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***AI for Mapping Brain Dynamics and Managing Intractable Epilepsy***

**Abstract:**

Brain activity is distributed over 3D space and evolves in time. Electrophysiological Source Imaging (ESI) is a functional imaging technology that estimates and images spatio-temporal distribution of dynamic brain electrical activity from noninvasively recorded electroencephalogram (EEG) or magnetoencephalography (MEG). ESI has been developed over the past decades to become an important functional neuroimaging modality mapping the underlying human brain function and dysfunctions. A fundamental technical challenge in ESI is to solve the ill-posed imaging problem. We will discuss our recent work on developing AI/ML-based approaches incorporating sparse signal processing for dynamic imaging of both source locations and extents and incorporating priors in solving imaging problem through training a deep neural network using big data generated by neural mass models. We rigorously validated our AI based source imaging algorithms using intracranial EEG recordings and surgical resection outcome in epilepsy patients undergoing surgical treatment. Our promising results suggest that AI/ML plays a significant role in solving ill-posed imaging problem, and offer robust solutions to mapping epileptogenic brain from scalp EEG/MEG measurements.