

2025-2026 Colloquium Series

Sri Sarma

Professor

Institute for Computational Medicine

Department of Biomedical Engineering

Johns Hopkins University

Measuring the Health of the Brain: From Global Networks to Local Biomarkers

How do we measure the health of the brain? Unlike blood pressure or cholesterol, there is no single number that captures brain function. We are developing the Brain Entropy Index (BEI), a new measure that integrates thermodynamics, statistical modeling, and brain imaging to provide a global indicator of brain health. Using data from modalities such as EEG, fMRI, and MEG, the BEI can reliably separate healthy from diseased brains, offering promise as a universal screening tool.

Yet, just as a blood test might flag “illness” without specifying the disease, a global index cannot by itself identify the underlying condition. Neurological disorders are defined by distinct local network dynamics, and it is these dynamics that can give rise to robust biomarkers. One example is EpiScalp, a computational tool we developed to model local brain networks from scalp EEG. EpiScalp can differentiate true epilepsy from seizure-mimicking disorders and from healthy brains, providing a disorder-specific biomarker.

Together, these approaches demonstrate a two-tiered framework: global measures can screen for health versus disease, while local network dynamics serve as biomarkers that refine diagnosis and define specific conditions. More broadly, this talk will illustrate how concepts from systems & control theory, physics, and data science can converge to open new frontiers in neuroscience and medicine.

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11AM-12PM



Sridevi Sarma is a Professor of Biomedical Engineering and Vice Dean for Graduate Affairs at the Whiting School of Engineering at Johns Hopkins University. She earned her B.S. in Electrical Engineering from Cornell University and her M.S. and Ph.D. in Electrical Engineering and Computer Science from MIT. After co-founding a data analytics company, she completed a postdoctoral fellowship in Brain and Cognitive Sciences at MIT.

Her research focuses on modeling and controlling neural systems using electrical stimulation, with applications to epilepsy, chronic pain, and psychiatric disorders. She leads NeuroTech Harbor, an NIH Blueprint MedTech Hub, and is a recipient of an NIH Research Investigator Award. Dr. Sarma's honors include the PECASE award, the Burroughs Wellcome Fund Career Award, the AIMBE Fellowship, and the Whiting School's Robert B. Pond Excellence in Teaching Award.