Reverse engineering motor output to identify the detailed structure of motor commands

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Motoneurons in the spinal cord are the conduit for all motor commands to muscles fibers. The neuromuscular junction is a powerful synapse, so that muscle fiber action potentials are one to one with the motoneuron that innervates them. Because these muscle fiber action potentials are relatively easy to measure, motoneurons are the only CNS cells whose spiking patterns can be measured in humans. The focus of this presentation is on our recent progress to reverse engineer this unique window on CNS function, to identify the structure of motor commands. One surprising result is that the interactions between neuromodulatory inputs that alter motoneuron electrical properties and inhibitory inputs that arise from spinal interneurons are probably the key factors specifying the form of motor outputs.