SEMINAR SERIES

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Multifractal Analysis: A Window On the Nonlinear Release/Constraint of Degrees of Freedom

Featuring Dr. Lucas Timmins

University of Utah

Friday, Sept. 1 | 10 A.M. – 11 A.M. | BRB 167

PRESENTATION ABSTRACT

The ability to perform complex tasks that require sensitivity to context is characterized by the skill to blend and merge information across different scales. Accomplishing multiple objectives while adhering to various task constraints involves considering various scales of concern. These scales include immediate sensory adjustments, long-term shifts in intention and attention, and intermediate modifications. The development of dexterity relies on non-linear interactions across these scales, which govern the freedom of action. While monofractal analyses offer initial insights into these interactions, they only present a single power law, lacking clarity regarding the presence and degree of nonlinearity in cross-scale interactions. Multifractal analyses build upon this by identifying multiple power laws, allowing a better differentiation between linear and nonlinear interactions across scales. This transition provides a clearer depiction of nonlinear cross-scale interactions, aiding in understanding context sensitivity and how finer movement details relate to broader structures. Additionally, it offers a way to comprehend the fluid relationships in the movement system and situates dexterity within cascade dynamics across various scales, contrasting with internal forward models.

ABOUT DR. MANGALAM

Madhur Mangalam is an Assistant Professor in the Department of Biomechanics at the University of Nebraska at Omaha. He earned his bachelor's and master's in life sciences at the Indian Institute and Science Education and Research, Pune, India, and his Ph.D. in psychology at the University of Georgia, Athens. He then completed his postdoctoral training in neuroscience at Northeastern University, Boston. Dr. Mangalam's research interests include nonlinear dynamical principles governing perception-action and embodied/embedded cognition and the development of nonlinear analytical methods that can aid in discovering these principles.

more info at **cobre.unomaha.edu**

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