Vertex sets in a hypercube: fair distribution and quick secret sharing

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Hypercubes are highly symmetrical graphs important for their mathematical properties, such as representing set systems, as well as for their applications in computer science and data analysis due to efficient communication pathways.

This talk will address two questions about special vertex sets in a hypercube Q_n:

For what parameters (n, d, s) is there a set A of vertices in Q_n that is distributed "fairly", i.e., such that each sub-hypercube of dimension d has exactly s vertices from A?

What is the largest size of a set B of vertices in Q_n that can share secrets quickly, i.e., such that for any two vertices from B there is a shortest in Q_n path between them that contains no other vertices from B.

The talk is based on a joint work with Noga Alon, John Goldwasser, and Dingyuan Liu.