Project 21: Time representation in temporal difference learning

1) Implement the temporal difference learning model with the microstimulus representation described in Ludvig et al. (2008). Simulate the findings from Hollerman & Schultz (1998) studying the effects of early reward delivery on dopamine neuron activity (see Figure 7 in the Ludvig paper).

2) Mello et al. (2015) have shown a microstimulus-like representation of time in the striatum that rescales with the task-relevant interval, without altering the relative temporal tuning of neurons in the population. How can this rescaling be implemented in the microstimulus representation? What is a possible biological interpretation?

References:

Hollerman, J. R., & Schultz, W. (1998). Dopamine neurons report an error in the temporal prediction of reward during learning. *Nature Neuroscience, 1*, 304-309.

Ludvig, E. A., Sutton, R. S., & Kehoe, E. J. (2008). Stimulus representation and the timing of reward-prediction errors in models of the dopamine system. *Neural Computation, 20*, 3034-3054.

Mello, G. B., Soares, S., & Paton, J. J. (2015). A scalable population code for time in the striatum. *Current Biology, 25*, 1113-1122.