**Dynamics of Neural Systems and Implications to Neural Information Processing**

Overview:

It is well known that dynamics plays an important role in the processing of information in the brain. However, while non-recurrent networks have been widely applied in artificial neural systems, our understanding on the dynamics of recurrent networks is relatively limited. Yet, they are highly relevant to applications in time-dependent data processing and neuroscience applications. The purpose of this invited session is to explore how artificial and natural neural systems process information through their dynamical processes, as well as how such insights can be used in artificial intelligence. Typical examples include the search and analyses of learning rules in recurrent networks, the mechanisms of compensating transmission delays in the brain, mechanisms of transforming external information from the body-centered frame to the world-centered frame and its relevance to navigation in robotics, relation between brain deficiencies and neural system functions, and the organization of brain activities into critical states. We intend to bring together researchers from different backgrounds to tackle these interesting yet challenging problems.

Topics (including, but not restricted to, the following):

Recurrent neural networks

Attractor dynamics in neural fields

Short-term synaptic plasticity

Networks with feedback modulations

Dynamics in hierarchical and modular networks

Multisensory integration in modular networks

Stochastic oscillations

Self-organized criticality in neural systems

Rhythmic synchronous firing

Effects of network structures on dynamics

Synchronization in neural systems

Reverberations in neural systems

Reconstructing synaptic weights from dynamics

Feedforward dynamics in convolutional neural networks

FORCE learning

Liquid state machines

Organizers:

Chair: Prof. K. Y. Michael Wong (Hong Kong University of Science and Technology) phkwong@ust.hk

K. Y. Michael Wong received B.Sc. in Physics from the University of Hong Kong, M.S. and Ph.D. degrees in Physics from University of California, Los Angeles. He worked as a Postdoctoral Research Associate with the Imperial College, London, U.K., and the University of Oxford, U.K. Then he became a Faculty Member with the Hong Kong University of Science and Technology, where he is now a Professor in physics. He has published over 160 journal and conference papers. His research interests include complex and disordered systems, neural networks and computational neuroscience, multi-agent systems, and optimization.

Co-chair: Prof. Changsong Zhou (Hong Kong Baptist University)

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Changsong Zhou graduated from Nankai University. He is now Associate Professor in Hong Kong Baptist University and Director of Center of Nonlinear Studies. His current research interests include the dynamics of complex systems, EEG data analysis of brain-behavior relationship, brain structural and functional connectivity, and complex activity and information processing in neural systems.

List of potential contributors

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