The Johns Hopkins University  
Whiting School of Engineering  
Department of Electrical and Computer Engineering

Information Storage for Big Data

A Seminar by

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Abstract: We address different challenges in information storage that are brought by Big Data. First, we study storage solutions for genomic data that can scale with the massive genomic information surge. In particular, we develop a specialized lossless approach to compression of RNA abundance information, combining various source coding methods so as to achieve fast encoding and compact data representation. We also provide random access functionality that enables data visualization in genome browsers. Second, we consider the cost of fault tolerance in distributed storage systems. We construct the first family of high-rate erasure codes such that the disk I/O and the network traffic is minimized when rebuilding information from failed storage nodes. Compared to traditional codes, our results reduce the rebuilding cost to 1/r given r redundant or parity nodes. Third, the problem of storing changing information in distributed storage is considered. We pose a new paradigm of storing such information, and obtain low storage cost through coding theory. Moreover, we propose an algorithm using this paradigm to solve the problem of emulation of shared memory in distributed systems.

Bio: Zhiying Wang is a postdoctoral research fellow at Stanford University. She received Ph.D. and M. Sc. degrees in Electrical Engineering from California Institute of Technology in 2013 and 2009, and B.Sc. degree in Information Electronics and Engineering from Tsinghua University, China, in 2007. Her research interests include information theory, theoretical and applied aspects of coding for distributed storage and non-volatile memories, information theory applied to distributed algorithms, as well as compression and computations on genomic data. She is the recipient of NSF Center for Science of Information (CSoI) Postdoctoral Research Fellowship in 2013.

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Invited by Andreas Andreou

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