Lecture-16

A brain-machine interface (BMI)

- Closed-loop system for taking brain activity and driving some sort of computer directly using brain activity
- Training using actual motor activity to correlate brain activity to it
- What brain structure to record from
- Andy Schwartz (CMU)

Limitations of motor BMI

- Two big limitations
    - Electrodes don't last forever because they are not biocompatible (gliosis)
    - Neurons adapt/change across days
- Sadtler, Quick. Golub, Shase, Ryu, Tyler-Kabara, Yu & Batista, Nature, 2014

Varieties of memory

- Assumed stages of memory processing
    - Encoding

    - Storage
    - Retrieval
- Memory
    - Sensory, short-term, working memory
        - Central executive
        - Visuospatial sketch pad
        - Phonological loop
    - Long-term memory
        - Declarative memory (explicit) -> Knowledge
            - Events (episodic memory)
                - Specific personal experiences from a particular time and place
            - Facts (semantic memory)
                - World knowledge, object knowledge, language knowledge, conceptual priming
        - Non-declarative memory (implicit) -> Experience
            - Procedural memory
                - Skills (motor and cognitive)
            - Perceptual representation system
                - Perceptual priming
            - Classical conditioning
                - Conditioned responses between two stimuli
            - Non-associative learning
                - Habituation, sensitization

Medial temporal lobe system

- Fornix
- Anterior thalmic nucleus
- Mamillary body
- Medial prefrontal cortex
- Medial temporal lobe
- Hippocampus
- Perirhinal cortex
- Entorhinal cortex

Connections to hippocampus

- Neocortical association areas
- Parahippocampal region
- Hippocampus

Memory loss caused by cortical lesions

- Cerebral cortex
- Medial temporal lobe, hippocampus and surrounding structures