**1. What part of our neural interface makes it a closed-loop system? (1 sentence)**

We are using surface electromyography (sEMG) to control a computer cursor in real time and can receive feedback about the cursor position by seeing the cursor position plotted visually, creating a closed-loop system.

**2. The rate of a neural interface system is set by the** \_\_\_\_temporal resolution\_\_\_\_ **of the neural feature used.**

**3. What other implementation details place constraints on the rate of a neural interface loop?**

Some other implementations that limits the rate of a neural interface is decoders and the hardware that we use. More complex decoders will require longer time to execute

**4. Describe the relationship you observed between control loop lags and performance of the neural interface (1 sentence). What part of the task appeared to be most influenced most by the lags (i.e. what did the subject struggle the most with)?**

**5. Which control variable (position or velocity) was easier for the subject to control? Briefly (2-3 sentences) explain why there is such a notable difference between these two systems. Hint: think about the temporal dynamics of the decoder (i.e. the role of the A matrix in the Kalman Filter).**

**6. In experiment 2, we used a state transition matrix with Vx(t) related to itself with a small ‘decay’ of 0.9. What would you predict would happen if we reduced this term to 0.5? Describe how this would impact the cursor dynamics.**

**7. In our experiments, we used 2 muscles to control movements along a single direction (1 “degree of freedom”). We could have, instead, used each muscle to control a separate direction of cursor movement (making a 2D cursor).**

**a. What property of the neural signals we have (our EMGs) makes the 2D interface infeasible with our existing approach? (Hint: think about how 1 muscle would control positive and negative velocity.)**

**b. What part of our neural interface pipeline (data acquisition, signal pre-processing, decoding) would need to change to implement a 2D cursor interface? Note: there are several possible solutions—just list one option.**

8. Append all requested figures to your comprehension questions.

Experiment data:

1. Bin size 100ms, lag size 0ms
2. Bin size 100ms, lag size 500ms
3. Bin size 100ms, lag size 300ms
4. Bin size 100ms, lag size 100ms
5. Bin size 100ms, lag size 0ms, position control