Halifax, Nova Scotia, Canada

CSCI6505: Machine Learning

Backup Project Proposal

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Proposed Project Topic

Audio Generation System using Long Short-Term Memory (LSTM) and PyTorch

Project Outline

There are many patterns available in the music notes and chords, so we plan to build an algorithm to predict a sequence in a piece of music using Long Short-Term Memory (LSTM), a type of Recurrent Neural Network (RNN). The purpose is to train the model using ABC notation found in the music that contains the metadata of a particular music note with complex chords, rhythms, and melodies. Then, the RNN model will perform a classification algorithm to estimate the probability of generating the next musical event and generate a new song of arbitrary length using the PyTorch python package for remembering long-term dependencies by minimizing the negative log-likelihood. The RNN model will receive the training data in mini-batches to process the data parallelly. The LSTM layer will understand the relationship between the notes, followed by the dropout and activation layers. Furthermore, the idea is to convert the predicted new song into audio and play that new pattern by converting the ABC notation to MIDI format.

Relevant Paper/References

[1]   S. mangal, R Modak, P. Joshi, "LSTM Based Music Generation System", IARJSET: Vol. 6, Issue 5 (2019) 47-54. Available: https://arxiv.org/abs/1908.01080

[2]   C. Garoufis, A. Zlatintsi and P. Maragos, "An LSTM-Based Dynamic Chord Progression Generation System for Interactive Music Performance," ICASSP 2020 - 2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2020, pp. 4502-4506, doi. Available: 10.1109/ICASSP40776.2020.9053992.

[3]   J. Wu, C. Hu, Y. Wang, X. Hu and J. Zhu, "A Hierarchical Recurrent Neural Network for Symbolic Melody Generation," in IEEE Transactions on Cybernetics, vol. 50, no. 6, pp. 2749-2757, June 2020, doi. Available: 10.1109/TCYB.2019.2953194.

[4]   Briot, JP., "From artificial neural networks to deep learning for music generation: history, concepts and trends.", Neural Comput & Applic 33, 39–65 (2021). Available: https://doi.org/10.1007/s00521-020-05399-0

Description of the Dataset

We plan to use the modified version of data from the MITDeepLearning library or Music21 library and split that data into training, validation, and testing datasets in a 3:1:1 ratio. The dataset consists of thousands of Irish songs and chord sequences with many other features. Also, we will represent the loaded data in ABC notation to gather the notes and rests of the raw music sheet.