Modulating the brain to move machines

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Brain-machine interfaces (BMI) create artificial bridges to connect a brain to external devices, which can be used for motor or sensory purposes. This topic has been actively researched for the last few decades in animal models ranging from rats to humans. The connected prosthetics can partially replace lost functions in cases of nervous system deficits; this has led to increasing translational work to push the technology into clinics. I will review the development of invasive BMI, highlighting the range of approaches and state of the art. While the current BMI architectures are promising, there remain critical obstacles which must be addressed, e.g. neuronal signal loss, control signal non-stationarity, and controller generalization to novel environments. Finally I will give an overview of our current research focus, brain-spinal interfaces, which are designed to restore (instead of replace) lost functions by hijacking the existing spinal cord circuitry.