Two Applications of Communication Complexity in Distributed Computing

Abstract:

In distributed systems, communication between the participants in the computation is usually the most expensive part of the computation. Theoretical models of distributed systems usually reflect this by neglecting the cost of local computation, and charging only for messages sent between the participants; in particular, we usually assume that the computation proceeds in rounds, and in each round, each participant can send only a limited number of bits. We are interested in characterizing the number of rounds required to perform various tasks.

In this talk I will describe two sets of results. The first concerns the complexity of distributed subgraph detection: we have \( n \) servers, each representing a node in an undirected graph, and each server receives as input its adjacent edges in the graph. The goal of the computation is to determine whether the global input graph contains some fixed subgraph. I will describe upper and lower bounds for several classes of subgraphs, through a connection to Turan numbers. The general case remains open.

In the second part of the talk I will describe recent work on multi-party number-in-hand communication and information complexity, and show a tight upper and lower bound for set disjointness in the shared blackboard model.

Joint work with Mark Braverman, Andrew Drucker and Fabian Kuhn.