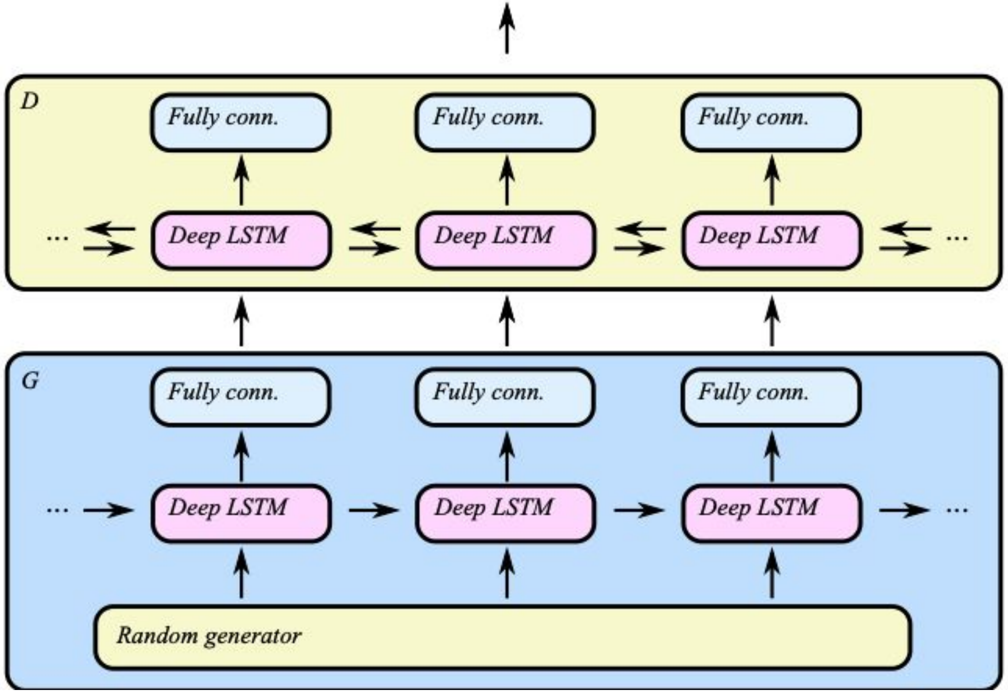
ChipSolo

A Reproduction of C-RNN-GAN for Chiptune Music

ChipSolo

- 8-bits music (easy?)
- good midi file resources
  - Super Mario
  - Zelda
  - Pokemon
  - and more...

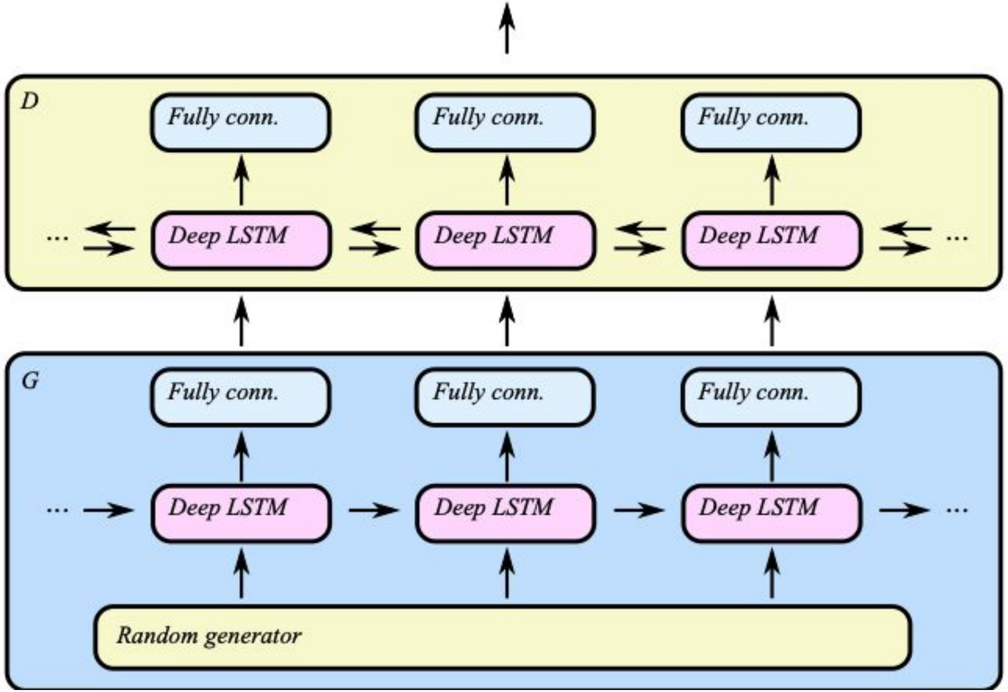


C-RNN-GAN Model

- Olof Mogren
- RNN embedded in GAN

Those Changes & Challenges ...

