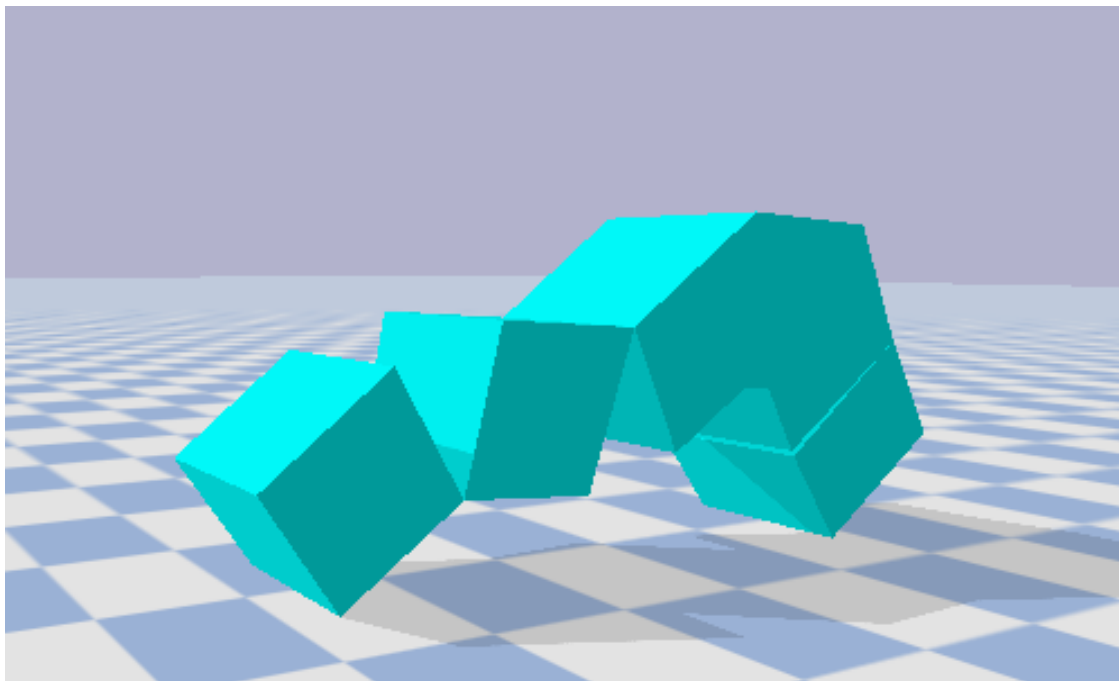
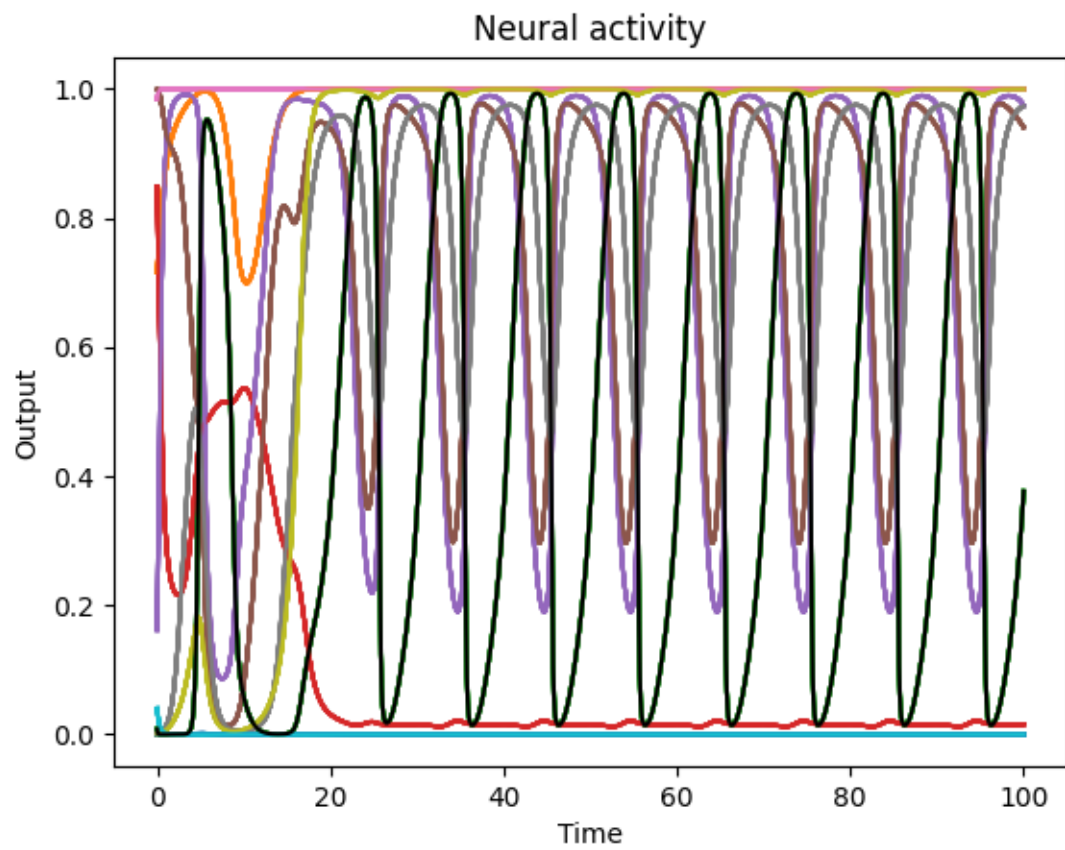


