The 19th International Conference on Computer and Information Technology (ICCIT 2016)
Keynote Address

Keynote Speaker:
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Keynote Title:
Applying Machine Learning to Sparse Coding in Image Compression

Abstract: Traditional video and image compression in main stream standards such as JPEG, H.264/AVC, and H.265/HEVC adopt a hybrid coding method predominantly based on signal processing approaches, incorporating orthogonal transforms, motion estimation, intra prediction, filtering, and entropy coding. Such methods seem to have reached a saturation point in terms of coding efficiency, and another level of major breakthrough is hard to achieve. Recently, much research has been focusing on applying machine learning to improve coding efficiency to another level. In this talk, we will give an overview of image/video coding and its recent progress; we will then focus on applying machine learning approaches and highlight one of our research using sparse coding with over-complete representation to reduce the number of coefficients representing image information, as opposed to those by a traditional discrete cosine transform (DCT) method. Dictionary with over-complete representation can be learned from data and trained by a K-SVD (singular value decomposition) algorithm. Orthogonal matching pursuit (OMP) algorithm is then applied to select dictionary elements and their coefficients to represent the image. We propose a rate-distortion optimization (RDO) approach to select the number of non-zero coefficients given a sparsity constraint. Experimental results showed a very good improvement of coding efficiency over conventional signal processing-based scheme. Finally, we will highlight our current research in video coding and our lab.