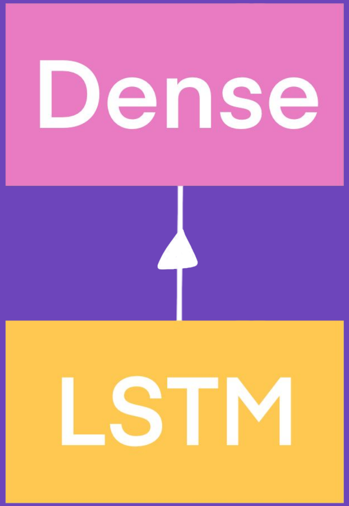
- Changed the original **tensorflow into pytorch** (author: cjbayron)
- Original code is aiming for **multi-genre and composers**
- Complexity to understand the **original data pre-processing**
- ...



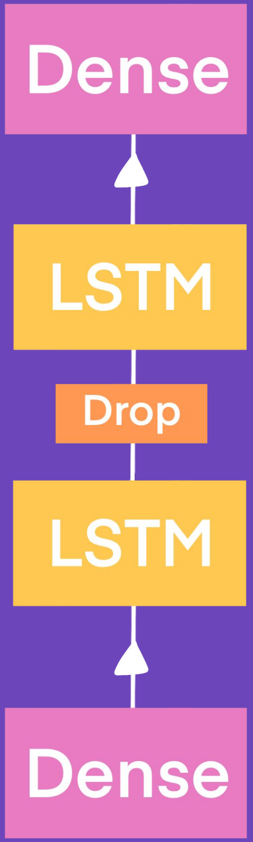
C-RNN-GAN Model

Change for Generater

Before



After



However

This model isn’t great in generating melodic music

However

This model isn’t great in generating melodic music

But...wait, it actually generates music with some recognizable patterns!