Programming Project #6: Neural Networks (Part 2): Dynamical Models

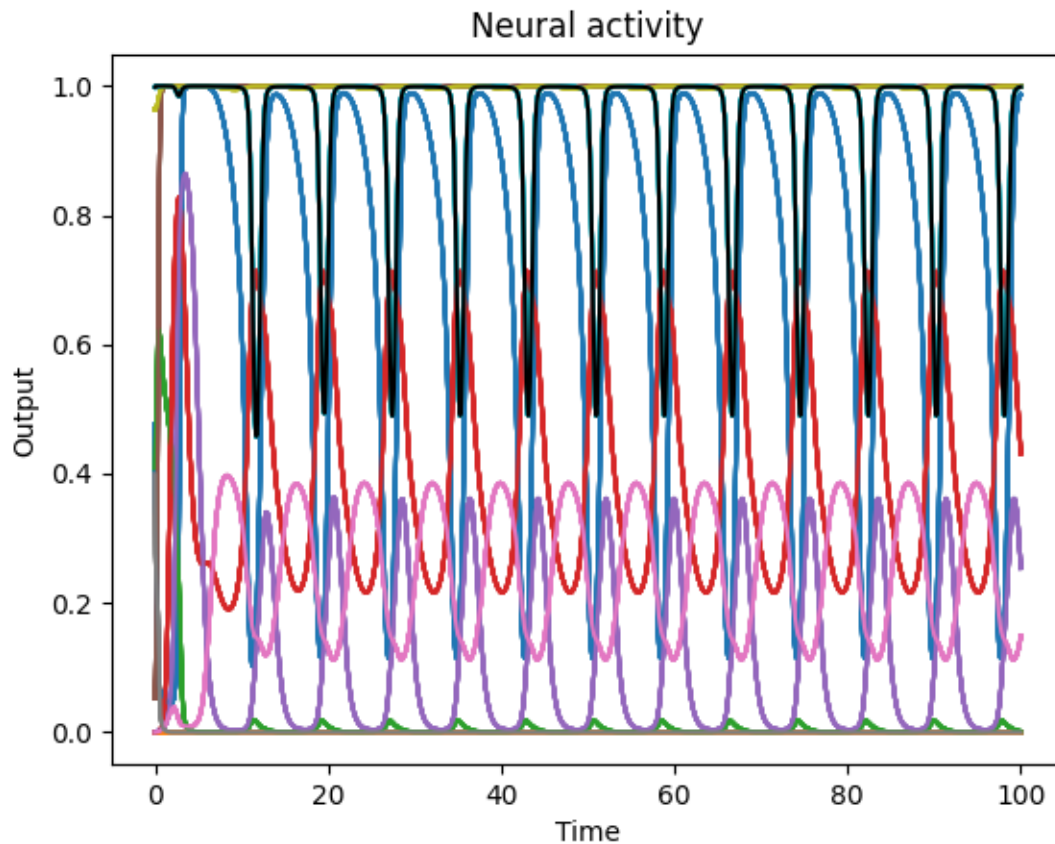
Anuj Suvarna

Option 1: For the project this week, I decided to integrate the CTRNN with my body I made last week. To do this I generated the behavior from some neurons and selected one neuron's behavior and applied it to all my joints on my body. Throughout this experiment I decided to mess with some of the parameters such as size and step size. I did have to apply a gain to the output of the neuron as the value of its output was extremely small. I initially wanted to experiment with different signals one run would produce. From there I decided I wanted to slowly alter the parameters of the actual CTRNN which ranged from the size and stepsize. In each of the Neural Activity graphs the black line is the signal that is used in the body.

