PES UNIVERSITY

PES Innovation Lab

Summer Internship 2020

Neural Music Generation and Analysis

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Problem Statement

To help people improve the audio-quality of their song, generate a backing track for their lead and vice-versa to help kickstart a composition with a piece of music generated by our deep-learning model, via a user-friendly web application.

Introduction

- This application was developed to help people complete an incomplete composition.
- We aim to do this by helping generate a backing track for a lead, and in the future, a lead for a backing track.

Domains

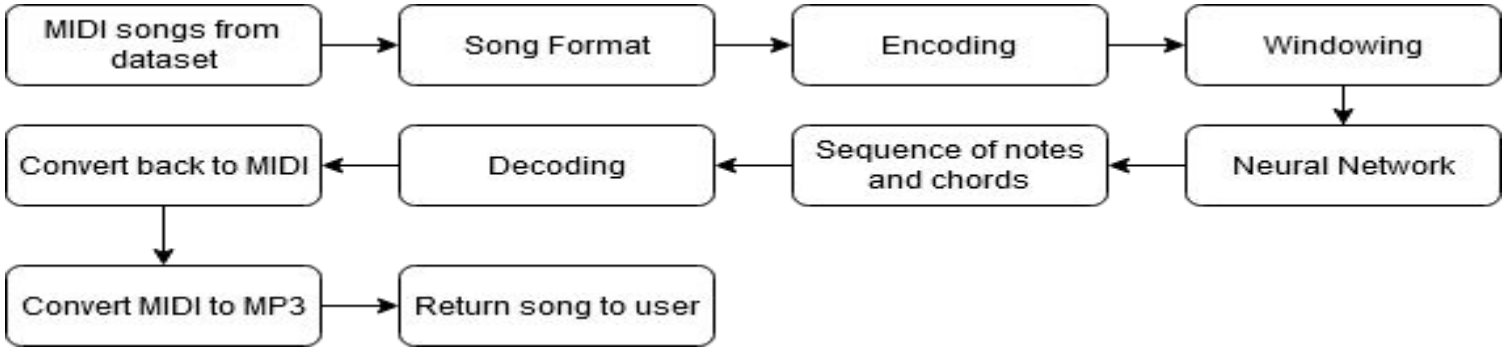
- Deep Learning
- Web Development
- Algorithms

