

Towards Human-Like Intelligence: A Self-Organizing Neural Networks Approach

Human intelligence involves a complex interplay of cognitive functions, notably self-awareness, memory, reasoning, learning, and problem solving. This talk will present a family of self-organizing neural networks, collectively known as fusion Adaptive Resonance Theory (fusion ART) (Tan *et al.*, 2007) for simulating intelligent systems with high level cognitive functions. By extending the original ART models consisting of a single pattern field into a multi-channel architecture, fusion ART unifies a number of important neural models developed over the past decades, including the ART networks for clustering and unsupervised learning, Adaptive Resonance Associative Map (ARAM) for pattern classification and supervised learning (Tan, 1995), and Fusion Architecture for Learning and Cognition (FALCON) (Tan *et al.*, 2008), for real-time decision making and reinforcement learning.

Following the notion of *embodied cognition* (Anderson, 2003), this talk will show how fusion ART, by encompassing a set of universal neural coding and adaptation principles, can be used as a building block of autonomous systems, integrating self-awareness, memory, emotion, planning, and deliberative behaviour (Tan *et al.*, 2010; Wang *et al.*, 2013). Several case studies will be presented, illustrating how such cognitive autonomous systems may be used in the domains of command and control (Feng *et al.*, 2008), first-person shooting game (Wang *et al.*, 2009), adaptive Computer Generated Forces (CGF) (Teng *et al.*, 2013), and modelling of human-like characters in virtual environment (Kang *et al.*, 2012).

Speaker Biography



Dr Ah-Hwee Tan received a Ph.D. in [Cognitive and Neural Systems](#) from Boston University, a Master of Science and a Bachelor of Science (First Class Honors) in Computer and Information Science from the [National University of Singapore](#). He is currently an Associate Professor at the [School of Computer Engineering \(SCE\)](#), [Nanyang Technological University](#) and was the founding Director of Emerging Research Laboratory, a center for incubating new interdisciplinary research initiatives. Prior to joining NTU, he was a Research Manager at the A*STAR [Institute for Infocomm Research \(I²R\)](#), spearheading the Text Mining and Intelligent Agents research programmes. His current research interests include cognitive and neural systems, brain-inspired intelligent agents, machine learning, knowledge discovery and text mining.

Dr. Tan has published more than 160 technical papers in major international journals and conferences of his fields, including 6 edited books. He holds two US patents, five Singapore patents, and has spearheaded several A*STAR projects in commercializing a suite of document analysis and text mining technologies. Prof. Tan serves as Associate Editor/Editorial Board Member of several journals, including [IEEE Access](#), [IEEE Transactions on SMC Systems](#), [Applied Soft Computing](#), and [Journal of Ambient Intelligence and Smart Environment](#). He is a Vice Chair of [IEEE ETTC Task Force on Towards Human-Like Intelligence](#) and has served as PC Co-Chair of BIH'2014, Track Chair of Aml'2013, General Co-Chair of INNS-WC 2012, PC Vice-Chair of IAT 2010, PC Co-Chair of UIC 2009, and PC members of AAMAS, SIGKDD, SDM, ICDM and IEEE/WIC/ACM IAT. He is a Senior Member of IEEE and a member of INNS.