



USC Viterbi School of Engineering

Seminar

Ming Hsieh Department of Electrical and Computer Engineering



Reinforcement Learning for Control and Beyond

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Chemical Engineering and Materials Science
University of Southern California**

Tuesday, November 14, 2023

12:00pm - 1:00pm

EEB 248

**<https://usc.zoom.us/j/93773325275?pwd=V3R4aEg1cW9DU1AvT3RCcHArS3RWUT09>
Meeting ID: 937 7332 5275 Passcode: 640189**

Abstract: Since Alan Turing's remarkable foresight of creating a machine that simulates the "adult brain" starting from the "child mind" through a computer algorithm that educates through rewards and punishments, reinforcement learning (RL) has been at the forefront of many academic fields including psychology, computer science, and control. With recent advancement of deep learning and GPU-computing as well as well-publicized success stories like the Alpha-Go, it is enjoying a renaissance of popularity and offers opportunities for applications with commercial impacts. RL and control originated from the different fields but they both address the same basic problem of making sequential decisions in an uncertain, dynamic environment to maximize/minimize a long-term objective function. In this presentation, similarities and differences between reinforcement learning and optimal control will be brought to attention and some ideas will be shared on how they can be brought to complement and support each other in solving complex industrial decision problems. Some exemplary applications expected to benefit significantly from the use of RL concepts and methods will be presented, including batch process control, energy planning, and materials design.

I will also give a short introduction to other research topics I am currently engaged in, including lithium-ion battery's state of health prediction and evaluation of CO₂ capture, utilization, and storage (CCUS) technologies.



Bio: Jay H. Lee obtained his B.S. degree in Chemical Engineering from the University of Washington, Seattle, in 1986, and his Ph.D. degree in Chemical Engineering from California Institute of Technology, Pasadena, in 1991. From 1991 to 1998, he was with the Department of Chemical Engineering at Auburn University, AL, as an Assistant Professor and an Associate Professor. From 1998-2000, he was with School of Chemical Engineering at Purdue University, West Lafayette, and then with the School of Chemical Engineering at Georgia Institute of Technology, Atlanta from 2000-2010 and Chemical and Biomolecular Engineering Department at Korea Advanced Institute of Science and Technology (KAIST) from 2010-2022, where he was the department head from 2010-2015, Associate VP of International Relations from 2015-2017, KEPCO Chair Professor and the founding Director of Saud Aramco-

KAIST CO₂ Management Center at KAIST. He is currently C. H. Cho Chair Professor of Mork Family Department of Chemical Engineering and Materials Science at University of Southern California. He was a recipient of the National Science Foundation's Young Investigator Award in 1993 and was elected as an IEEE Fellow and an IFAC (International Federation of Automatic Control) Fellow in 2011 and an AIChE Fellow in 2013. He was also the recipient of the 2013 Computing in Chemical Engineering Award given by the AIChE's CAST Division and the 2016 Roger Sargent Lecturer at Imperial College, UK. He is an Editor of Computers and Chemical Engineering and Discover Chemical Engineering. He was currently the Editor-in-Chief of Korean Journal of Chemical Engineering and also the chair of IFAC Coordinating Committee on Process and Power Systems. He published over 260 manuscripts in SCI journals with ~21000 Google Scholar citations. His research interests are in the areas of system identification, state estimation, robust control, model predictive control, and reinforcement learning with applications to sustainable energy systems, bio-refinery, and CO₂ capture/conversion systems.

Host: Dr. Richard M. Leahy, leahy@usc.edu