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Novel computational tool for localization of the epileptogenc zone from intracranial EEG recordings

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Epilepsy is a neurological disorder characterized by abnormal electrical activity in the brain, called seizures. The region of the brain that causes the seizures is called the epileptogenic zone (EZ), and may differ for each patient. Epilepsy affects 60 million people worldwide, of whom over 30% of cases do not respond to medication or have medically refractory epilepsy (MRE). There are currently two treatments for patients with focal MRE: surgical resection, in which the EZ is removed in hopes of stopping seizures, or neurostimulation, in which the EZ is electrically stimulated to suppress seizures. Both treatments depend on accurately localizing the EZ, and when successful, both treatments are life-changing. EZTrack is a novel computational tool that generates a simple-to-read heat map overlaid over the patient's brain scan that displays to clinicians which regions of the brain are highly likely to be in the EZ. EZTrack implements network-base data analytics and was tested in a retrospective study that included 42 patients who had resective surgeries. To test its efficacy, we compared EZTrack's "red-hot" regions (ROI) to resected regions using electrocorticographic data per patient. If the complete ROI was resected, then we predicted a successful surgery; else we predicted a failure. For 42 patients, EZtrack achieved a prediction accuracy of 95%. It also correctly predicted all 17 failed surgeries, which is especially important to indicate to clinicians whether to resample different areas of the brain before deciding to resect.

Biography

Sridevi V Sarma (M'04) received the B.S. degree in electrical engineering (EE) from Cornell University, Ithaca NY; and an M.S. and Ph.D. degrees in EECS from Massachusetts Institute of Technology (MIT) in, Cambridge MA, in 1997 and 2006, respectively. She was a Postdoctoral Fellow in the Brain and Cognitive Sciences Department at the MIT, from 2006-2009. She is now an assistant professor in the Institute for Computational Medicine, Department of Biomedical Engineering, at Johns Hopkins University, Baltimore MD. Her research interests include modeling, estimation and control of neural systems using electrical stimulation. She is a recipient of the National Science Foundation graduate research fellow, a L'Oreal For Women in Science fellow, the Burroughs Wellcome Fund Careers at the Scientific Interface Award, the Krishna Kumar New Investigator Award from the North American Neuromodulation Society, and a recipient of the Presidential Early Career Award for Scientists and Engineers.

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