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SPEAKER: Sundeep Rangan, Qualcomm Flarion Technologies

DATE: Thursday, March 5th

TIME: *5:30 pm Doubleheader

TITLE: Random Access Channels, Compressed Sensing and Sparsity

ABSTRACT: Random access communication is commonly used for short, intermittent transmissions in wireless networks, especially when coordinated scheduling is difficult. By having several users "opportunisticly" share a common airlink resource, random access reduces delay and provides statistical multiplexing gain. The ability to efficiently communicate short messages with low delay will be essential for next-generation wireless networks that require significant over-the-air control messaging to dynamically coordinate the interference environment.

Unfortunately, current engineering practice in random access detection remains limited to relatively simple single-user correlation methods, with orthogonalization sometimes used to separate users. However, the growing demand for efficient control messaging suggests we reconsider current practices and evaluate if more intelligent short, multi-user communication is possible.

Towards this end, in this talk, I will consider a simple on-off random multiple access channel from the perspective of the emerging field of compressed sensing. Compressed sensing deals with detection of sparse signals from random linear measurements. I present a new class of compressed sensing-based multi-user detection algorithms that offers large potential improvements in airlink efficiency for on-off random access communication. I also develop new performance scaling laws that illustrate the role of power control and interference cancellation.

Sparsity is also widely used in statistical model selection and machine learning, and I will briefly discuss how our analysis may have some value for these applications as well.

BIO: Dr. Sundeep Rangan is currently a Director of Engineering at Qualcomm Flarion Technologies. He received the B.A.Sc. degree from the University of Waterloo and M.S. and Ph.D. degrees from the University of California, Berkeley all in electrical engineering. In 1998, he joined Bell Labs where he worked on the development of a novel OFDM-based cellular data system. That project was spun-off in 2000 to form Flarion Technologies to commercialize the system and Dr. Rangan was a co-founder (with four others). Flarion grew to over 150 employees with trials with leading carriers worldwide. Flarion was acquired by Qualcomm in 2006, where Dr. Rangan now works on next-generation wireless infrastructure products. Dr. Rangan's research interests are in wireless communications, information theory, control and signal processing.

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