200

samples

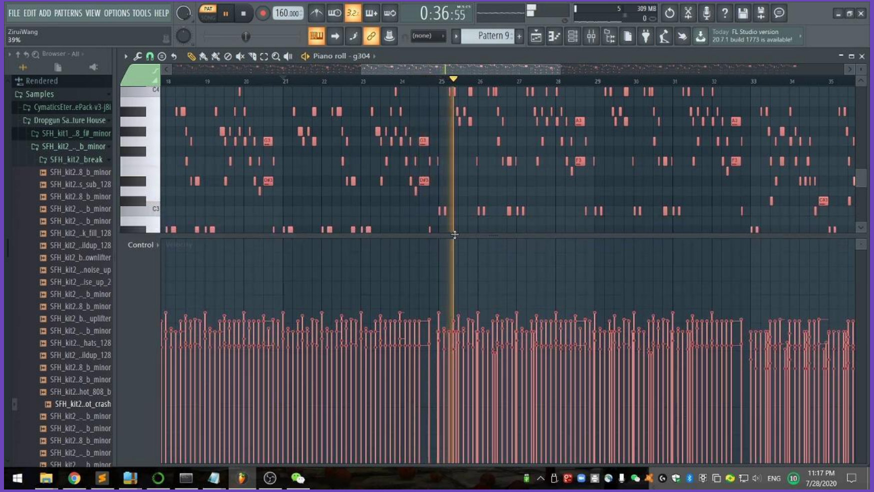
4

games

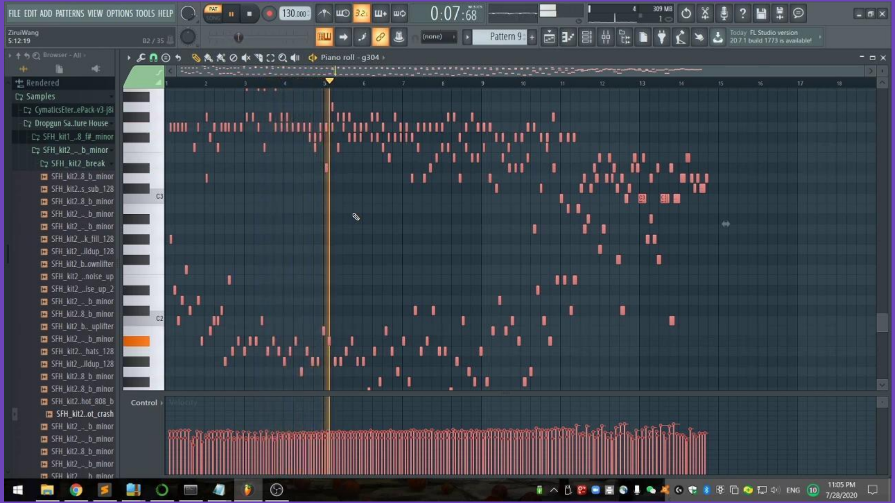
no pre-classification

Similar

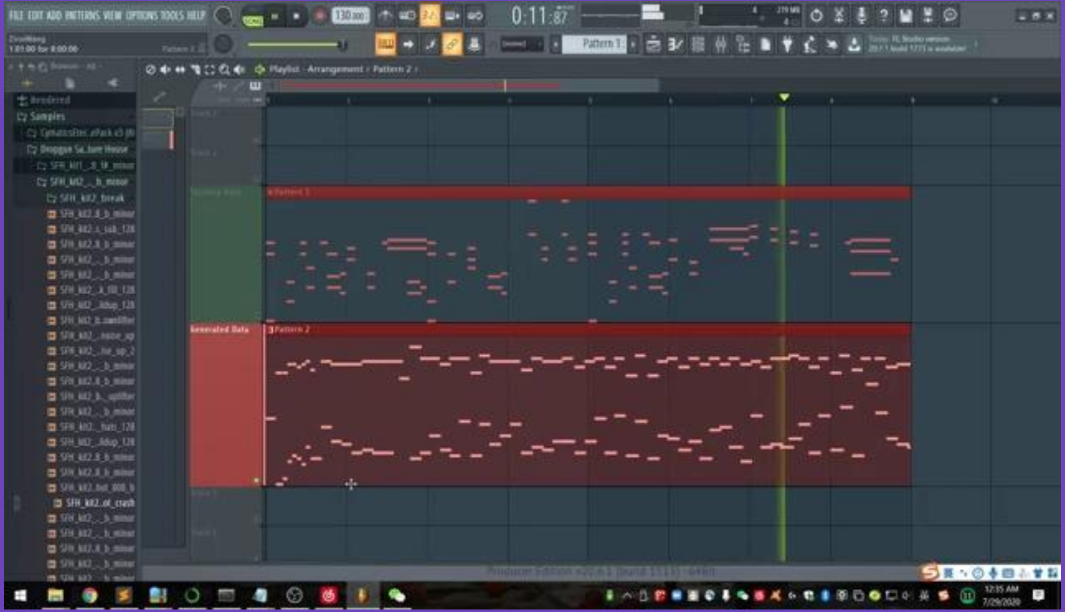
Original



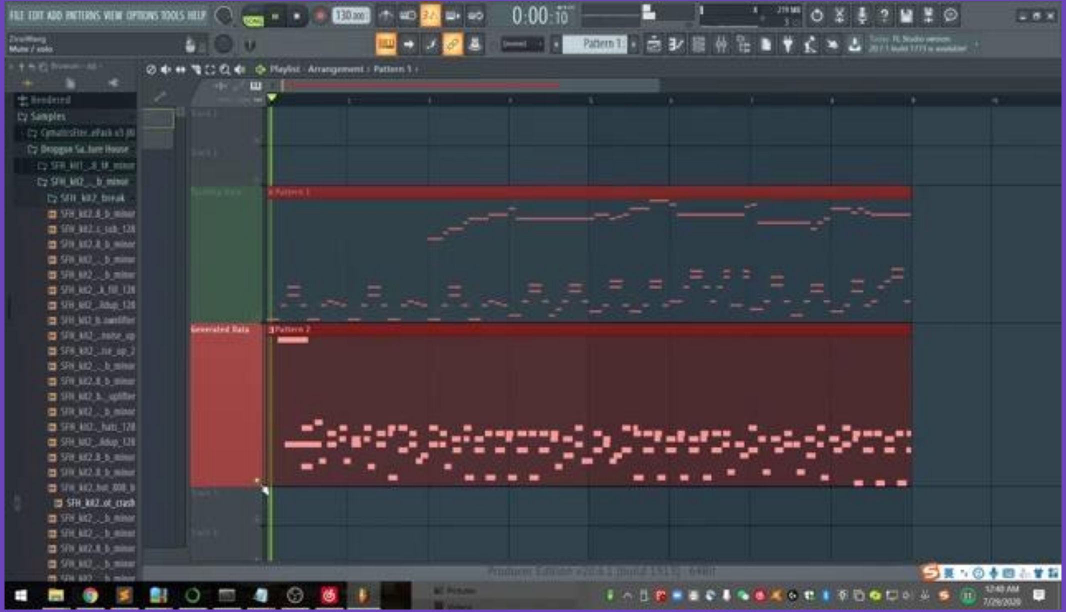
Generated from One of the Epochs



… Similar


FILE EDIT ADD PATTERNS VIEW OPTIONS TOOLS HELP
130.000
0:11:87
Pattern 1
