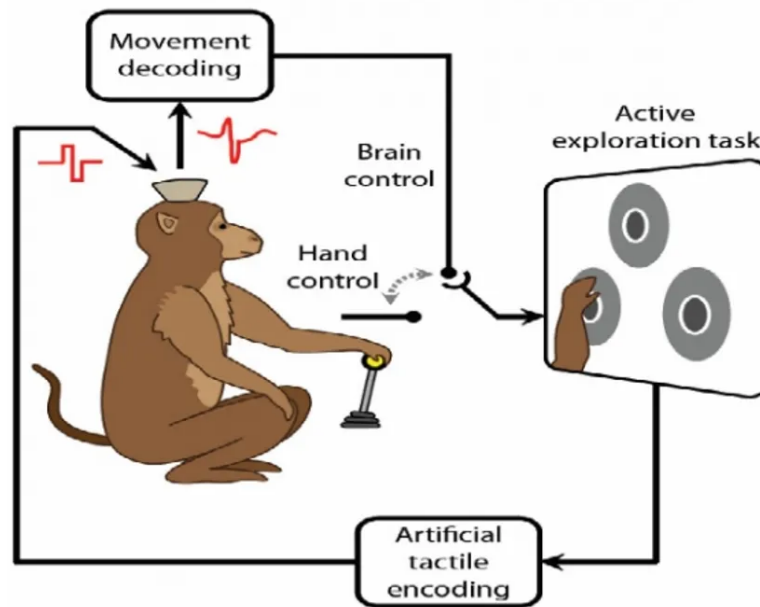# Wksht 5: Incorporating a stimulus

Suppose I have recordings from an experiment in which electrodes were placed in the motor cortex of a monkey while it performed a reaching task.

Suppose the stimulus was presented at t = 3.5 seconds and the monkey reached for the correct location of the stimulus at 4.5 seconds (technically, this data set recorded 4.5 seconds as the "time of maximal velocity of reaching"). You can find 10 spike trains labeled "spikeTimes_neuronX_M1cortex.csv" in our data folder on Google Drive.

The goal is to use R to make the figures we talked about in class, but before we dive into the code, let's first brainstorm different ways to _visualize_ the spike-train data. How many different ways can you think of to illustrate or highlight the spike times together with the time at which the stimulus is on and off? Sketch some here.

Now use R to make one of the figures you sketched. You might find it useful to use the "annotate" component of ggplot(), which allows you to add to graphs. And note that "alpha" refers to the transparency of an object. The smaller the number, the more transparent; the larger the number, the more opaque.

Once you've visualized the spike trains and illustrated where the stimulus occurs, you'll want to start computing measures for times when the stimulus is on or off.

Try the three we talked about in class:
1) firing rate (highlighting somehow where the stimulus occurs)
2) Synchrony (again, highlighting were the stimulus occurs)
3) ISI — this one you will want to compute the distributions for the three separate regions of time: before the stimulus, during the stimulus, and after the stimulus. For each of these, you will want to compute the CV too.

What do your visualizations tell you about these recordings in the Monkey motor cortex and how they may or may not change characteristics with the stimulus?

Homework: Tell me a story about this data! Imagine that you've recorded these spike trains and you are trying to explain to someone with very little neuroscience background what you think is happening with the stimulus. Use any and all measures we've learned so far to justify your assertions. As always, you'll want to create a slide or two that presents your figures and your story.

I purposefully didn't clarify if these recordings came from 10 different neurons or from the same neuron across 10 trials. Comment on how your interpretation would be different for those two cases.