GEN AI Assignment 7
Brittany Klose
12/06/24

# Discussion Points for the Report

## Summary of Findings:

I chose to do 50 epochs because my machine sadly could not handle anything greater without taking too much time or breaking down. While the authors say this model needs 5000 epochs to properly work I was still happy that my results produced 2 lines of music. As the model progressed I noticed more things were added. At the first epoch it outputted just some notes, then epoch 3 began with a rest, then epoch 5 through 25 stated the piece was in C-major and included a time signature. Strangely epoch 26 switched to F#-major and then on 27 it switched right back to C-major. Both were strange Additionally, there were a few random epochs where the music included a large amount of rests in the beginning or for the whole line; which is typically unusual in most pieces. Furthermore, I also noticed most epochs repeated the same note for the whole line. C and G were the most common notes which makes sense for the key of C-major, though E only appeared once or twice which was odd. Though it was more odd that C major was used every time, especially since that's not a popular key for bach. Lastly, though the same notes were often repeated I noticed plenty of variation in frequencies of notes. To explain, one line might be all G5 and another G4 and another G3. This occurred for multiple notes showing the program was able to move around in frequencies even if the same notes were being played.

## Reflection on the model's ability to generate music in the style of Bach:

As mentioned above 90% of my epochs began with C-Major and most of Bach's pieces were D, F, or especially G major. However, in one of my actual transformer outputs the midi file in musescore showed it was in D major which I could tell by the one sharp for F notes. D major is plenty common for a Bach piece as I stated so that was a good sign off the bat. Additionally, my key signature was in 4:4 which matched many of the Bach midi files. My results also were in bass clef which is the clef used for Cello. Overall I was really pleased with my results.The actual music sounded like Bach. It was in his typical fast paced tempo with many buildups with ascending and descending scales, i.e. low to high and high to low. It's possible that my model overfit as it sounded almost too similar to one of the data pieces we originally played in class when introducing the assignment. However it was still different and if my machine could handle more epochs, even 100, I think the results would be more diverse. All in all, a very cool assignment!

## Extra Credit Research Problems

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

There are definitely quantitative metrics to evaluate a model's training performance. The point of the training data is to help the model establish patterns in the pieces. In Bach's case the model should learn his most common keys, tempos, notes, tonality, and melody patterns. Thus, the model's ability to replicate these patterns could be measured to evaluate its performance. More so, the model can also be evaluated quantitatively by its ability to correctly label and write music in general. To explain, beyond stating it in the key of D-major, one could go through each note in the piece and mark how many notes out of the total number were in the key of D-major. You could also rate the performance by the presence of a melody that follows a pattern and includes a natural end. In music most pieces' last notes finish the story in some way and without that last note it would sound incomplete like if you did not hit the last note in a scale. You could have a quantitative rate for how well a model's results was able to form a pattern and finish end part of the pattern.

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

I previously mentioned that my results sounded in the style of Bach in regards to its tempo and pattern. Bach is known to have fast tempos with quick beats and for including many scales either ascending or descending. This combination goes together to give the sound of music building and swelling and getting dramatic and intense as was Bach's typical theme. My two lines were not as intense and complex as a Bach pieces. It sounded like a piece for someone of a lower level to play. However it still sounded like Bach in regards to the build up and scales.

**Beyond Bach?** Build a similar model on **any music/composer of your choice**:

I decided to build another model but using Taylor Swift's music instead seen in the Swift_extra_credit file. I uploaded 30 midi files for 30 different songs, from various albums. Though each album is different there is typically a similar theme and key that marks it as being a Taylor Swift Song. I noticed in my epochs that again everything was in C major which matches the key signature of many Swift songs; though I couldn't tell if this was a sign they model was learning from the data or if C-major would appear for any artist with this model with so few epochs compared to 5000. I would have to test another artist and or try Bach and Swift again with more epochs to find out. Additionally, my results with Taylor Swift's music did not come out as well. I'm not sure why but my

results were the same note, though the tempo was rather very in line with her typical tempo.