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Presents the Spring 2014 EECS Seminar Series

Dr. Mahdi Cheraghchi
MIT

"Codes that No Longer Correct: New Faces of Error-Correcting Codes"
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Since the pioneering work of Shannon over half a century ago, error-correcting codes have served as a tool for practical transmission of information over physical communication media. However, more recently and especially over the past decade, many unexpected connections have been found between coding theory and seemingly unrelated areas of Discrete Mathematics, Theoretical Computer Science, and Electrical Engineering. Exciting lines of collaboration between these research communities have contributed not only to advances in each area, but also progress in classical coding problems as well. In this talk, I will touch upon a few such examples highlighted by my own research, including the following:

1. Big Sparse Data: Sparse recovery, in particular compressive sensing and combinatorial group testing, aims for the acquisition of sparse high dimensional data directly in a compressed form. I will describe some examples of coding-theoretic methods leading to optimal or nearly-optimal measurement schemes that are able to accurately reconstruct sparse data using much fewer samples than their size.

2. Security: I will describe novel coding techniques for ensuring provable information-theoretic privacy of data in the presence of wiretappers and tampering adversaries.

3. Theoretical Computer Science: Many of the above developments result from the fascinating interplay between coding theory and derandomization theory from the core of computer science. I will briefly discuss a few such connections throughout the talk.

Biography
Mahdi Cheraghchi is a post-doctoral fellow at the Computer Science and Artificial Intelligence Lab of MIT. Previously, he held similar positions at the Computer Science Department of Carnegie Mellon University and the University of Texas at Austin. He obtained his Ph.D. and M.Sc. degrees in computer science from EPFL, Switzerland, in 2010 and 2005, respectively and B.Sc. in computer engineering from Sharif University of Technology, Iran, in 2004. He has been awarded two Swiss NSF research grants and EPFL's Patrick Denantes thesis prize. His research interests include the interconnections between coding theory and theoretical computer science, sparse recovery and high-dimensional geometry, information-theoretic privacy and security, and approximation algorithms.

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