

Near Optimal Separation of Tree-like and General Resolution

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Abstract

We present the best known separation between tree-like and general resolution, improving on the recent $\exp(n^{\varepsilon})$ separation of [BEGJ98]. This is done by constructing a natural family of contradictions, of size n , that have $O(n)$ -size resolution refutations, but only $\exp(\Omega(n / \log n))$ -size tree-like refutations. This result implies that the most commonly used automated theorem procedures, which produce tree-like resolution refutations, will perform badly on some inputs, while other simple procedures, that produce general resolution refutations, will have polynomial run-time on these very same inputs. We show, furthermore that the gap we present is nearly optimal. Specifically, if $S(S_T)$ is the minimal size of a (tree-like) refutation, we prove that $S_T = \exp(O(S \log \log S / \log S))$.