Chords and Note Sequence Generation – A Text-based LSTM Approach

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Introduction

Music generation has long been a research topic in music technology field. Here I use deep learning to generate the chord and note sequences. It is generally based on LSTM(*Long short-term memory*). As a result, the model can generate the chord and note sequences successfully.

Demostration

The generated chords:

C:maj7 C:maj6 C:maj6 D:min7 D:min7 G:7 G:7 C:maj C:maj C:maj C:maj D:min7 D:min7 G:7 G:7 C:maj7 C:maj7 A:min A:min D:min7 D:min7 G:7 G:7 E:min7 E:min7 A:7 A:min7 D:min7 D:min7 G:7 G:7 C:maj7 C:maj7 C:maj7 C:maj7 G:7 G:7 G:aug(b7) G:aug(b7) C:maj7 C:maj7 C:maj7 C:maj7 D#:7 D#:7 G#:min7 C#:7 G:7 G:7 D:min7 D:min7 G:7 G:7 C:maj6 C:maj6 C:maj7 C:maj7

The generated note sequence:

170_no_70_52 6_no_59_46 3_no_63_48 11_no_58_47 5_no_67_44 365_cc_0_64_127 53_no_67_0 29_no_59_0 45_no_63_0 4_no_58_0 11_cc_0_64_0 20_no_70_0 48_no_63_21 12_no_69_41 2_no_57_40 4_no_59_42 131_cc_0_64_127 235_no_59_0 14_no_63_0 33_cc_0_64_0 24_no_68_55 53_no_68_0 1_no_71_63 179_no_77_0 48_no_72_0 65_no_72_0 2_no_74_71 17_no_37_42 30_cc_0_64_127 14_no_73_0 92_no_70_0 74_no_82_0 34_no_65_64

Data

For the chord progression part, 2487 original scores were used in the dataset. They were converted into .xlab format, and then transposed to the key of C. Then the chord features were extracted into a single text file. (The data was preprocessed by the .xlab format creator.)

A snippet of the chord text file	C#m7 F#7 BMaj7 D7 GMaj7 Bb7 EbMaj7 EbMaj7 Am7

figure 1

For the note sequence part, I currently only used one single MIDI file. It was converted into a text file, which contains its noteOn, noteOff, control change, resolution and tempo info.

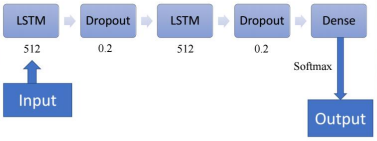
A snippet of the MIDI text file	rs_960 0_st_94_631579 0_cc_0_64_127 0_cc_0_64_0 0_cc_0_64_127 0_cc_0_64_0 0_cc_0_64_127 0_cc_0_64_0 12_no_39_44 119_cc_0_64_127 486_no_51_57 8_no_60_31 5_no_46_37 13_no_56_59 48_no_60_0 12_no_51_0 39_no_56_0 203_no_46_0 32_no_54_80 4_cc_0_64_0 1_no_49_75 6_no_63_72 23_no_59_46 2_no_60_49 56_no_60_0 113_cc_0_64_127 311_no_59_0 17_no_54_0 40_no_63_0 115_no_49_0 216_cc_0_64_0 0_no_65_92 4_no_61_92 1_no_56_98 21_no_51_83

Procedure

For the chord progression part,
(1) First, read the chord text file, then make it a list. There are mainly 2 derived important lists – sentences, which contains a list of several chords and next_chars, which contains the chord after the several chords in the original file.
(2) Build the model. Here I use a single LSTM Sequential model.
(3) Train the model.
(4) Generate the chords and write them into a file.

For the note sequence part, it is quite similar, except that the input and output are different. And for the generated textfile, which is quite similar to figure 2, there's a post-processing step for the text. It's converting the text file into midi file.

Model



It is a very simple Sequential model with 2 LSTM layers and 2 Dropout layers.

Discussion and Results

The model can generate some valid chord and note sequences. However, for music improvising, the generated note sequence is not very auditorily satisfying. It is probably because of the improper processing of the time(MIDI tick) data.

Reference

[1] Choi, Keunwoo, George Fazekas and Mark B. Sandler. Text-based LSTM networks for Automatic Music Composition. CoRR abs/1604.05358 (2016)
[2] Hadjeres, Gaëtan & Pachet, Francois. DeepBach: a Steerable Model for Bach chorales generation. (2016)
[3] Huang, Allen & Wu, Raymond. Deep Learning for Music. (2016)
[4] Brunner, Gino & Wang, Yuyi & Wattenhofer, Roger & Wiesendanger, Jonas. JamBot: Music Theory Aware Chord Based Generation of Polyphonic Music with LSTMs. (2017).
[5] Yuki Inoue Nipun Agarwala and Alex Sly. Music composition using recurrent neural networks. Technical report, 2017