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Title: « Dynamic Race Detection for Concurrent Systems
(Dr. Andreas Pavlogiannis)

Abstract:
Developing concurrent systems is highly error-prone due to the nondeterminism in interprocess communication.
A first step in reasoning about such programs is often discovering data races, because the behavior of systems is often ill-defined in the presence of data races.
We study the algorithmic problem of predicting data races in lock-based concurrent programs.
The input consists of a concurrent trace t, and the task is to determine all pairs of events of t that constitute a data race. Existing polynomial-time sound techniques are highly incomplete and can miss many simple races.
In this work we develop a new polynomial-time algorithm for the problem that has no false positives. In addition, our algorithm is complete for input traces that consist of two processes, i.e., it provably detects all races in the trace.
Our tool soundly reports thousands of races, and misses at most one race on the whole benchmark set. In addition, its running times are comparable, and often smaller than the theoretically fastest, yet highly incomplete, existing methods. To our knowledge, this is the first sound algorithm that achieves such a level of performance on both running time and completeness of the reported races.