Self-Healing of Byzantine Faults in Computation Networks

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Abstract

In our previous work, we provided algorithms that *self-heal* communication networks in the presence of adversarial attacks. In this paper, we extend these algorithms to self-heal computation networks in the presence of such attacks.

In particular, we describe a tree-based computation network over n nodes that ensures the following properties, even when an adversary controls up to $t \leq (1/4 - \epsilon)n$ nodes, for any non-negative ϵ. First, the network provides a computation with bandwidth and latency costs that are asymptotically optimal. Second, the expected total number of message corruptions is $O(t(\log^* n)^2)$ before the adversarially controlled nodes are effectively quarantined so that they cause no more corruptions. Moreover, we study extending our computational model to be for any acyclic computational circuit.