Scalable Multicast Transmission for 6G Massive Data Distribution and Access

Abstract:

Next-generation wireless networks are expected to manage massive data distribution and access at terabit data rates, with ultra-low latency, high reliability and energy efficiency. Physical-layer multicasting can efficiently exploit beamforming capabilities to effectively support information distribution or data aggregation in enhanced mobile broadband, cache-aided networks, distributed learning, and the Internet of Things applications. However, designing scalable multicast solutions for massive MIMO (massive multiple-input multiple-output) systems faces significant challenges due to the inherent design difficulty, which is more prominent for future systems that feature extremely large-scale antenna arrays for immersive and massive communication. In this talk, we will discuss the development of scalable and efficient multicasting solutions for 6G. In particular, we will present the breakthrough that establishes the structure of the optimal multicast beamforming, highlighting how the structural properties can lead to highly scalable algorithms. We will show how to leverage this optimal structure to design ultra-low-complexity multicasting solutions for scenarios including mixed traffic transmissions and group scheduling. We will further discuss how distributed processing and computing can be integrated into multi-cell coordination for multicasting, resulting in significant savings in computation and communication.