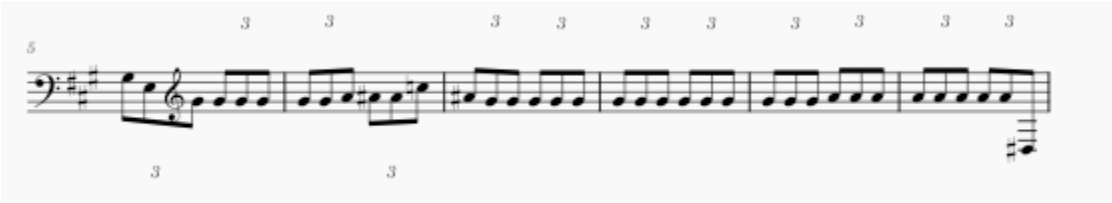
Assignment 6

I decided to generate music in the style of Ludwig van Beethoven's Sonatas. Beethoven wrote 32 sonatas, but I trained the model with the first 16, which was still over 100,000 notes. Parsing all 32 sonatas took a long time, and when I started training, the RAM reached maximum capacity and terminated my runtime during training. So, I reduced the training data set to 16 sonatas and trained the model.

Summary of findings

After 100 epochs, I generated three outputs with 200 max tokens and varying temperatures. I looked at the first output with a temperature of 0.8 and saw a lot of repetition. About half of the generated music varied the notes, but a single note was repeated in several places. For example, you can see in this line that many of the notes are repeated.



Based on this output, I increased the temperature to 1.0 and generated another example. This fixed the problem of repeated notes, and the music seemed highly varied. The only problem I noticed was that the tempo seemed faster than Beethoven's sonatas. Lastly, I generated music with a temperature of 0.2 just to see the output. As expected, there was not much variation at all. The same notes are constantly repeated for most of the music.

Reflection on the model's ability to generate music in the style of Beethoven

Using higher temperatures, the model generates music that has a lot of variation and doesn't sound too bad. It also uses the treble clef, like Beethoven. However, it does not seem to capture Beethoven's exact tempo. So, it looks like the model is on the right track, but it requires many more epochs to understand Beethoven's tempo and dynamics.

Extra Credit Research Problems

Quantitative Metrics? Are there any such metrics to evaluate a model's training performance?

Yes, the loss function value can be seen at each epoch. The goal is to minimize loss over time, meaning the model is effectively learning. In the case of my model, the sparse categorical cross-entropy loss function value decreases through the 100 epochs. This means that the model is learning, although its learning rate slows down over time.

Musical Quality? How can you determine if the generated music resembles Bach's Cello Suites, both in structure and stylistic elements?

You can examine structural elements like cadence and harmony when comparing any generated music to the original pieces. Cadence is the rhythmic change at the end of a phrase. Harmony is the combination of sounds or notes that a composer may use. So, you could look for common harmonies that Bach uses and see if they appear in the generated music. For stylistic elements, the clef and rhythmic patterns can be examined. Clef can reflect the instrument used because it is the intended pitch of the

notes. For example, if the model is trained on music in treble clef, it should also generate music using treble clef. When looking at rhythmic patterns, it can be less obvious if you are unfamiliar with music. However, comparing the duration of the notes and the rest times can help determine if the generated music is a good representation of the artist.