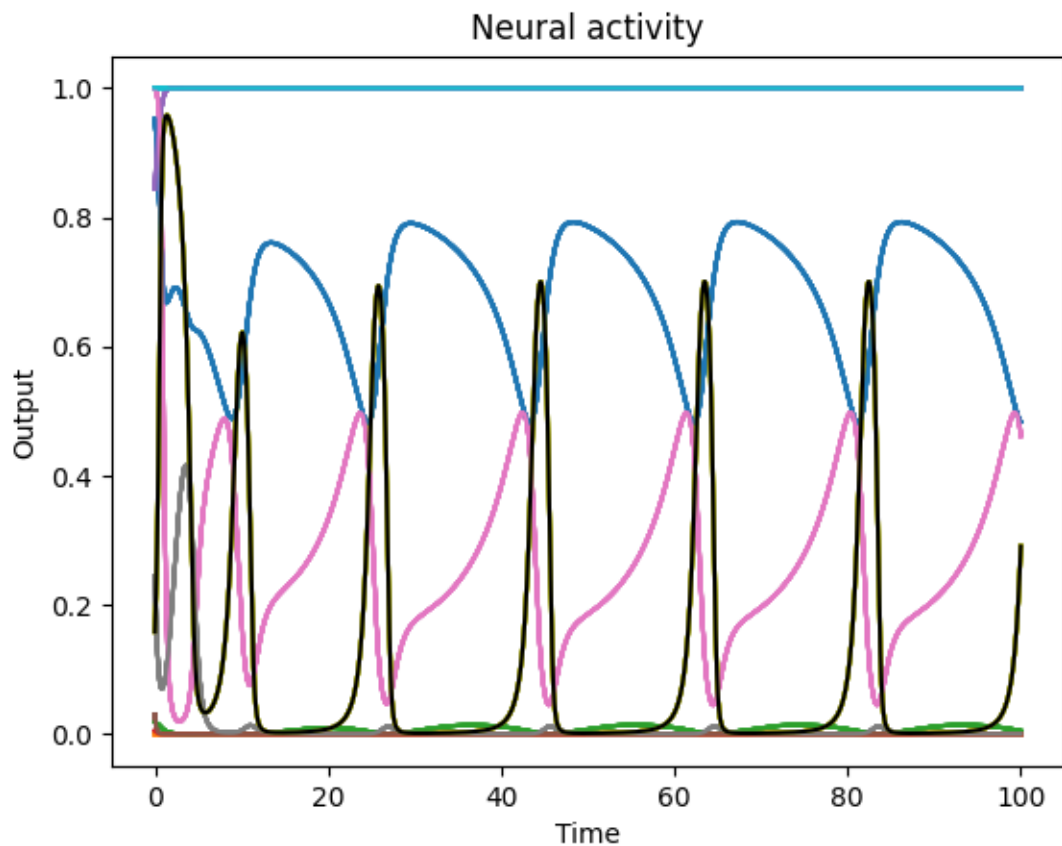
size = 10, duration = 10000, stepsize = 0.01:



When choosing this neuron, I noticed that it seemed to have a jumping motion where it would wind up quickly and shoot itself backwards and then decrease its velocity and relax. It can be seen [here](#). From here I decided that I wanted to see one more trial using a different neuron from this CTRNN run. As shown below.



The behavior for this neuron is demonstrated [here](#). It seems like in this case there is the initial jump where all the joints essentially turn instantly and then after that it has small blips where it extends and contracts but doesn't go anywhere unlike the first one. Again, I've decided to do another run to see perhaps a different type of behavior to see if movement can be optimized with this body. This is again shown below.



The video of this run can be found [here](#). It seems like from the video that the body initially has a very large jump and then slowly oscillates again but doesn't seem to go anywhere.

Conclusion: Overall, I decided to find different signals that covered a spectrum of 0-1 and then one that oscillated between 0.5-1 and then finally one that goes to about 0-0.5. From what I can tell the best run happened to be the first one where it oscillated from 0-1 as it got actual movement. The other ones seemed to oscillate in place and didn't have enough force to gain momentum. For further investigation, I think it would be very interesting to see what would happen if I started to alter the time constant for the CTRNN.