

Signal Processing Seminar

Title: Multiple-View Object Recognition via Sparse Representation

Speaker: Allen Y. Yang

Date: Wednesday, October 7, 2009

Time: 4:00 - 5:00 pm

Where: 2269 Beckman Institute

Abstract: In this talk, I will reexamine the classical problem of object recognition in low-power, low-bandwidth distributed camera networks. The ability to perform robust object recognition is crucial for applications such as visual surveillance to track and identify objects of interest, and compensate visual nuisances such as occlusion and pose variation between multiple camera views. We propose an effective framework to perform distributed object recognition using a network of smart cameras and a computer as the base station. Due to the limited bandwidth between the cameras and the computer, the method utilizes the available computation power on the smart sensors to locally extract and compress SIFT-type image features to represent individual camera views. In particular, we show that between a network of cameras, high dimensional SIFT histograms share a joint sparse pattern corresponding to a set of common features in 3-D. Such joint sparse patterns can be explicitly exploited to accurately encode the distributed signal via random projection, which is unsupervised and independent to the sensor modality. On the base station, we study multiple decoding schemes to simultaneously recover the multiple-view object features based on the distributed compressive sensing theory. In particular, we demonstrate that the multiple-view SIFT histograms can be jointly recovered with high accuracy using a linear L1-minimization solver, called polytope faces pursuit. The system has been implemented on the Berkeley CITRIC smart camera platform. The efficacy of the algorithm is validated through extensive simulation and experiments. To conclude my talk, several open problems in the broad area of distributed sensing and perception will be discussed.

This work is in collaboration with Subhansu Maji, Mario Christoudas, Dr. Trevor Darrell, Dr. Jitendra Malik, and Dr. Shankar Sastry at UC Berkeley.

Short Bio: Allen Y. Yang is a postdoctoral researcher in the department of EECS at UC Berkeley. His primary research is in pattern analysis of geometric and statistical models in high-dimensional data spaces, and applications in motion segmentation, image segmentation, face recognition, and sensor networks. He received his Bachelor's degree in CS from the University of Science and Technology of China (USTC) in 2001. He received an MS in EE in 2003, an MS in Math in 2005, and a PhD in ECE in 2006, all from the University of Illinois (UIUC). He has published seven journal papers and more than 15 conference papers. He has three US patent applications. Among the awards he received are a Best Bachelor's Thesis Award from USTC in 2001, a Henry Ford II Scholar Award from UIUC in 2003, a Best Paper Award from the International Society of Information Fusion and Best Student Paper Award at Asian Conference on Computer Vision in 2009.