



Intracranial recordings for the study of cognitive processes



FRONT
neuro lab

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Implantation

We record from patients with drug-resistant epilepsy who are candidates for resective surgery

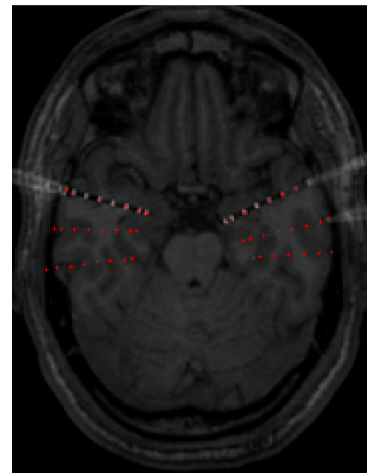
Stereo EEG (SEEG)



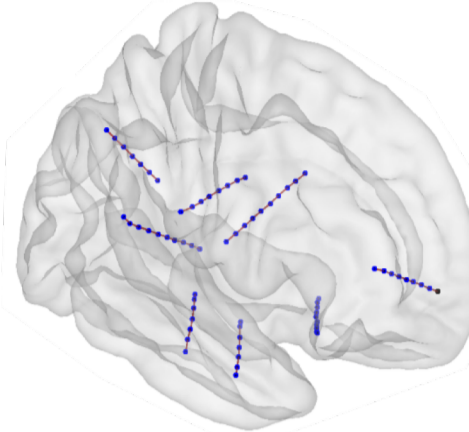
The EEG is recorded from depth electrodes implanted into the brain tissue

Where are the electrodes localized?

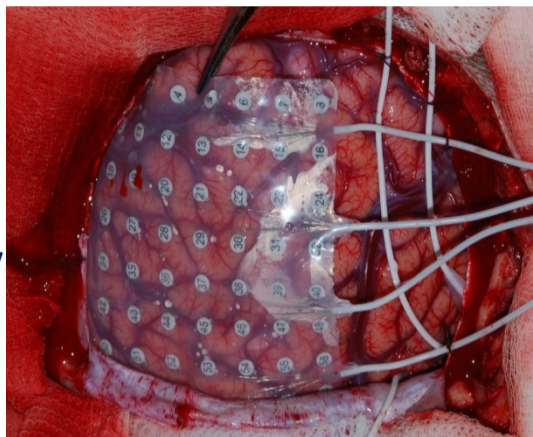
MRI (brain) - CT (electrodes) coregistration



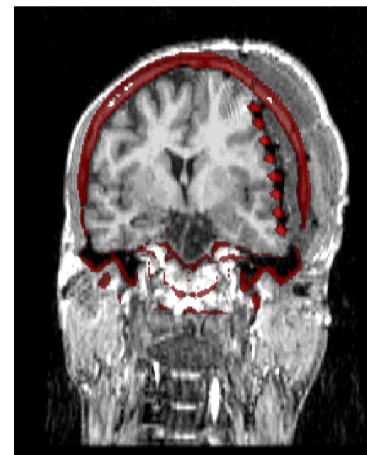
Deep electrodes implanted bitemporally



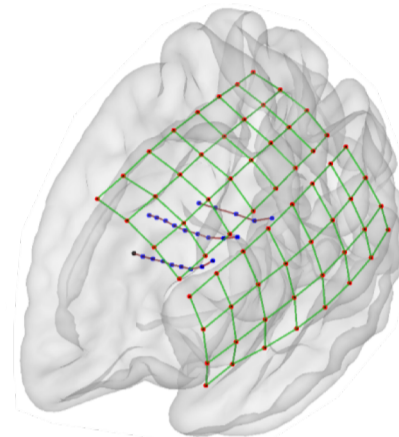
Deep electrodes implanted in right frontal, temporal and parietal areas



The EEG is recorded from a grid of electrodes placed over the cortical surface



Grid placed over left frontal, temporal, and parietal areas



Grid and deep electrodes in the left hemisphere

INTRACRANIAL EEG RECORDING

ADVANTAGES

- Direct recording of signal sources
 - Electrical activity of neuronal populations
 - Not like fMRI or PET indirect recordings

