Peter Kennedy, Paper Summaries:

Learning Visually Guided Latent Actions for Assistive Teleoperation

Convolutional neural networks (CNN) can be used to map low-dimensional controls (i.e. single Joystick) to higher level actions (ie. Pick up or put down an object) by training the CNN to recognize the type and location of nearby objects and map the possible high dimensional actions to the low-dimensional controls.

EMG-based teleoperation of a robot arm using low-dimensional representation

The human arm has 7 degrees of freedom, however recent investigation shows that the activation of the 30 muscles which control the arm are activated with electrical patterns rather than one signal per muscle. This means that low-dimensional EMG input could feasibly contain most of the information required to control a high-dimensional output (prosthetic arm), which the authors attempt to do with some success.

Assistive teleoperation of robot arms via automatic time-optimal mode switching

Joystick type control methods often use mode switching to allow a user to control a robot over its full range of motion. However, mode switching and tracking current mode takes a significant amount of time and concentration from users, thus automatic mode switching can help relieve workload. The authors had an experiment where they mapped the optimal control mode to a region of 2d space and had their robot automatically switch modes based on where it was in that space. This worked, but I’m skeptical of having to have a pre-mapped “optimal mode” space.

Providing low-dimensional feedback of a high-dimensional movement allows for improved performance of a skilled walking task

Authors taught a new walking pattern to participants using two different visual feedback systems. The base system showed 4 different parameters at once against their new “principle component” system showed one summary measure, which performed better. The author’s hypothesize that the low dimensional feedback takes less time to process.