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EEG-IntraMap: A Tool for Predicting Intracranial Neural Activity from Noninvasive EEG for Applications in Psychiatry

Stanford researchers have developed a technology that predicts deep brain activity from standard scalp EEG recordings. The system enables non-invasive monitoring of subcortical brain regions previously accessible only through surgical implants, with applications in treatment response prediction and precision medicine for psychiatric and neurological disorders.

Unlike conventional methods, the system non-invasively monitors subcortical brain regions previously accessible only through surgical implants, capturing neural oscillations in deep structures that other non-invasive technologies cannot detect. More accessible and cost-effective than fMRI or MEG, this technology has significant applications in treatment response prediction and precision medicine for psychiatric and neurological disorders. It represents a major advancement over competing technologies like standard EEG source localization, fMRI, and MEG.

Applications

- Clinical tool for personalized treatment selection and prognosis in depression and other psychiatric disorders
- Biomarker development for drug discovery in neurology and psychiatry
- Research tool for cognitive neuroscience studies
- Brain-computer interface applications
- Neuromodulation therapy optimization (e.g., for TMS or DBS)

Advantages

- Higher spatial resolution than standard EEG for deep brain regions
- Better temporal resolution and scalability/cost than fMRI
- Non-invasive, unlike intracranial EEG
- More accessible and cost-effective than fMRI or MEG
- Ability to track neural oscillations in deep brain structures, which is not possible with current non-invasive methods

Publications

- Subramanian, A. K., Talbot, A., Kim, N., Parmigiani, S., Cline, C. C., Solomon, E. A., ... & Keller, C. J. (2025). Scalp EEG predicts intracranial brain activity in humans. bioRxiv, 2025-04.

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