

ALGEBRA & DISCRETE MATHEMATICS SEMINAR

4:00 PM, Monday, March 26, 2012, Martin M-102
Refreshments 3:45 PM, Martin O-112

New Challenges in Coding Theory

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In this talk, we present new results on the bounds and code constructions for two new applications of coding theory. In the first part of the talk, we discuss the problem of Index Coding with Side Information. This problem considers a broadcast communication scenario with one transmitter and several receivers. Each receiver requests some part of data, but it might miss some other parts of the data, which are known to the transmitter. The transmitter has to deliver all the requested data, while spending a minimum number of transmissions. We consider the case where transmitted symbols are subject to errors. Our results include the Singleton bound and two other bounds on the optimal length of a linear error-correcting index code (ECIC). For large alphabets, a construction based on concatenation of an optimal index code with an MDS classical code, is shown to attain the Singleton bound. We also analyze a random construction, which yields another bound on the length of an optimal linear ECIC. In the second part of the talk, we discuss rank modulation codes for flash memories that allow for handling arbitrary charge drop errors. Unlike classical rank modulation codes used for correcting errors that manifest themselves as swaps of two adjacently ranked elements, the proposed translocation rank codes account for more general forms of errors that arise in storage systems. We present several results, including tight bounds on the capacity of translocation rank codes and construction techniques for asymptotically good codes.