Concepts Covered

- Introduction to EEG
- Types of Bands in EEG
- fMRI

EEG(*electroencephalography*)[1]

- Non invasive method
- Provides the total electrical activity of the cortical region underneath the electrode
- Depending on the reference electrode should be chosen carefully and placed on a location where the activity is not to be measured

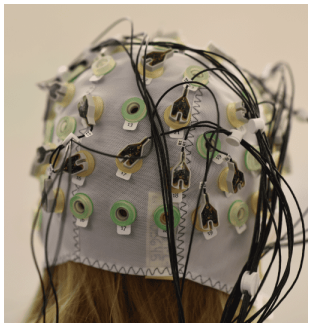

Fig1:- Sample picture of electrode placement in EEG

- Cannot be used for precisely pointing out the cortical regions from where the signals are acquired.
- Classification based on frequency /spectral content and related to event (event related potential)
- Event related potentials can be used to get multisensory responses /potentials .
- For eg:- When auditory and visual stimulus are played together and EEG is recorded ,this provides the multisensory responses to auditory and visual stimulus.
- Spectral analysis of EEG data:- The response is sampled at 250Hz - 4KHz, and the obtained EEG responses are within 250Hz.
- Based on different frequency responses , EEG data is divided into different bands.
- The decomposition of the overall power in the EEG signal into individual bands is commonly achieved through Fourier transforms and related methods for spectral analysis.
- Typical frequency bands and their approximate spectral boundaries are delta (1–3 Hz), theta (4–7 Hz), alpha (8–12 Hz), beta (13–30 Hz), and gamma (30–100 Hz).
- Advantages of EEG :1) Good temporal resolution
  2) Cheap and easily available

fMRI(Functional magnetic resonance imaging)[2]

- MRI is used for structural imaging

- Measures brain activity by detecting changes associated with blood flow. This technique relies on the fact that cerebral blood flow and neuronal activation are coupled.
- The differential change in the blood oxygenation level allows us to detect the level of activity
- BOLD(blood oxygenation level dependent) measure of activity, indirectly gives the account of which brain area is active.
- Major advantage is that functional signals from different brain areas can be measured simultaneously.
- However, spatial resolution across a single brain region is poor.

References

1. https://doi.org/10.1016/j.cub.2018.11.052
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3073717/