

**THURSDAY**  
**FEBRUARY 21, 2008**

**Scaife Hall Auditorium**  
**Room 125**

**4:30 p.m.**  
**Refreshments—4:00 p.m.**

**VIVEK K. GOYAL**

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Vivek K. Goyal received the B.S. and B.S.E. degrees from the University of Iowa and the M.S. and Ph. D. degrees from the University of California, Berkley. He was previously a Member of Technical Staff in the Mathematics of Communications Research Department of Bell Laboratories and a Senior Research Engineer for Digital Fountain. He is currently the Esther and Harold E. Edgerton Assistant Professor of Electrical Engineering at the Massachusetts Institute of Technology.

Dr. Goyal is a recipient of the Eliahu Jury Award of the University of California, Berkley, the IEEE Signal Processing Society Magazine Award and the NSF CAREER Award. He serves on an IEEE Signal Processing Society Technical Committee and as permanent Co-Chair of the SPIE Wavelets conference series.

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## Source Coding for Permutation- Invariant Computation

Traditional modes of lossy compression aim to represent a time series or vector with a small number of bits while facilitating reconstruction of an approximate version with low mean-squared error. However, reconstruction of the data itself is not always necessary. Performance might be dramatically improved if the goal is to compute or approximate a function of the data. This is explored in two settings:

- (1) Encoding of samples without regard to their order is appropriate when the receiver will use the samples in some permutation-invariant computation. In centralized encoding, disregarding order reduces rate requirements for  $n$  samples from  $O(n)$  to  $O(\log n)$ . Universal coding results are also obtained.
- (2) Optimal fixed- and variable-rate distributed quantization of  $n$  samples for the computation of a monotonic function of the samples is developed. Several examples with permutation-invariant functions show that using functional form in the quantizer design yields large gains, including distortion reduction exponential in  $n$  for the variable-rate case.