Playlist · Arrangement › Pattern 2 ›
Rendered
Samples
SFH_kit2_break
SFH_kit2_crash
Generated Data
Pattern 2
12:35 AM
7/29/2020

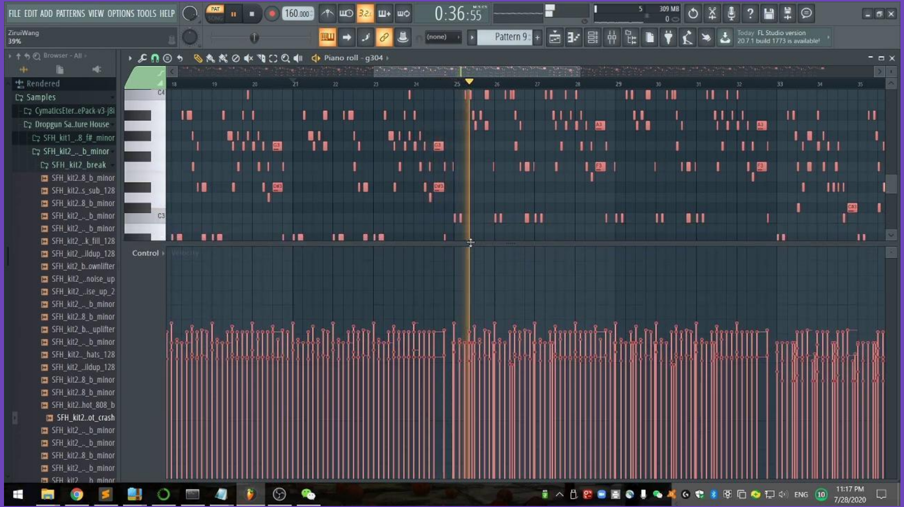
... More Similar

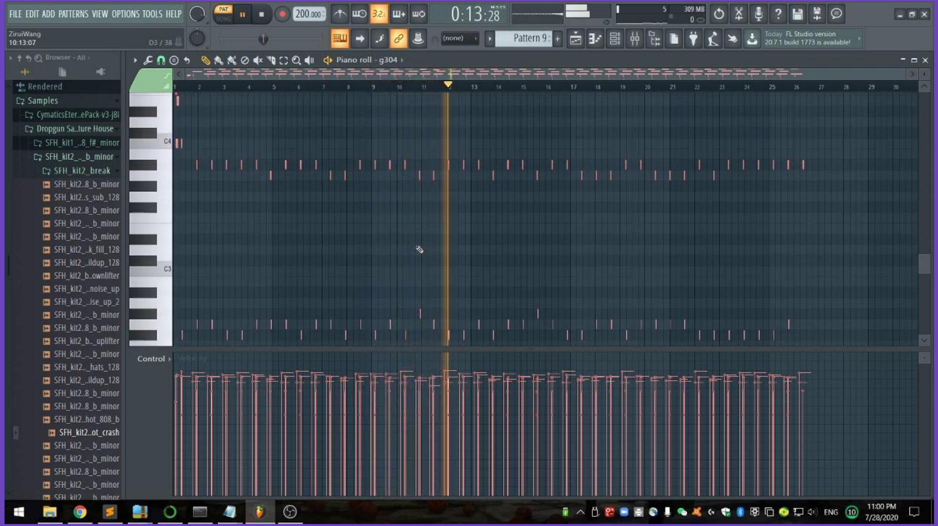

FILE EDIT ADD PATTERNS VIEW OPTIONS TOOLS HELP
0:00:10
Pattern 1
Playlist - Arrangement › Pattern 1
Samples
Pattern 1
Generated Data
Pattern 2

