T&C CHEN BRAIN-MACHINE INTERFACE CENTER
Three $50,000 awards, one per RFP.

RFP 1. Invasive or non-invasive recording technology
A central bottle-neck in advancing brain-machine interface (BMI) solutions are the recording devices that record the neural signals. Currently, arrays with approximately 100 recording channels are used which are limited in length, recording yield, and long-term viability. They also require brain surgery for implantation. We request applications for innovative solutions for invasive (e.g. requiring surgery) or non-invasive technologies for recording neural activity from the brain in real-time and with high spatial and temporal resolution.

RFP 2. Computational neural prosthetics
A brain-machine interface (BMI) decodes neural activity into useful control signals for guiding robotic limbs, computer cursors, or other assistive devices. In its most basic form, such a system might involve learning a basic mapping of how neural signals relate to cursor velocity and then "closing the loop" to enable direct neural control of cursor velocity. Such systems have shown promise; however, improving performance and robustness remains a challenge. We request applications to improve aspects of real-time neural decoding algorithms based on state-of-the art machine learning principles. Example topics would include the following: optimization of calibration procedures used for algorithm parameterization; robust and efficient algorithms for non-linear neural signals; or, algorithms that adapt to recording and/or neural non-stationarities. Algorithms should be sensitive to the fact that the amount of training data that can be acquired for algorithm parameterization is limited based on subject compliance and fatigue (typically 3-10 minutes) and neural recordings can change on the time scale of minutes.

RFP 3. Neural plasticity for BMI learning
In a cortically-based brain-machine interface (BMI), the user's neural activity directly controls the movement of a prosthetic effector such as a computer cursor or robotic limb. Within such a system, the causal influence of individual neurons can be manipulated and the compensatory response of the neurons can be directly observed. This model provides a unique window into understanding the basic learning mechanisms that make the cortical motor system one of the most robust and versatile control systems on earth. We request applications that seek to understand the learning mechanisms that govern cortical plasticity in a BMI system, and how these insights might lead to better training protocols, improved performance, or novel implementations of artificial learning systems.

Proposal deadline: October 1, 2017. Please refer to the Proposal Guidelines for detailed proposal instructions.

Proposal Terms: Grants are for 1-year (with six-month extensions permitted upon request, with justification). Budget can include personnel (graduate RA, postdoc, SURF or other undergraduate), equipment, equipment usage (e.g. fMRI hourly fees) and reasonable travel for dissemination of research findings. No faculty salary will be awarded. A progress report is required after one year.

Proposal Submission: Send proposal, budget and list of support, as a combined pdf file, to Chen.Inst@caltech.edu. In the body of your email, please identify the RFP to which you are applying. Overview of available RFPs can be found here: www.neuroscience.caltech.edu/grants. There is an IP obligation associated with these grants. For more details about this obligation, please contact Case Cortese casecortese@caltech.edu in the Office of Technology Transfer and Corporate Partnerships.