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A novel branching strategy for parameterized graph modification problems

Many *fixed-parameter tractable* algorithms using a bounded search tree have been repeatedly improved by describing a larger number of branching rules involving an increasingly complex case analysis. We introduce a novel and general branching strategy that branches on the forbidden subgraphs of a relaxed class of graphs. By using the class of P_4 -sparse graphs as the relaxed graph class, we obtain efficient bounded-search tree algorithms for several parameterized deletion problems. For the cograph edge-deletion problem and the trivially perfect edge-deletion problem, the branching strategy yields the first non-trivial bounded-search tree algorithms. For the cograph vertex deletion problem, the running time of our simple bounded search algorithm matches those previously designed with the help of complicated case distinctions and non-trivial running time analysis and computer-aided branching rules.