

Why and Why Not Convolutional Neural Networks (CNNs)? Prediction of Satisfied User Ratio (SUR) Curves and Just-Noticeable-Difference (JND) Points for Coded Video

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6th Floor, Yellow Zone

B5-311, 5th Floor, Blue Zone

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ABSTRACT

The superior performance of Convolutional Neural Networks (CNNs) has been demonstrated in many applications such as image classification, detection and processing. Yet, the CNN solution has its own weaknesses such as robustness against perturbation, scalability against the class number and portability among different datasets. Furthermore, CNN's working principle remains mysterious. In this talk, I will present an alternative solution, which is motivated by CNNs yet allows rigorous and transparent mathematical treatment, based on a data-driven signal transform called the Saak (Subspace approximation with augmented kernels) transform. The kernels of the Saak transform are derived from the second-order statistics of inputs in a one-pass feedforward way. Neither data labels nor backpropagation is needed in kernel determination. The pros and cons of CNNs and multi-stage Saak transforms are compared. Finally, the potential of integrated compression and understanding is pointed out.

BIOGRAPHY

Prof 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 Dean's Professor in Electrical Engineering-Systems. His research interests are in the areas of digital media processing, compression, communication and networking technologies. Prof Kuo was the Editor-in-Chief for the IEEE Trans. on Information Forensics and Security in 2012-2014. He was the Editor-in-Chief for the Journal of Visual Communication and Image Representation in 1997-2011, and served as Editor for 10 other international journals. Prof 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. Prof Kuo is a Fellow of AAAS, IEEE and SPIE. He has guided 140 students to their Ph.D. degrees and supervised 25 postdoctoral research fellows. Prof Kuo is a co-author of about 250 journal papers, 900 conference papers and 14 books.

All are welcome!



In case of questions, please contact Prof KWONG Tak Wu Sam at Tel: 3442 2907, E-mail: cssamk@cityu.edu.hk or visit the CS Departmental Seminar Web at <http://www.cs.cityu.edu.hk/news/seminars/seminars.html>.