Real-time Neural Feedback of Mesoscale Cortical GCaMP6 Signals Using Raspberry-Pi

Pankaj K. Gupta, Timothy H. Murphy
Department of Psychiatry, University of British Columbia, Vancouver, Canada

INTRODUCTION
- GCaMP based neural feedback in closed loop
- Can mice can learn to control target cortical regions? (Clancy et al. 2014) (Prsa et al. 2017).
- Neurofeedback for goal directed learning neuroplasticity.
- We present a real-time, low-cost Brain Machine Interface (BMI) for goal directed training, based on cortical GCaMP activity.

CLOSED-LOOP FEEDBACK SETUP

METHODOLOGY
- tetO-GCaMP6s (Jax#024742) mice used
- Rig: Raspberry Pi based GCaMP epifluorescence recording, audio speakers
- Camera: Sony IMX219 sensor, Triple band-pass filter attached (440, 530, 620 nm), 256x256 px imaging

RESULTS
- Normalised number of rewards (N=19)
- Spontaneous threshold (N=19)
- AUC scores (N=19)
- Reward centred cortical GCaMP activity maps
- ΔF/F of ROI-1 is conditioned on the task rule

APPLICATIONS
- Induce neuroplasticity in specified region of mouse cortex after stroke
- Training tasks in automated homecage environments

CONCLUSION
- Mice modulate the GCaMP activity in ROIs
- Real-time, low-cost GCaMP based BMI for raining mice.
- Extensible to mouse lines with expression in neuronal sub-populations.

REFERENCES
Clancy et al. (2014). Nature Neuroscience
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