Approach

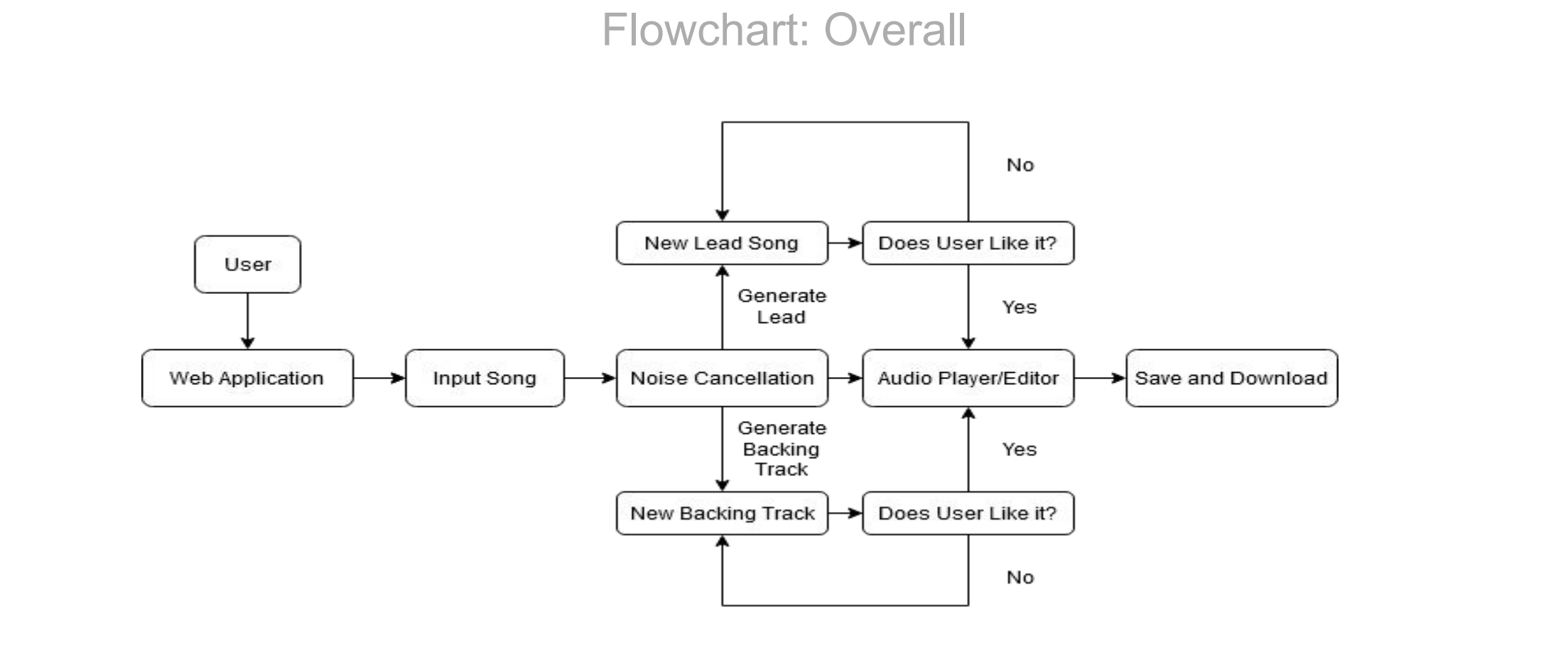
- For the machine learning part, we are going to implement a sequential model using RNN-LSTM.
- We take a more algorithmic approach in using the model to generate a backing track for a given lead and vice versa.
- While converting input files to MIDI files, we have used a model involving multiple Fast Fourier Transformations.
- Noise Cancellation: The algorithm takes in an audio file from the user with the noise and then it parses through a common set of noises and removes those noises from the audio file and produces a pure audio file with reduced noises.