Spatial resolution ~ 1-2 mm

- Even better for high density arrays

Temporal resolution ~ ms

- Better than other neuroimaging techniques for analyzing brain dynamics

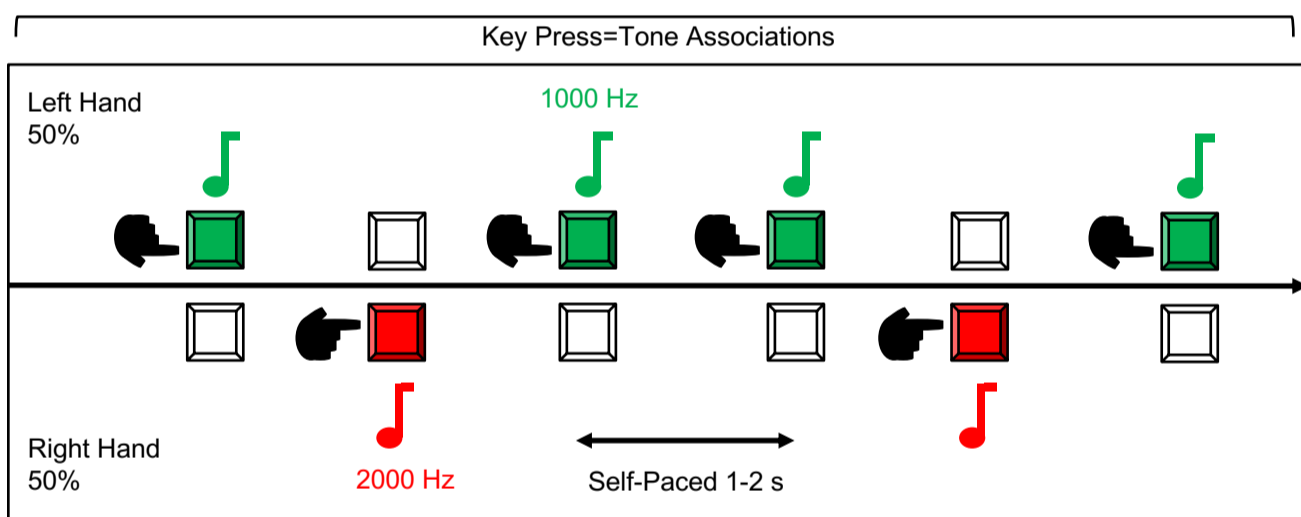
Compared to Scalp EEG

- Less artifacts and noise interference
- Much more sensitive to high frequencies. Changes in beta and gamma bands are sensitive indices of task-related brain activity.

COGNITIVE EXPERIMENT "Action-Based Auditory Predictions"

Fully Predictable (High Precision)

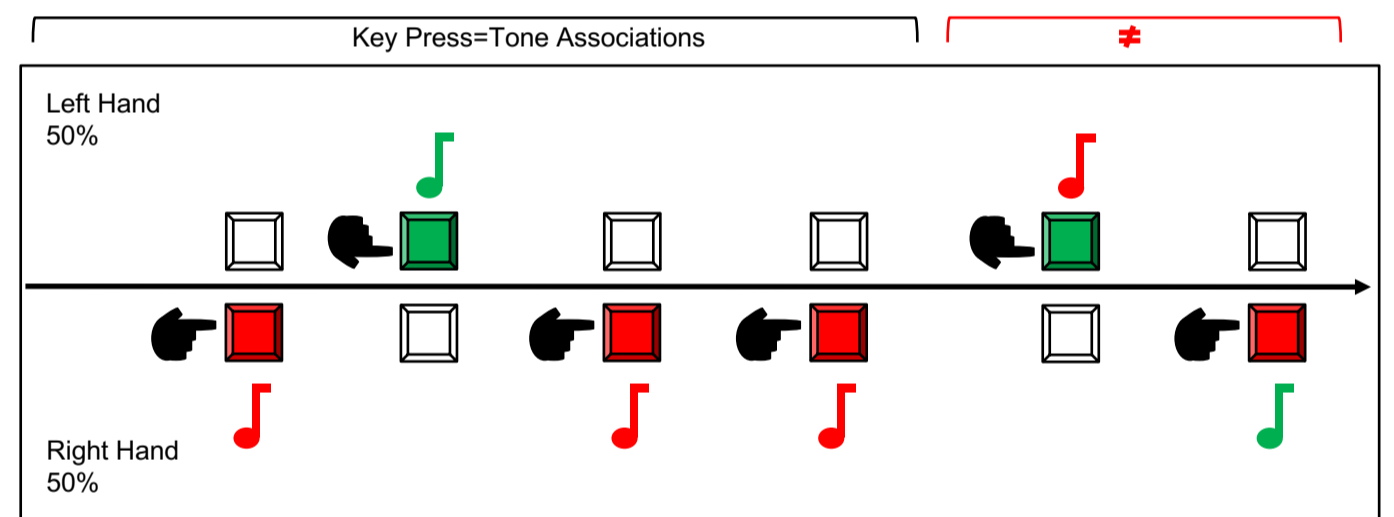
Standard 100%



Not Fully Predictable (Low Precision)

Standard 70%

Violation 30%

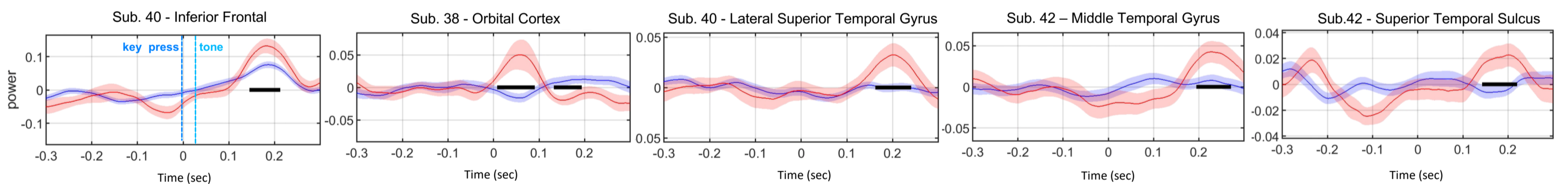


Preliminary Results: High frequency activity

Violation of Action-Based Prediction (Stimulus Change)

Standard Prediction

Violation of Prediction



Precision of Action-Based Prediction

(Standard Prediction - Stimulus Repetition)

(Standard Prediction - Stimulus Change)

High Precision of Predictability

Low Precision of Predictability

