

The computational complexity of subgraph isomorphism

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Abstract

For a fixed pattern graph H , the H -Subgraph Isomorphism Problem asks to determine, given an n -vertex graph G , whether or not it contains a subgraph isomorphic to H . In this talk, we will survey results on the computational complexity of this problem in classes of Boolean circuits and formulas. The best known algorithms solve this problem in terms of natural structural parameters of H by circuits of size $n^{O(\text{tree-width}(H))}$ and formulas of size $n^{O(\text{tree-depth}(H))}$. These upper bounds are conjectured to be asymptotically optimal, and this conjecture has significant implications in complexity theory (including the separation of P and NP). We discuss progress toward this conjecture in the form of lower bounds for bounded-depth circuits and formulas.

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