Description of real neural data

The following describes the data format. The .mat file has a single variable named *trial*, which is a structure of dimensions (100 trials) x (8 reaching angles). The structure contains spike trains recorded simultaneously from 98 neural units while the monkey reached 182 times along each of 8 different reaching angles (where the trials of different reaching angles were interleaved). The neural data includes both well-isolated single-neuron units (~ 30% of all units), as well as multi-neuron units. The structure also contains the monkey's arm trajectory on each trial. On each trial, both the neural data and arm trajectory are taken from 300 ms before movement onset until 100 ms after movement end.

The spike train recorded from the ith unit on the nth trial of the kth reaching angle is contained in *trial(n,k).spikes(i,:)*, where i = 1, . . . , 98, n = 1, . . . , 100, and k = 1, . . . , 8. A spike train is represented as a sequence of zeros and ones, where time is discretized in 1 ms steps. A zero indicates that the unit did not spike in the 1 ms bin, whereas a one indicates that the unit spiked once in the 1 ms bin. Thus, a spike train of duration T ms is represented by a 1 xT vector.

The three-dimensional arm trajectory recorded on the nth trial of the kth reaching angle is contained in *trial(n,k).handPos*, which is a 3 xT matrix of the hand position (in mm) at each 1 ms time step. On each trial, the data in spikes and handPos are aligned in time. In this task, the monkey reached to targets on a fronto-parallel screen. Most of the arm movement was in the plane of the screen along the horizontal (*handPos(1,:)*) and vertical (*handPos(2,:)*) directions. The movement perpendicular to the plane of the screen (*handPos(3,:)*) was relatively small. The indices k = 1, . . . , 8 correspond to reaching angles (30/180π, 70/180π, 110/180π, 150/180π, 190/180π, 230/180π, 310/180π, 350/180π) respectively. The reaching angles are not evenly spaced around the circle due to experimental constraints that are beyond the scope of this problem set.

The neural data have been generously provided by the laboratory of Prof. Krishna Shenoy at Stanford University. The data are to be used exclusively for educational purposes in this course.