ELECTRICAL AND COMPUTER ENGINEERING SEMINAR

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Coded Computing for Next-Generation Information Processing Systems

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11:00am-12:00pm

Abstract: Modern networks are designed to facilitate information processing in large-scale, highly distributed environments that connect humans with smart machines. Information collected in such networks is often privacy-sensitive, such as healthcare records, financial transactions, or geolocation data. Moreover, these networks often need to operate in unknown environments using unreliable information sources, which can lead to various interpretations of the received information. This brings three main challenges in designing effective distributed information-processing frameworks: scalability, privacy, and context-awareness. In this talk, I will discuss how to address these challenges through information and coding theory principles. I will first introduce a fast and privacy-preserving framework for distributed machine learning, which can provide an order of magnitude speedup over the existing cryptographic approaches. Next, I will address a major bottleneck for the scalability of large-scale distributed computing frameworks, the inter-processor communication load, in the context of distributed graph processing.

To do so, I will introduce a topology-aware graph allocation and communication strategy using coding theory and demonstrate that it can reduce the inter-processor communication load significantly for both real-world and random graph structures. Finally, I will discuss the fundamental performance limits of information transmission in context-aware multi-user communication networks. I will characterize the information-theoretic performance limits for lossy transmission of correlated sources in a multi-user communication channel, when the communicating parties have access to context information correlated with the sources.

Bio: Basak Guler is a postdoctoral scholar at the University of Southern California. She received her M.Sc. and Ph.D from the Department of Electrical Engineering at the Pennsylvania State University. Her research interests include information and coding theory, distributed computing, wireless communications, graph signal processing, machine learning, privacy and security, and game theory. She is a recipient of the Dr. Nirmal K. Bose Dissertation Award by the Pennsylvania State University, the Young Scholar Award by the Turkish-American Scientists and Scholars Association, and was named a Rising Star in EECS by MIT.