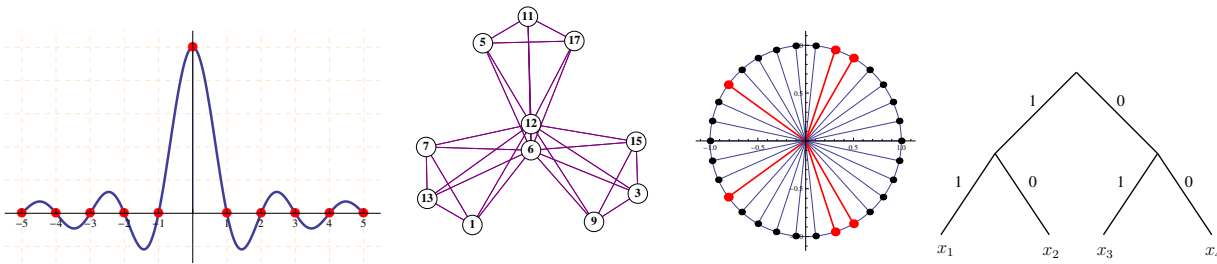# Graph-Theoretic Problems in Sampling and Compression

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Abstract

We present two research topics in telecommunications that involve graph theory. In the first part of the talk, we investigate generalizations of the Nyquist-Shannon Sampling Theorem, used in all modern-day digital communications systems. We present graph-based algorithms for constructing interpolation equations analogous to Shannon's under different prior assumptions on the signal space. Cliques, perfect graphs, and vanishing sums of roots of unity will be discussed. In the second part of the talk, if time permits, we review Huffman coding trees and the classic parlor game of Twenty Questions – and present a new result clarifying a caveat in the information theory literature. Various open problems will be mentioned. (Joint work with Brad Osgood[2] and John Gill[3], respectively.)