Spring 2026 Colloquia

Spring 2026 is ongoing; this document will be updated as more information becomes available.

Date: Wednesday, March 11th, 2026, 12:00 – 1:00pm
Speaker: Philippe Ciuciu (CEA, France)
Title: Multifractal Formalism in Neural Field Dynamics: A New Prospect on Criticality in the Brain
Abstract: The "brain criticality hypothesis" suggests that neural systems operate near phase transitions to optimize computational power and information transmission. While scale invariance is a known hallmark of this state, standard power-law scaling often fails to capture the full complexity of intermittent neural dynamics. This talk bridgges gaps between statistical physics and signal processing by introducing a robust multifractal framework for studying brain criticality. Utilizing a Landau-Ginzburg formulation of Wilson-Cowan field equations, we demonstrate that multifractality—characterized by the c_2 log-cumulant—is not a trivial property but peaks specifically at the critical point of a phase transition.

To ensure these mathematical insights hold in empirical settings, we present a wavelet p-leader formalism combined with a novel segmentation-based outlier detection method to protect estimates from non-stationary noise. Finally, we validate this approach using Magnetoencephalography (MEG) data, revealing that significant multifractality is prevalent in human alpha and beta band oscillations, organized in distinct spatio-temporal gradients across the cortical surface. This work provides a new mathematical standard for quantifying the organizational principles of neural dynamics.

Date: Wednesday, April 8th, 2026, 12:00 – 1:00pm
Speaker: Mihai Fulgar (University of Connecticut)
Title: TBA
Abstract: TBA

Date: Wednesday, May 13th, 2026, 12:00 – 1:00pm
Speaker: Ruben Louis (University of Illinois, Urbana-Champaign)
Title: TBA
Abstract: TBA

Multifractal Formalism in Neural Field Dynamics: A New Prospect on Criticality in the Brain