

Summer 2021 MDS Project

Summer 2021 Mechanistic Data Science Course

James Fleming, Undergraduate, University of Illinois at Chicago

Bradley Goedde, Undergraduate, Northwestern University

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1. Objective and Goal

The objective of this project is to learn how to use mechanistic feature extraction techniques like Fast Fourier Transform and Short-Time Fourier Transform to analyze any piano key. We also want to create a database and find as many piano key sounds as we can and use the sound generator mini-app. One of our main goals is to learn how to improve the sound generator mini-app so that it works properly for all 88 piano keys, as well as learn how the feature extraction techniques work for our example.

2. Approach

Our approach would be to first start on creating the piano keys database. Once we have collected all 88 .wav files needed for the database, the next step would be to rework the mini-app to actually generate the generated guitar sound, rather than just pulling from a folder of generated sounds. In working to fix the mini-app, we will learn how the FFT and STFT techniques and the neural network work in detail, and we will learn to apply them to the piano keys through the mini-app. Once the app is working properly, the final step would be to improve the interface of the app so that it would be easier for anyone to use it. Throughout this project, we will work closely with our mentors to understand the code and how FFT, STFT, and the neural network work on our example.

3. Summary/Expectation

In the 5 weeks we have, we expect to finish the project details described above. The majority of our time will be spent learning how the inner mechanics of the FFT, STFT, and neural network parts work, and then applying them to generate the guitar sounds

from the piano keys. After the 5 weeks, we expect that the steps described in the approach will be accomplished, but we anticipate that we will work further to improve the app and its interface.

4. Wish to accomplish and learn

One of our main goals is to learn how mechanistic feature extraction can be paired with neural networks to generate sounds. We also hope to complete the mini-app to be functional enough to be used as an educational tool.