MST in Log-Star Rounds of Congested Clique

Abstract:

We present a randomized algorithm that computes a Minimum Spanning Tree (MST) in \( O(\log^* n) \) rounds, with high probability, in the Congested Clique model of distributed computing. In this model, the input is a graph on \( n \) nodes, initially each node knows only its incident edges, and per round each two nodes can exchange \( O(\log n) \) bits.

Our key technical novelty is an \( O(\log^* n) \) Graph Connectivity algorithm, the heart of which is a (recursive) forest growth method, based on a combination of two ideas: a sparsity-sensitive sketching aimed at sparse graphs and a random edge sampling aimed at dense graphs.

Our result improves significantly over the \( O(\log \log \log n) \) algorithm of Hegeman et al. [PODC 2015] and the \( O(\log \log n) \) algorithm of Lotker et al. [SPAA 2003; SICOMP 2005].

Join work with Mohsen Ghaffari.