Machine Learning based Video Coding using Data-driven Techniques and Advanced Models

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Abstract

In June 6th 2016, Cisco released the white paper [1], VNI Forecast and Methodology 2015-2020, reported that 82 percent of Internet traffic will come from video applications such as video surveillance, content delivery network, so on by 2020. It also reported that Internet video surveillance traffic nearly doubled, Virtual reality traffic quadrupled, TV grew 50 percent and similar increases for other applications in 2015. The annual global traffic will first time exceed the zettabyte (ZB;1000 exabytes[EB]) threshold in 2016, and will reach 2.3 ZB by 2020. It implies that 1.886ZB belongs to video data. Thus, in order to relieve the burden on video storage, streaming and other video services, researchers from the video community have developed a series of video coding standards. Among them, the most up-to-date is the High Efficiency Video Coding (HEVC) or H.265 standard, which has successfully halved the coding bits of its predecessor, H.264/AVC, without significant increase in perceived distortion. With the rapid growth of network transmission capacity, enjoying high definition video applications anytime and anywhere with mobile display terminals will be a desirable feature in the near future. Due to the lack of hardware computing power and limited bandwidth, lower complexity and higher compression efficiency video coding scheme are still desired. For higher video compression performance, the key optimization problems, mainly decision making and resource allocation problem, shall be solved. In this talk, I will present the most recent research results on machine learning and game theory based video coding. This is very different from the traditional approaches in video coding. We hope applying these intelligent techniques to vide coding could allow us to go further and have more choices in trading off between cost and resources.

About the Keynote Speaker

Sam Kwong received the B.Sc. degree from the State University of New York at Buffalo, Buffalo, NY, in 1983, the M.A.Sc. degree in electrical engineering from the University of Waterloo, Waterloo, ON, Canada, in 1985, and the Ph.D. degree from the Fernuniversität Hagen, Hagen, Germany, in 1996. From 1985 to 1987, he was a Diagnostic Engineer with Control Data Canada, where he designed the diagnostic software to detect the manufacture faults of the VLSI chips in the Cyber 430 machine. He later joined the Bell Northern Research Canada as a Member of Scientific Staff, where he worked on both the DMS-100 voice network and the DPN-100 data network project. In 1990, he joined the City University of Hong Kong as a Lecturer in the Department of Electronic Engineering. He is currently an Associate Professor in the Department of Computer Science. He was responsible of the software design of the first handheld GSM mobile phone consultancy project in which it was one of the largest consultancy projects at the City University of Hong Kong in 1996. He coauthored three research books on genetic algorithms, eight book chapters, and over 200 technical papers. He has been a consultant to several companies in telecommunications. Prof. Kwong was awarded the Best Paper Award for his paper entitled "Multiobjective Optimization of Radio-to-Fiber Repeater Placement Using a Jumping Gene Algorithm" at the IEEE International Conference on Industrial Technology (ICIT'05), Hong Kong, in 2005. In addition, he received the Best Paper Award at the 1999 BioInformatics Workshop, Tokyo, for the paper entitled "A Compression Algorithm for DNA Sequences and Its Application in Genome Comparison" in recognition of his outstanding contribution to the conference. Currently, he is the Associate Editor for the IEEE Transactions on Industrial Informatics, the IEEE Transactions on Industrial Electronics, IEEE Transactions on Evolutionary Computation, the Journal of Information Science. Currently, he is the Head and Professor of the department of Computer Science, City University of Hong Kong. Prof. Kwong was elevated to IEEE fellow for his contributions on Optimization Techniques for cybernetics and video coding in 2014.