

**Taming Both Predictable and Unpredictable Link Failures for Network Tomography**

**Abstract:**

Calculating fine-grained link metrics by using aggregated path measurements, known as network tomography, is an effective and efficient way to facilitate various network operations, such as network monitoring, load balancing, and fault diagnosis. Recently, there is a growing interest in the monitor placement problem that ensures link identifiability in a network with link failures. Unfortunately, existing work either assumes an ideal failure prediction model where all failures can be predicted perfectly or makes pessimistic assumptions that all failures are unpredictable. In this paper, we study the problem of placing a minimum number of monitors to identify additive link metrics [or additive by using the log(·) function, e.g., loss rates] from end-to-end measurements among monitors with considering both predictable and unpredictable link failures. We propose a set of robust monitor placement algorithms with different performance-complexity tradeoffs to solve this tomography problem. In particular, we show that the optimal (i.e., minimum) monitor placement is the solution to a hitting set problem, for which, we provide a polynomial-time algorithm to construct the input. We formally prove that the proposed algorithms can guarantee network identifiability against failures based on the graph theory. Trace-driven evaluation results show the effectiveness and the robustness of our algorithms.