Dissimilar

Original

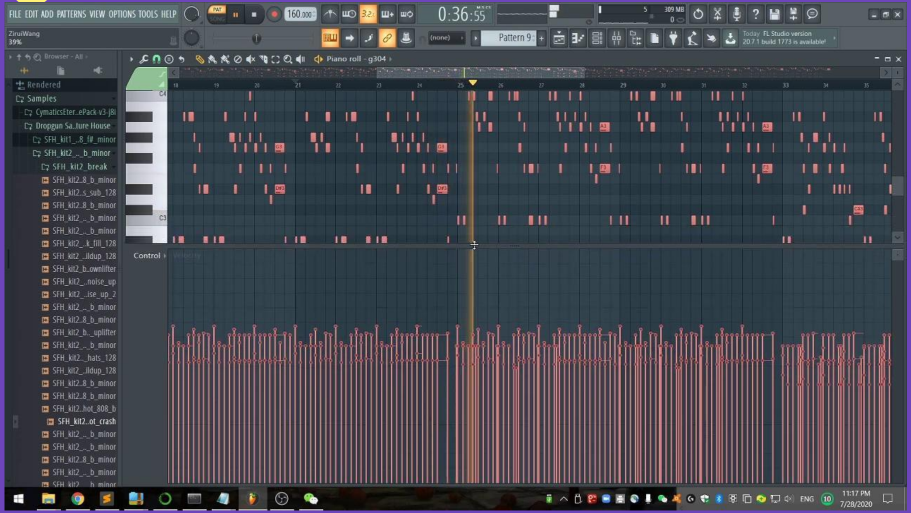
Generated from One of the Epochs



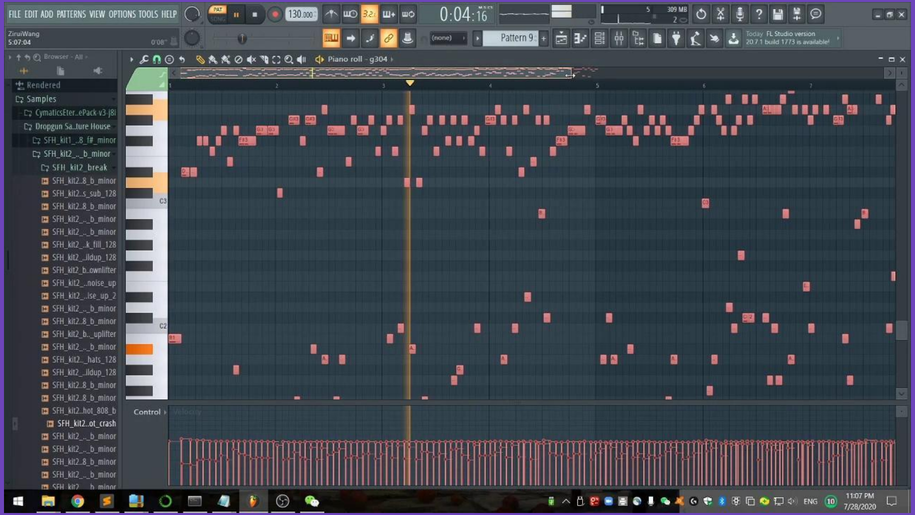


…Dissimilar

Original



Generated from One of the Epochs

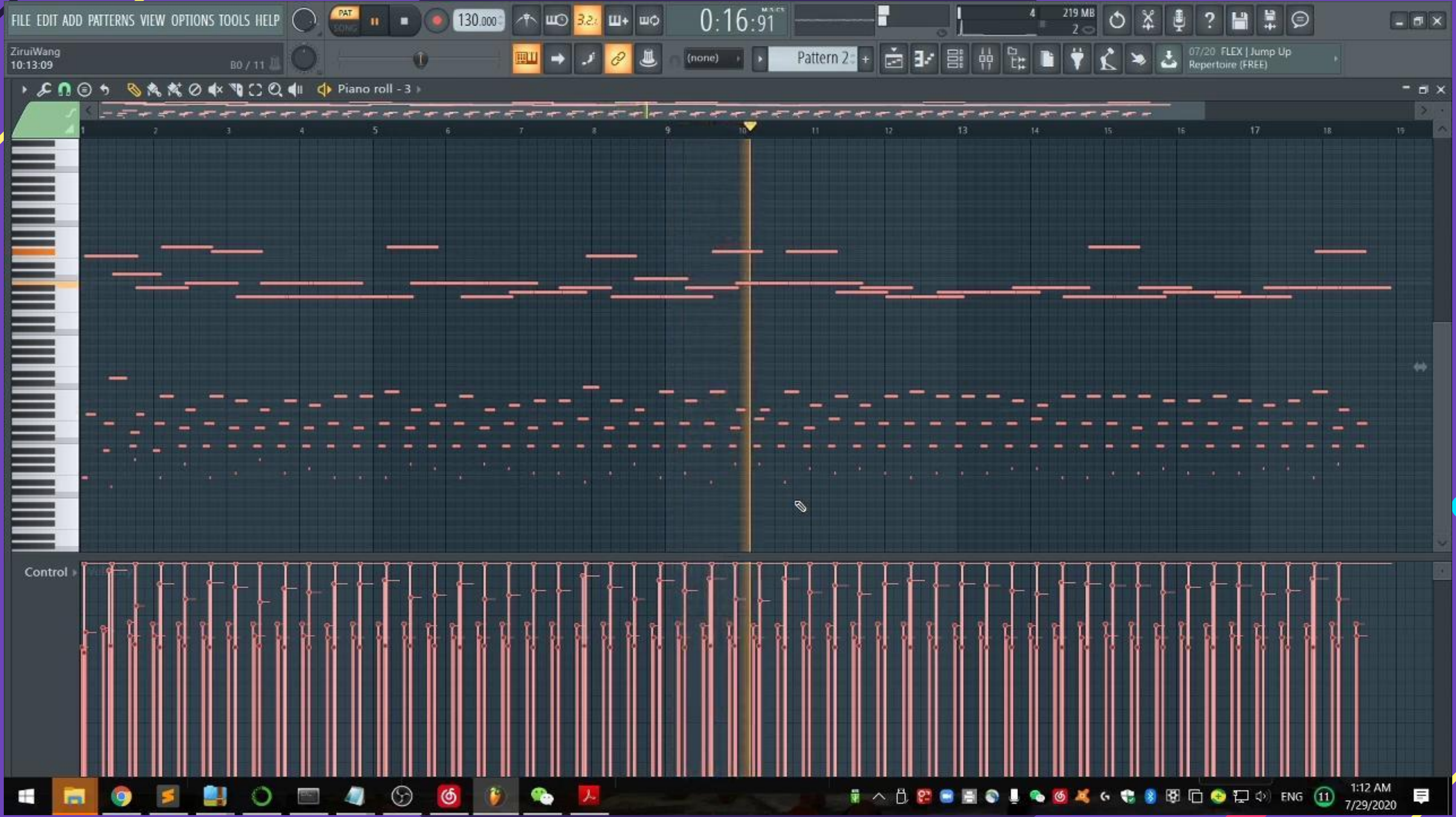


30s demo

Title: Swiiiing

We named it Swiiiing because in one of the epochs, we found that this clever model learned how to make swing patterns without our supervision! (Again, we'll try to tell it to produce melodic music in the future :))

Check out this if you're interested in this pattern: https://www.youtube.com/watch?v=nz-Dh5-qdkM


FILE EDIT ADD PATTERNS VIEW OPTIONS TOOLS HELP
PAT
SONG
130.000
0:16:91
219 MB
ZiruiWang
10:13:09
(none)
Pattern 2
07/20 FLEX | Jump Up Repertoire (FREE)
Piano roll - 3
Control
ENG
1:12 AM
7/29/2020

Credits

- Original C-RNN-GAN Paper for Music Generation (https://arxiv.org/abs/1611.09904)
- Original C-RNN-GAN PyTorch Implementation (https://github.com/cjbayron/c-rnn-gan.pytorch.git)
- Original C-RNN-GAN TF Implementation (https://github.com/olofmogren/c-rnn-gan)
- MIDI (Python Library for Midi Feature Extraction) (https://github.com/louisabraham/python3-midi)
- FL Studio 20 (DAW, Demonstration Purpose Only) (https://www.image-line.com/flstudio/)
- Spire (VST, Demonstration Purpose Only) (https://www.reveal-sound.com/plug-ins/spire)

Thanks!

