

Daily Log

Tuesday October 15

Researched and took detailed notes on the mechanisms behind a neural network. I learned new terms such as "loss function" and "activation function". I also learned about the process for training a simple network, namely feed forward and back-propagation. There are various types of neural networks, so I'm looking into those in order to decide what kind best suits my project.

Thursday October 17

I continued my research into neural networks. I learned that convolutional neural networks (CNNs) are often used in recommendation systems, which are similar in function to my program. I also read about recurrent neural networks (RNNs), which save outputs from different layers and feed this back as input. I'm still shopping around to find a really good fit for the project, but I'll probably end up going with a CNN. I have enough to start with a relatively simple neural network, though.

Monday October 21

I started my first attempt at a neural network today based on instructions from an online tutorial. I used a simple sigmoid function as an activation function and a sum-of-squared errors function as a loss function. Once I finished, though, I realized that the tutorial never really said how to feed the network inputs. I did some searching and came up with nothing, so I started looking into machine learning libraries.

Tuesday October 22

I had heard that TensorFlow was a pretty comprehensive machine learning tool, so I looked into that today. It has tutorials for beginners that I found really helpful. I read through some tutorials and even tried one out for myself on Google Colab.

Thursday October 24

Keras is a deep learning library that runs on top of TensorFlow. Its library contains everything I could ever need to build and train a neural network. I started looking through the API and tutorials today, and I also installed Keras and TensorFlow onto my computer. I looked through the Keras documentation started looking into all the new terms I read there. I'll be learning how to implement the library in the coming week.

Timeline

Date	Goal	Met
9/30/19- 10/04/19	Learn how to extract MFCC data using the Librosa Python library	Yes, but I need to convert the MP3 song files I've collected into WAV files before I can calculate MFCC with them
10/14/19- 10/18/19	Learn how neural networks work	Yes, but I'll probably learn even more as the year progresses
10/21/19- 10/25/19	Start neural network	Yes, but I ended up deciding to switch to TensorFlow and Keras
10/28/19- 11/1/19	Continue work on convolutional neural network	In progress
11/04/19- 11/08/19	Continue work on CNN	In progress

Reflection

I'm really glad I finally got to the real implementation part of my project. It sort of feels like I'm going in blind, but considering that I started out not knowing how to do any of the things I've accomplished in the last couple of months, I know I'll be fine. I'm still reading everything I can about MFCC and I'm probably going to end up reaching out to a researcher for a more in-depth explanation of it. I'll also probably need to compute the MFCCs of a couple thousand songs for training to get my CNN super accurate, but I'll deal with that when I need to.

```

4  import numpy as np
5  import math
6  import librosa
7  from librosa import display
8  import matplotlib.pyplot as plt
9
10 class NeuralNetwork:
11     def __init__(self, x, y):
12         self.input = x
13         self.weights1 = np.random.rand(self.input.shape[1], 4)
14         self.weights2 = np.random.rand(4, 1)
15         self.y = y
16         self.output = np.zeros(self.y.shape)
17
18     def activate(self, x):
19         #sigmoid activation function
20         return 1/(1 + math.exp(-x))

```

Figure 1: My first (failed) attempt at a neural network.