

Computer Science Seminar Series

National Capital Region

From Elements of Convolution Neural Networks Deep Learning to Build Intelligent World

Speaker: Dr. ShihChung Benedict Lo

**Arlington Innovation Center
for Health Research, Virginia Tech**

Friday, September 29, 2017

1:00PM-2:00PM

Abstract

Fukushima's Neocognitron [1980] and its practical alternation called convolution neural networks - CNN [late 1980s - early 1990s] were derived from modeling biological visual signals passing from eye retina to lateral geniculate Nucleus (LGN) and to primary visual cortex (V1). The seminar will review the history of Neocognitron and CNN as well as how they model biological neural system. Components and structures of the CNN in several successful cases will be used to demonstrate its powerful applications. Though each NN/CNN itself is a self-contained organism, it requires proper guidance in order to perform an optimal intelligent task. One must analyze input data characteristics in terms of correlation, isotropy, distribution, feature and texture for effective arrangement of input layer, design of output, and training strategy. Several I/O models and applications will be discussed: (I<-image; O->category, O->caption, or O->image), (I<-correlated data sequence; O->category or O->Prediction). NN/CNN based ensemble method and composing approach such as statistics based model are also commonly used in today's AI R&D.

Biography

ShihChung Benedict Lo received his BS in Physics from National Cheng-Kung University, Taiwan, and Ph.D. in Medical Physics from University of California, Los Angeles in 1986. He was MRI&CT scientist at Philips Medical System. In 1987, he joined Center for Imaging Sciences and Information Systems (ISIS) at Radiology and Oncology Departments of Georgetown University Medical Center where he independently developed convolution neural networks - CNN technique (1993), wavelet CNN (1996), optimization of wavelets and filter bank unification theory through CNN (1997), and circular path CNN (2002). Since 1990s, he has also collaborated with industrial partner and developed more than 10 FDA cleared medical AI systems including vessel removed chest CT and rib shadow suppressed chest radiograph coupling with computer-aided cancer detection systems. He has a long track record and a full range of experiences in AI techniques, CNN and filter bank related theories and their medical applications.