

## SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Faculty of Engineering

Website: <http://www.ece.nus.edu.sg>

**Area: Signal Analysis & Machine Intelligence**

**Host: Prof Li Haizhou**

### Technical Talk

<b>TOPIC</b>	:	<b>Interpretable Convolutional Neural Networks (CNNs) via Feedforward Design</b>
<b>SPEAKER</b>	:	<b>Professor C.-C. Jay Kuo University of Southern California</b>
<b>DATE</b>	:	<b>23 October 2018, Tuesday</b>
<b>TIME</b>	:	<b>4pm to 5.30pm</b>
<b>VENUE</b>	:	<b>E3-06-01, Engineering Block E3, Faculty of Engineering, NUS</b>

### ABSTRACT

Given a convolutional neural network (CNN) architecture, its network parameters are determined by backpropagation (BP). In contrast with the BP design, we propose a feedforward (FF) and interpretable design with the LeNet-5 as an illustrative example. The FF design is a data-centric approach that derives network parameters based on training data statistics layer by layer in one pass. To build the convolutional layers, we develop a new signal transform, called the Saab (Subspace approximation with adjusted bias) transform. The bias in filter weights is chosen to annihilate nonlinearity of the activation function. To build the fully-connected (FC) layers, we adopt a label-guided linear least squared regression (LSR) method. The FF design is more computationally efficient and robust against adversarial attacks than the traditional BP design. The classification performances of BP-designed and FF-designed CNNs on the MNIST and the CIFAR-10 datasets are compared. Finally, we comment on the relationship between BP and FF designs by examining their cross-entropy values at nodes of intermediate layers.

### BIOGRAPHY



Dr. C.-C. Jay Kuo received his Ph.D. degree from the Massachusetts Institute of Technology in 1987. He is now with the University of Southern California (USC) as Director of the Media Communications Laboratory and Distinguished Professor of Electrical Engineering and Computer Science. His research interests are in the areas of media processing, compression and understanding. Dr. Kuo was the Editor-in-Chief for the IEEE Trans. on Information Forensics and Security in 2012-2014. Dr. Kuo received the 1992 National Science Foundation Young Investigator (NYI) Award, the 1993 National Science Foundation Presidential Faculty Fellow (PFF) Award, the 2010 Electronic Imaging Scientist of the Year Award, the 2010-11 Fulbright-Nokia Distinguished Chair in Information and Communications Technologies, the 2011 Pan Wen-Yuan Outstanding Research Award, the 2014 USC Northrop Grumman Excellence in Teaching Award, the 2016 USC Associates Award for Excellence in Teaching, the 2016 IEEE Computer Society Taylor L. Booth Education Award, the 2016 IEEE Circuits and Systems Society John Choma Education Award, the 2016 IS&T Raymond C. Bowman Award, and the 2017 IEEE Leon K. Kirchmayer Graduate Teaching Award. Dr. Kuo is a Fellow of AAAS, IEEE and SPIE. He has guided 145 students to their Ph.D. degrees and supervised 27 postdoctoral research fellows. Dr. Kuo is a co-author of 260 journal papers, 900 conference papers and 14 books.