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DISTINGUISHED BIOMEDICAL ENGINEERING WEBINAR

"Label-Free Molecular Imaging with Spins: A Path to High Resolution through Learned Subspaces"

Zhi-Pei Liang, PhD
University of Illinois at Urbana-Champaign

ABOUT THE WEBINAR

Since its invention in the early 1970s, magnetic resonance imaging (MRI) has become a premier tool for structural imaging and functional imaging using water proton spin signals. MR spectroscopic imaging (MRSI) has also long been recognized as a potentially powerful tool for non-invasive, label-free molecular imaging by exploiting the spin signals from other molecules. However, state-of-the-art MRSI methods, after more than four decades of development, still far short of providing adequate spatial resolution, speed, and signal-to-noise ratio useful for label-free molecular imaging in clinical applications. The talk will discuss our recent "breakthroughs" in overcoming the long-standing technical barriers of MRSI-based label-free molecular imaging using a new technology known as SPICE (SPectroscopic Imaging by exploiting spatiospectral CorrElation). SPICE uses a subspace mathematical framework to effectively integrate rapid scanning, sparse sampling, constrained image reconstruction, quantum simulation, and machine learning. Preliminary results show an unprecedented capability for simultaneous mapping of brain structures, function and metabolism using intrinsic spin signals from multiple molecules. In this talk, I'll give an overview of SPICE and also show some "SPICY" experimental results we have obtained.

ABOUT THE SPEAKER

Zhi-Pei Liang, PhD, *Franklin W. Woeltge Professor, ECE Department; Co-chair, Integrative Imaging Theme, Beckman Institute, University of Illinois at Urbana-Champaign*

Zhi-Pei Liang is currently the Franklin W. Woeltge Professor of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign (UIUC). His research is in the general area of magnetic resonance imaging and spectroscopy, ranging from spin physics, signal processing, machine learning, to biomedical applications. His work has been recognized by a number of awards, including the Sylvia Sorkin Greenfield Award (Medical Physics, 1990), Whitaker Biomedical Engineering Research Award (1991), NSF CAREER Award (1995), Henry Magnuski Scholar Award (UIUC, 1999), University Scholar Award (UIUC, 2001), the Otto Schmitt Award (IFMBE, 2012), and the Technical Achievement Award (IEEE-EMBS, 2014). Dr. Liang is a Fellow of the IEEE, ISMRM and AIMBE. He was elected to the International Academy of Medical and Biological Engineering in 2012. Dr. Liang served as President of the IEEE-EMBS from 2011-2012 and received its Distinguished Service Award in 2015.