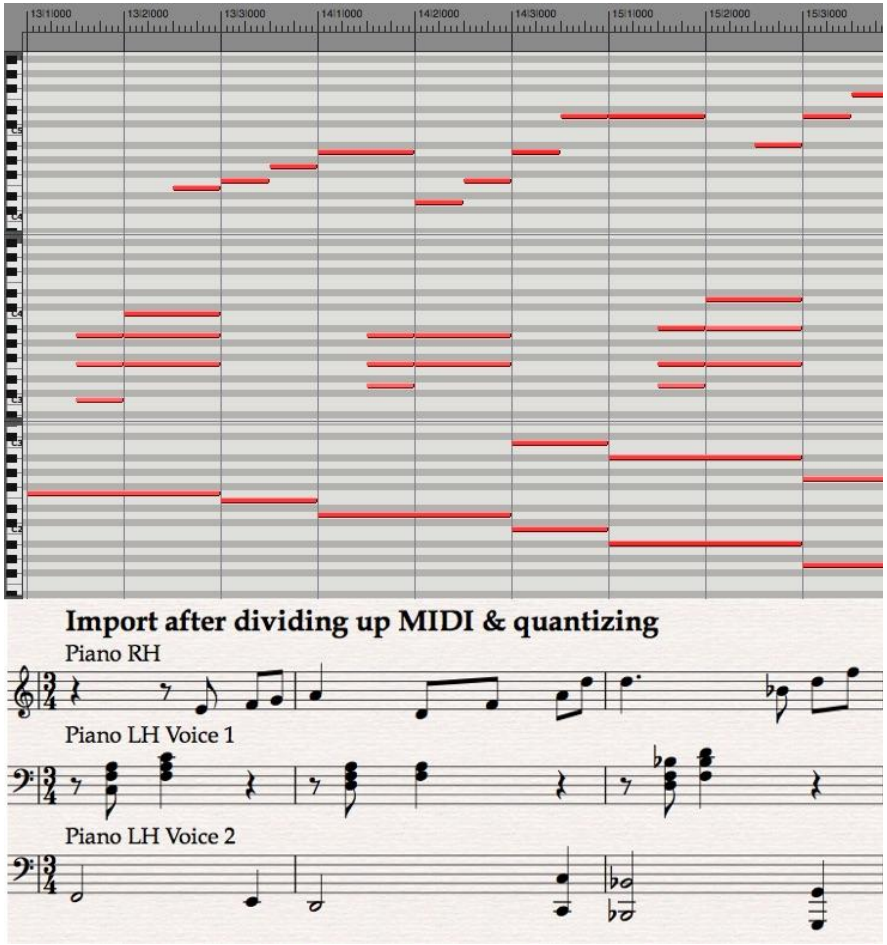
Problem Statement

- Looking at ML-models for music composition
- Motivation:
  - Group members interested in music
  - Important to pursue creative projects in ML
- Discover the current capabilities of making computer-generated music
- Suited to ML because music is full of patterns
- Can a model generalize to multiple genres of music?



Technical Challenges

- Music is very complex. Current models use spectrogram data which takes a long time to train and requires better models to analyze.

