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Nonlinear Frequency-Domain and Network Analysis of EEG Signals

Prof Fei He (Coventry University, UK)

Wednesday, 25 March 2026 | 12h00 – 13h00 SAST

Venues: Online & NITheCS Seminar Room, Stellenbosch University

ABSTRACT

Neuronal information processing is complex at different levels, from the microscopic pre- and post-synaptic cellular interactions to the macroscopic interactions between large populations of neurons in, for instance, sensory processing and motor response. Various functional and effective connectivity measures have been developed to characterise such functional integration in neural networks, from neurophysiological signals (such as EEG). In current literature, linear modelling, connectivity and causality analysis are still the dominant approaches. Nevertheless, recent studies indicate that linear methods can only capture certain amount of neural activities and functional relationships, and therefore cannot describe neural behaviours in a precise or complete way. In this talk, I will present how nonlinear dynamic modelling, frequency-domain analysis and network analysis can be integrated to study complex neural interactions; and applied to characterise neurological disorders.

BIOGRAPHY

Dr Fei He (Senior Member, IEEE) is an Associate Professor in the Centre for Computational Science and Mathematical Modelling, Coventry University, UK. Dr He previously held research positions at Imperial College London, University of Sheffield, and University of Manchester (Manchester Centre for Integrative Systems Biology). He received a PhD and an MSc in control engineering from University of Manchester. Currently, Dr He co-leads the 'Digital Neuroscience' Cross Cutting Theme at Coventry University. His current research interests lie at the interface of control systems engineering, signal processing and neuroscience. He has been awarded several EPSRC grants (as PI and co-I). He is the Associate Editor of IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE), Frontiers in Neurology, BMC Neuroscience and IET Healthcare Technology Letters. He is also a member of EPSRC Peer Review College and a member of UKRI Talent Peer Review College.



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