

University of Houston - Biomedical Engineering Seminar

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Via Zoom: <https://uh-edu-cougarnet.zoom.us/j/93512038041>

: Brain Controllability Analysis



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Abstract

Brain neuromodulation effectively treats neurological diseases such as Depression. However, due to the patient heterogeneity, neuromodulation treatment outcomes are often highly variable, requiring patient-specific stimulation targets and parameters by accommodating inherent variability and intersession alteration during treatments. To address this gap, we developed a personalized transcranial magnetic stimulation (rTMS) protocol and evaluated its feasibility in optimizing the treatment efficacy using an existing dataset from an antidepressant experimental imaging study in depression. The personalization of the rTMS treatment protocol was achieved by personalizing both stimulation targets and parameters via integrating the brain controllability analysis and optimal control analysis. Our results support the feasibility of developing personalized neuromodulation protocols to more efficiently treat depression and the utility of brain controllability analysis in understanding neural control mechanisms of various neurological and psychiatric diseases.

Biosketch

Feng Fang is a PhD Candidate in Dr. Yingchun Zhang's lab in the Department of Biomedical Engineering at the University of Houston. He earned his Bachelor's degree in Biomedical Engineering from Chongqing University, China. His doctoral research aims at modeling large-scale brain network dynamics, and designing personalized neuromodulation strategies via integrating network control theory, optimization algorithms, and multimodal brain imaging tools, to optimize the treatment efficacy of various neurological and psychiatric diseases such as depression. The results of these works will contribute to the development of novel neuromodulation protocols for the treatment of different diseases, and provide new perspective to interpret the underlying neural control mechanisms and caused by various diseases.