Flowcharts

Flowchart: Model



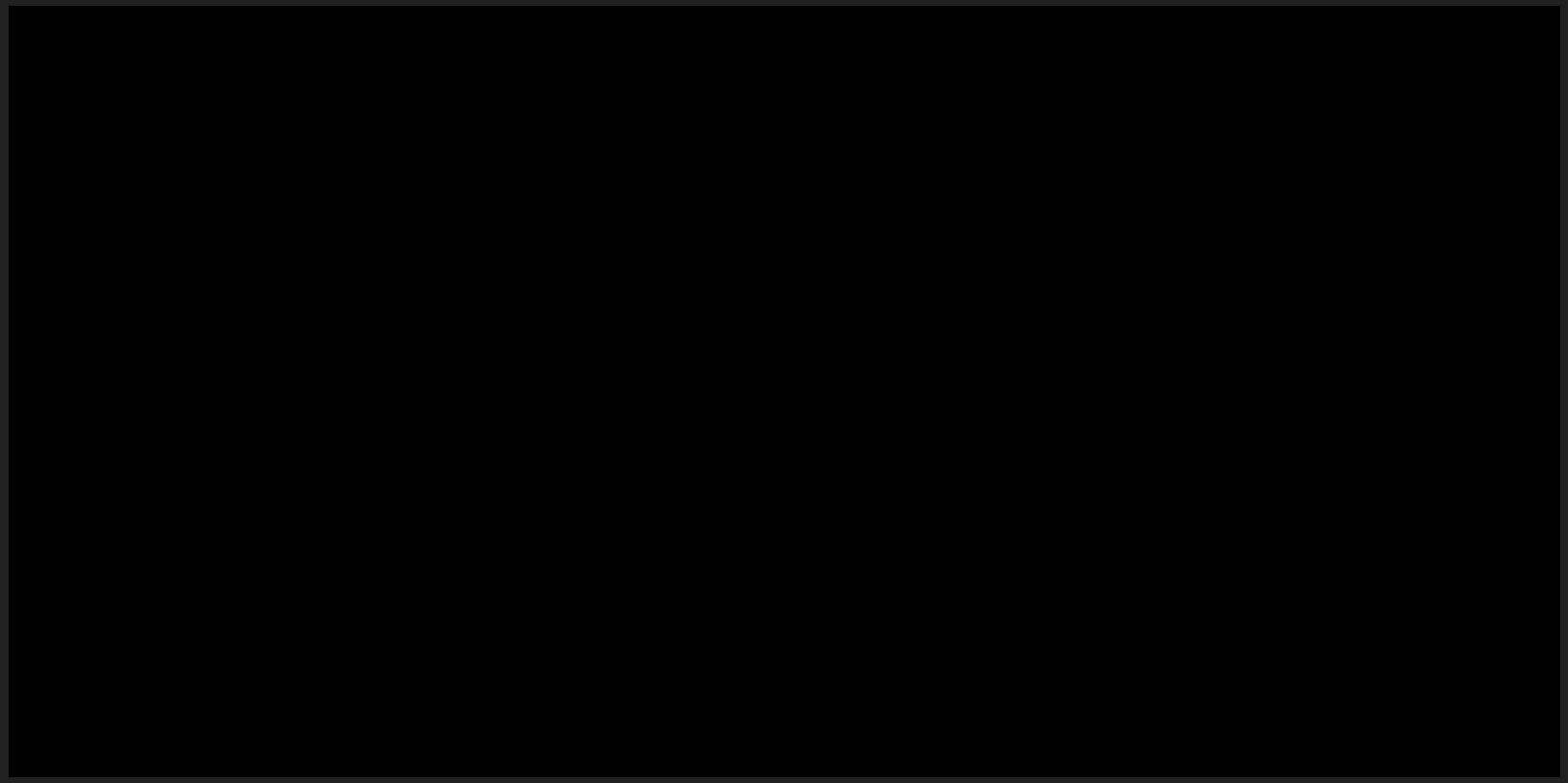
Flowcharts


Flowchart: Overall
User
Web Application
Input Song
Noise Cancellation
Generate Lead
New Lead Song
Does User Like it?
No
Yes
Audio Player/Editor
Save and Download
Generate Backing Track
New Backing Track
Does User Like it?
Yes
No

Results

As we approach the end of the first phase of this internship, Neural Moosic, in its current state, is capable of generating an appropriate backing track given an input lead track.

Demo



Challenges and Limitations

- We modified our problem statement in Week 3 to change our focus towards lead/backing track generation.
- The noise cancellation uses a predetermined data set, so if it encounters any new type of noise, it will not be able to recognize it.
- The MIDI converter can sometimes result in inaccurate Beats Per Minute.
- The backing tracks generated lack the more esoteric chords, and its tempo is constant.

Future Scope

- We aim to continue progress in working on the Lead generation model
- We will be working on refining the Accompaniment generation model by increasing available chords and making the pattern more dynamic.
- We will also try to Increase the size of the active noise cancelling data set.
- We also plan on adding more features to the Audio editor, such as speed manipulation.
- Support for multiple instruments.

References

Music Generation by Deep Learning:

https://arxiv.org/pdf/1712.04371.pdf

Deep Learning for Music:

https://arxiv.org/pdf/1606.04930.pdf

Audio to MIDI conversion:

https://www.researchgate.net/publication/316110427_Pitch_Contours_as_a_Mid-Level_Representation_for_Music_Informatics

Flask Introduction:

https://flask.palletsprojects.com/en/1.1.x/

React Redux with Hooks:

https://react-redux.js.org/api/hooks

Thank You!

for the music, the songs I'm singing