- Audio with multiple instruments does not compress to MIDI well

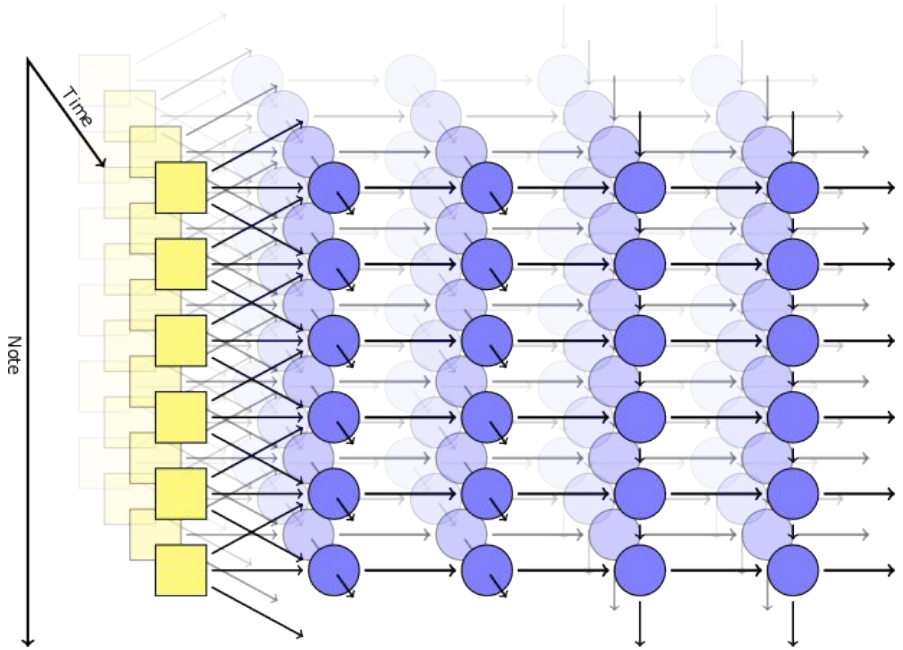
- Evaluating quality of music is an abstract challenge

Related Works

- Daniel Johnson’s Biaxial Recurrent Neural Network
- Doug Eck’s LSTM Recurrent Neural Network
- Boulanger-Lewandowski Polyphonic Music Transcription
  - RNN and RBM
- MidiNet
  - GAN and CNN

Methods

- Biaxial RNN
- Music consists of notes played over a period of time ➜ biaxial structure
- Built for classical (piano) music, we re-trained the model on other genres
- Training vs generating



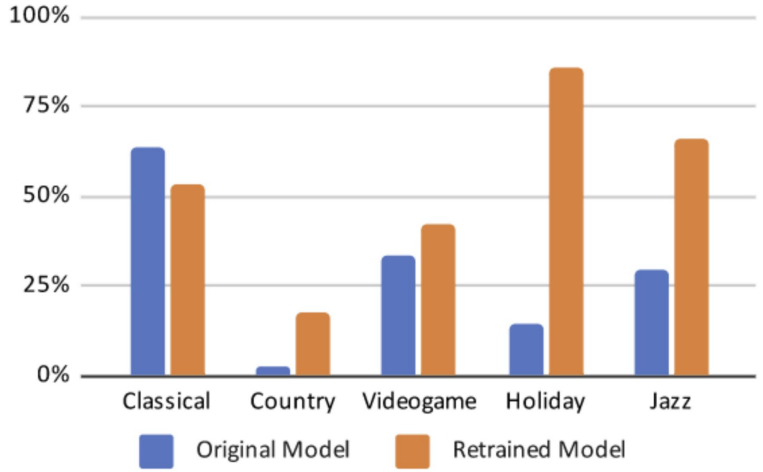
- Implemented in Python 2, Theano back-end
- Libraries: python-midi, theano-lstm
- AdaDelta cost optimization

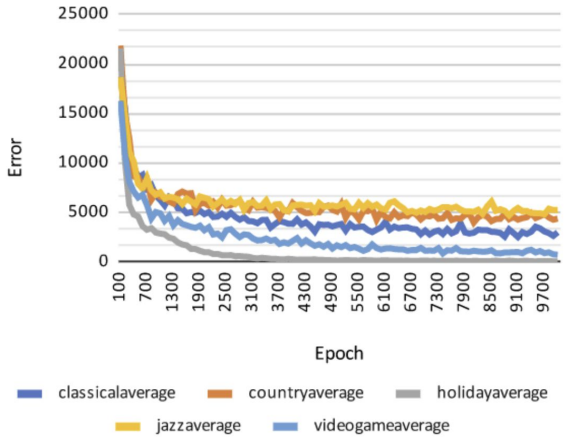
RESULTS

Holiday

Video Game

- The model resulted in improvements in every genre except classical
- Holiday performed the best beating even the classical model
- Country was the worst emphasizing the need for data filtering





Broader Impact

- Shows classical model can be retrained for other genres
- Room for Improvement
  - Could perform better with better data
  - Polyphonic Music
  - Reduce training time