



- Neurons in the human brain are electrically active.
- This activity can be measured by means of electro-encephalogram (EEG)
- As the brain is performing various tasks, EEG signals change.
- These changes can be measured and mathematically analyzed in real time (as soon as they happen).
- If a computer can detect these changes, they can be used to communicate messages directly from the brain. This technology is called Brain-Computer Interface (BCI).

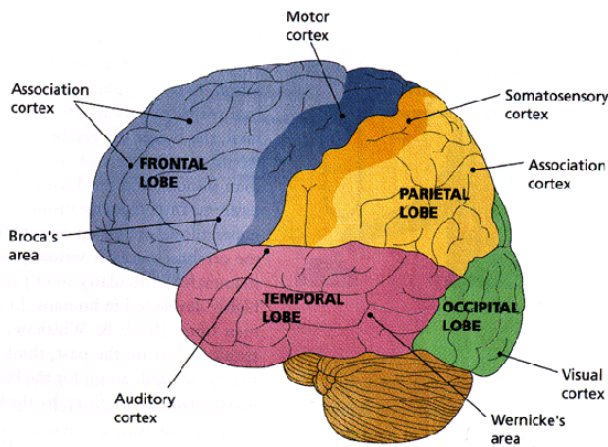


Fig. 1: The 4 lobes of the brain

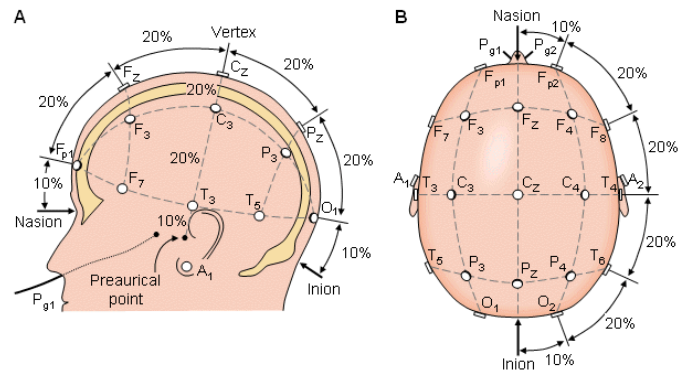


Fig. 2: The 10-20 International Standard for EEG electrode placement

The electrodes we use in the P300 spelling task are: C3 Cz C4 (frontal/parietal lobe border); P3 Pz P4 (parietal lobe); O1 O2 (occipital lobe)

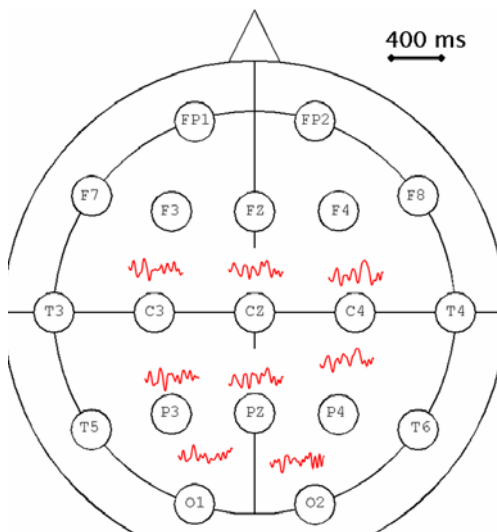


Fig. 3: Snapshot of EEG signals when the intended letter is highlighted (P300 should be present)

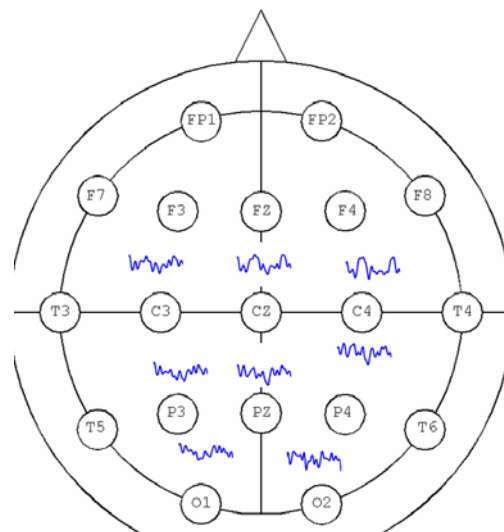


Fig. 4: Snapshot of EEG signals when the intended letter is NOT highlighted (P300 should be absent)

The mathematical challenge is to recognize whether P300 is present or not. If the computer determines that it is present, the highlighted letter (or a group of highlighted letters) will be selected.