Does anyone have any questions?

Appendix for Grading

- Overview of your process
  - Essentially a recap of your project proposal, along with any changes made or challenges along the way. **(2, 3, 4, 7, 8, 9)**
  - Cite any libraries, implementations, or references used. **(17)**
  - Visualization of model architecture. **(5, 6)**
- Output demonstrations:
  - Two side-by-side examples of similarity: Audio and/or visual demonstrating a few seconds that are very similar to examples from training data. Please include both your network output and the similar training data so we can clearly see and/or hear the similarity. **(10, 11, 12)**
  - Two examples of dissimilarity: Audio and/or visual demonstrating a few seconds that are very dissimilar to the training data (or are complete noise). **(13, 14)**
  - One complete (and creatively-titled) audio track, at least 30 seconds in length, using output generated by your model. **(15, 16)**

Appendix 2: Common FAQs

1. Which are some of the changes/challenges that existed in the original proposal? (tf? Format? etc)

    a. The author of this paper originally created this project in tensorflow 1. However, due to the compatibility, we eventually switched to a pytorch version from https://github.com/cjbayron/c-rnn-gan.pytorch.git
    b. In the original proposal we have identified that may occur during our implementation. However, we have met more serious problems relating to the music genre and data collected. (such as the data pre processing is not as ideal as the original data. Surprisingly, we the given data, the output is not ideal either. We have been working on our best to see if we could come out with a similar result as in the sample set given, however, upto now, the outcome is not as expected.
    c. A lot of details are not mentioned in the paper and it is hard to modify it.

2. What references (papers, libs, implementations) that you have used?
   We have used midi, pytorch….
    a. Pytorch ver. https://github.com/cjbayron/c-rnn-gan.pytorch.git
    b. FT ver. https://github.com/olofmogren/c-rnn-gan
    c. paper https://arxiv.org/abs/1611.09904
    d. Midi (python library)
    e. FL Studio 20 (DAW, for demonstration)
    f. Spire (VST, for demonstration)

3. What have you done in experimenting and modifying the original implementation? And why?
    a. We have explored its data pre-processing, c-rnn-gan structure
    b. To make them fit into our data set and training, we have changed all the training samples into our 204 samples of 8-bits music.
    c. To make it easier, we made them all in one genre and one composer
    d. There is a validation list and a test list. We have been modifying these two lists to meet different training expectations.
    e. To test them out, we have been trying on single game music set for example Zelda.
    f. We changed the resolution(mentioned in proposal) to lower value for a better tempo

4. What is the architecture of this model (visualization - layers, sequences, etc) - and how and why it is different from the original paper's architecture, if any?
    a. In paper: G: LSTM->Dense

  b. in code: G: Dense->LSTM->dropout(0.6)->LSTM->Dense

  c. In paper: D: LSTM->Dense
  d. in code: D: dropout(0.6)->LSTM->Dense

5. How is this architecture different from other common music generation models like Char-RNN, VAE, etc? And what are its potential advantages/disadvantages?
    a. It is designed to be capable of dealing with complex music structures without overfitting and etc.

6. How do you preprocess the data? What features were extracted and fed into the neural network?
    a. To preprocess the code, we extracted out the note, tempo, time, and velocity.
    b. We will first normalize them into fitting format then compact them into an object
    c. In training phase, we will call this object to get the tuple that contains all the preprocessed information.

7. Why did the generated music not resemble the style of the original music? (reasons behind the high discriminator accuracy?) How you could improve it by changing how the data is fed or the architecture (due to time and knowledge limit, we may not have that time to improve it in this project)?
    a. The original music is often used as background music, we have tried our best to collect 200 music pieces that are in the similar style. However, this model still cannot handle that much complexity.
    b. If continuing this project, we would start with single track music pieces then add on complexity

8. Why did this model fail in producing melodic music? Is this based on the architecture of the model? If it is, how?

    This GAN model cannot transform chords + noise into new chords. But it’s probably solvable, which needs efforts beyond the timeframe of this project. We’ll try to continue improving this model (where the paper was published in 2016) to see if it can make even better music!