

Department of Electrical and Computer Engineering



TEXAS TECH UNIVERSITY

Edward E. Whitacre Jr.
College of Engineering

Fall 2026 Seminar Series

Seminar Title: *Data-driven modeling, analysis and control of whole-brain dynamics*

Monday, Sept 21, 2026

2:00-2:50pm

Location: ECE 101

Speaker:

ShiNung Ching

Washington University in Saint Louis



Abstract:

A key problem in neural engineering has been to understand the internal mechanisms within the brain that give rise to cognitive function, i.e., our ability to see, hear and think. Such understanding has the potential to enable new forms of neurotechnology, such as brain stimulation, to treat diseases and aid rehabilitation. In this presentation, I will describe our recent efforts to generate dynamical systems models that reveal brain mechanisms and their link to cognition. Specifically, I will describe how we have adapted tools from control engineering and computer science, including high-dimensional optimization, to build, from data, large-scale biophysically interpretable models of network interactions involving hundreds to thousands of neural populations. I will highlight two ways in which we are leveraging the obtained models. First, I will discuss how we are interrogating the intrinsic dynamics within models, toward assessing the similarities and differences in brain mechanisms across individual people. Second, I will describe how we are using models to predict input-output relationships within brain networks and their responses to exogenous, causal perturbations, i.e., control. In addition to basic mechanistic insights, these approaches enable us to design brain stimulation protocols that are tailored to individuals and defined in terms of dynamical targets that can be linked to specific functional endpoints.

Speaker Bio:

ShiNung Ching is Professor and Department Chair in the Preston M. Green Department of Electrical and Systems Engineering at Washington University in St. Louis (St. Louis, USA). His research interests are at the intersection of control engineering and computational neuroscience, particularly in using systems and control theoretic concepts to study the links between dynamics and function in the brain. Dr. Ching completed his B.Eng (Hons.) and M.A.Sc degrees in Electrical and Computer Engineering from McGill University, Canada and the University of Toronto, Canada. He earned his Ph.D. in Electrical Engineering from the University of Michigan in 2009 in systems and control theory. He subsequently completed post-doctoral training in computational neuroscience at the Massachusetts Institute of Technology and the Harvard Medical School. He is an author on over 150 publications in academic journals and conferences spanning Engineering, Neuroscience and Brain Medicine. Dr. Ching has received the CAREER Award from the US National Science Foundation, the Young Investigator Program award from the US AFOSR, the Career Award at the Scientific Interface from the Burroughs-Wellcome Fund, and has served as principal investigator on research projects funded by the National Institutes of Health, the National Science Foundation and the US Department of Defense.



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