



THE CHINESE UNIVERSITY OF HONG KONG
 Institute of Network Coding
 &
 Department of Information Engineering
Seminar



**Reinforcement Learning: Control and Management of
 Communications and Computer Networks**
 By
Prof. Kin K. LEUNG
 EEE and Computing Departments
 Imperial College, London

Date : 11 August 2022 (Thursday)

Time : 2:00pm – 3:00pm

Venue : SHB801

Abstract

Deep reinforcement learning (RL) techniques have been applied to many application domains. In communications networks, deep RL has been used to solve routing, service-placement and power-allocation problems in the software defined networks (SDN) as well as the software defined coalitions (SDC) developed in the DAIS ITA Program.

This speaker begins with a brief introduction to RL. For illustration purposes, he presents use of RL to train a smart policy for synchronization of domain controllers in order to maximize performance gains in SDN. Results show that the RL policy significantly outperforms other algorithms for inter-domain routing tasks.

As shown in the above work, a challenging issue for deep RL is the huge state and action spaces, which increase model complexity and training time beyond practical feasibility. The speaker will present a method to decouple actions from the state space for the value-function learning process and a relatively simple transition model is learned to determine the action that causes the associated state transition. Experimental results show that the state-action separable RL can greatly reduce training time without noticeable performance degradation. Other methods, including embedding and state-space decomposition techniques, to reduce training time will also be briefly discussed.

The speaker will conclude by highlighting the open issues for use of RL for control of large-scaled communications networks.

Biography

Kin K. Leung received his B.S. degree from the Chinese University of Hong Kong, and his M.S. and Ph.D. degrees from University of California, Los Angeles. He joined AT&T Bell Labs in New Jersey in 1986 and worked at its successor companies until 2004. Since then, he has been the Tanaka Chair Professor in the Electrical and Electronic Engineering (EEE), and Computing Departments at Imperial College in London. He serves as the Head of Communications and Signal Processing Group in the EEE Department at Imperial. His current research focuses on optimization and machine-learning techniques for system design and control of large-scale communications, computer and sensor networks. He also works on multi-antenna and cross-layer designs for wireless networks.

He received the Distinguished Member of Technical Staff Award from AT&T Bell Labs (1994). He was elected as an IEEE Fellow (2001), received the Royal Society Wolfson Research Merits Award (2004-09), and became a member of Academia Europaea (2012) and an IET Fellow (2021). Jointly with his collaborators, he received the IEEE Communications Society (ComSoc) Leonard G. Abraham Prize (2021), the IEEE ComSoc Best Survey Paper Award (2022), the U.S.–UK Science and Technology Stocktake Award (2021), the Lanchester Prize Honorable Mention Award (1997), and several best conference paper awards. He currently serves as the IEEE ComSoc Distinguished Lecturer (2022-23). He was a member (2009-11) and the chairman (2012-15) of the IEEE Fellow Evaluation Committee for ComSoc. He has served as guest editor and editor for 10 IEEE and ACM journals. Currently, he chairs the Steering Committee for the IEEE Trans. on Mobile Computing, and is an editor for the ACM Computing Survey and International Journal on Sensor Networks.

**** ALL ARE WELCOME ****