

DJ Tuner

Better Than Your Campaign's Bard (Unless It's Angie)

"Didn't they play that song already?"

"I can't believe they're using the same song."

"That song? Again?"

Music is used to enhance someone's experience. It can be used to evoke feelings, or to provide entertainment. In an ideal world, one could add music to any situation to enhance its experience, whether it be a high beat song to aid in exercise, or a solemn song to facilitate mourning. However, it isn't that easy. Music, as important as it is, needs to be created and for some people, the creation of a song can be a year-long endeavour. This is where **DJ Tuner** comes in.

DJ Tuner is a music generation project using a generative adversarial network (GAN) to create new tunes. A human might take a year to create a piece of music. **DJ Tuner** can make 100s in a minute.

Music is a special orientation of sound waves which includes a frequency and temporal component. It is a complicated topic that requires melody and a subjective collection of sounds. Data processing is computationally expensive for music because of the large data size for spectral information. However, using midi files, which contains music in the form of an array of notes and beats, data processing can be computationally simplified.

Since midi files are arranged as a simple array, many methods have been applied to attempt to generate music. Convolutional neural networks (CNN) have been used since the midi file can be treated similarly to an image. However, it does not contain melody, just collections of complementary sounds, since later notes can not learn from earlier notes. To combat this problem, recurrent neural networks (RNN) or more specifically, long short-term memory (LSTM) are used to learn melodies. However, the problem with LSTMs is that they do not generate new music, they only learn similar melodies to the pieces they are trained on. Generative adversarial networks (GAN) use a discriminator and forger system to generate novel data to mimic the data trained on. Using a GAN combined with an RNN, new music that preserves melodies can be created.

Midi files from the Video Game Music Archives were scraped. To keep training simple, only pieces that strictly used piano were taken. No exploratory data analysis was performed but, in the future, it could be performed to make sure that music has a minimum length as shorter pieces might make training more difficult.

In most machine learning implementations, such as regression techniques, there is a statistical metric that can be used to evaluate the model. With GANs, however, there is no metric that can be used. The results can only be evaluated subjectively. Consequently, results that are satisfactory for me, someone with a very low bar in music, might be unacceptable for someone who produces music for a living. Some of the generated music can be found [here](#) and the evaluation of the results left for the reader.

One of the problems that arose from the GAN was that the music generated after 10,000 epochs was very similar sounding to that after 50,000 epochs. The GAN seems to have either over-trained or have undergone mode collapse. To fix this problem, a Wasserstein loss with a gradient penalty could be used since it is a common way to prevent mode collapse.

Overall, I was pleased with the results of **DJ Tuner**. It generated novel music that I could listen to repeatedly. I could even imagine certain situations in video games where the music could be played. Even if the reader is not impressed with the music, however, it is undeniable that the music has a melody that can be used as a muse for humans to aid in producing music.