List Error-Correction Algorithms: A Survey

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School of Physical and Mathematical Sciences

The construction of error-correcting codes that achieve the best possible trade-off between information rate and the amount of errors that can be corrected has been a long sought-after goal. In this talk, I will survey some of our work on list decoding, culminating in the construction of codes with the optimal rate for any desired error-correction radius. I will describe these codes (called folded Reed-Solomon codes), and give a peek into the ideas underlying their error-correction. These list decoding algorithms correct a factor of two more errors compared to the conventional algorithms currently used in several storage and communication applications.

List decodable codes have also found several applications extraneous to coding theory, in algorithms, complexity theory, and cryptography. Time permitting, I will mention some of these, highlighting a construction of graphs with good expansion properties.

Speaker Biography
Venkatesan Guruswami received his Bachelor's degree from the Indian Institute of Technology at Madras in 1997 and his Ph.D. from the Massachusetts Institute of Technology in 2001. He is currently an Associate Professor in the Computer Science Department at Carnegie Mellon University. From 2002-09, he was a faculty member in the Department of Computer Science and Engineering at the University of Washington. Dr. Guruswami was a Miller Research Fellow at the University of California, Berkeley during 2001-02, and was a member in the School of Mathematics, Institute for Advanced Study during 2007-08.

Venkat Guruswami's research interests span several topics including the theory of error-correcting codes, approximability of fundamental optimization problems, explicit combinatorial constructions and pseudorandomness, probabilistically checkable proofs, computational complexity theory, and algebraic algorithms. Dr. Guruswami currently serves on the editorial boards of the SIAM Journal on Computing, IEEE Transactions on Information Theory, and the ACM Transactions on Computation Theory. He is a recipient of the Packard Fellowship, Sloan Fellowship, NSF CAREER award, ACM's Doctoral Dissertation Award, and the IEEE Information Theory Society Paper Award.

Host: Prof. Xing Chaoping, Division of Mathematical Sciences, School of Physical and Mathematical Sciences

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