SPIKING NEURAL NETWORK

1. References

- Article No.1
  I used this article to read about SNNs and understand the equations and implementations of IF and LIF neuron.

- Article No.2
  Used these tutorials as a reference for the implementation of SNNs

2. Approach

So, I had already gone through the resources and had a rough biological understanding of SNNs as to how instead of using weights and bias we use spikes and signals are sent from time to time and not continuously. A large amount of storage usage is reduced by the use of only 1's and 0's since multiplication is a lot more simpler.

So, I first began by implementing a LIF neuron. Then proceeded onto making a linear layer of them. I made a single layer SNN and applied it onto the dataset then proceeded to expand to two layers and so on to the third. The main challenges I faced was in the gradient calculation. So, I chose to implement the supervised learning with surrogate gradients. Surrogate gradients involves approximating the heavisite function to a sigmoid function.

3. Images:

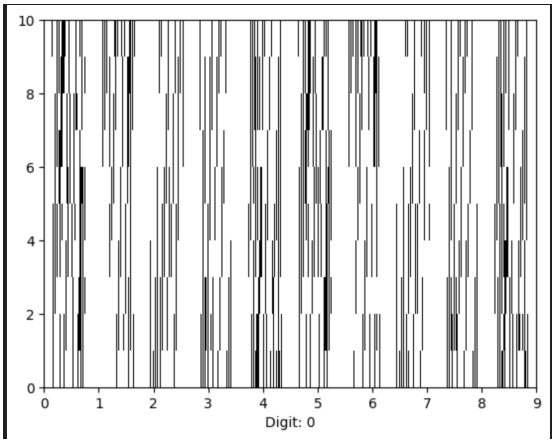

FIGURE 1. A spiking input for the number 0

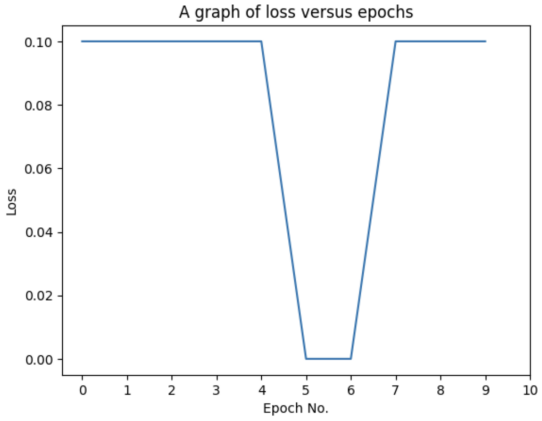

FIGURE 2. Graph of loss vs Epoch