Brain-machine Interface(BMI): Inter-subject Transfer Learning for Decoding Electrocorticographic Signals

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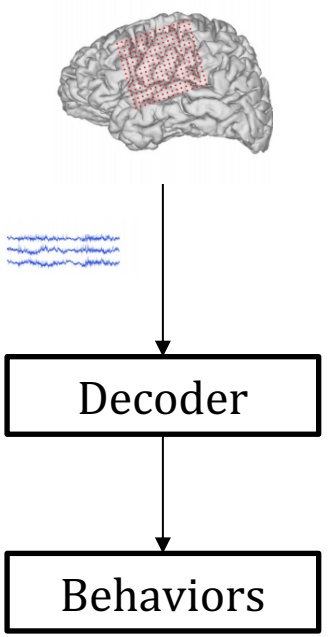
Motivation

- Why we need to study the relationship between neural signal and behaviors?

- Answer: we want to figure out the map between spatio-temporal patterns in neural data to behaviors. These would help us to develop brain-machine interface(BMIs) decoder to resort the lost mobility in individuals paralyzed.

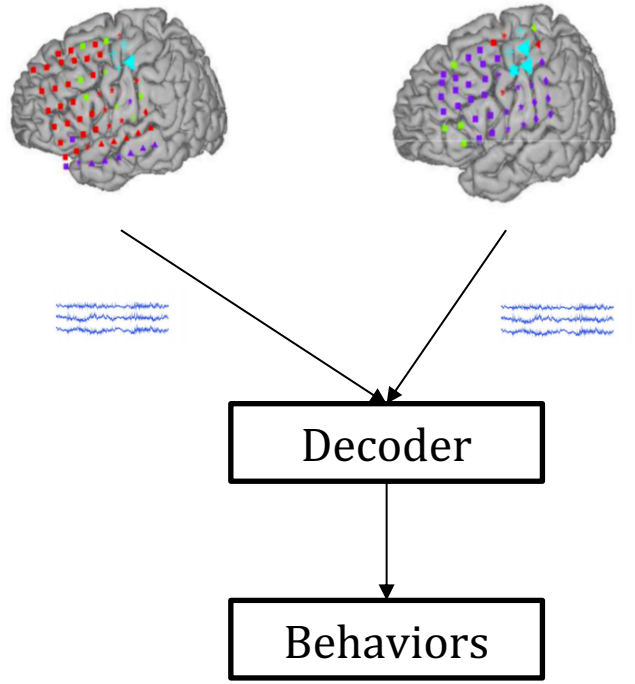
- What is the challenge in developing BMIs decoder?

- Answer: how to transfer BMI decoder across different users or across sessions for a given user.



Project Goal

- Develop across-session BMIs decoder using multi-task deep learning framework for ECoG based Brain-machine interface.
- Transfer the BMIs decoder across multiple users and improve the stability using domain adaptation techniques.



Dataset

- Neural signals were recorded from five patients being treated for epilepsy using standard sub-dural clinical electrocorticography(ECoG) grids.
- Experiment: subjects wearing a DataGlove were asked to flex an individual finger for two seconds based on a visual cue.
- Author: Miller, Kai Joshua

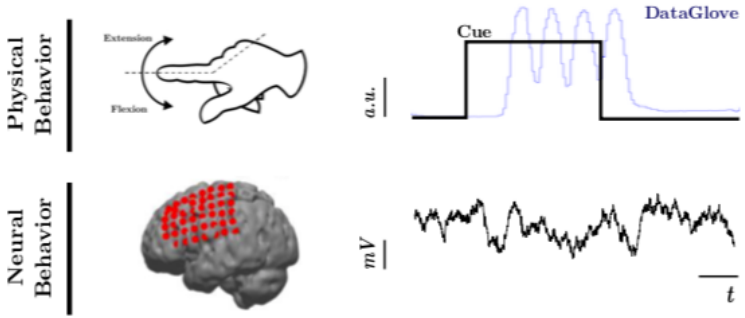


Figure 2.1: Overview of finger flexion experiment. The top row depicts the physical behavior measured during during the cue stimuli. The bottom row depicts a sample subject brain with implanted ECoG grid and measured neural trace.

"Patel, A.N., 2017. *Towards Practical Neural Prosthetic Interfaces* (Doctoral dissertation, UC San Diego)."