Abstract

The Chordal Vertex Deletion (ChVD) problem asks to delete a minimum number of vertices from an input graph to obtain a chordal graph. In this paper we develop a polynomial kernel for ChVD under the parameterization by the solution size. Using a new Erdős-Pósa type packing/covering duality for holes in nearly-chordal graphs, we present a polynomial-time algorithm that reduces any instance (G, k) of ChVD to an equivalent instance with poly(k) vertices. The existence of a polynomial kernel answers an open problem of Marx from 2006 [Proceedings of the 32nd International Workshop on Graph-Theoretic Concepts in Computer Science, LNCS 4271, 37–48, 2006]. To obtain the kernelization, we develop the first poly(OPT)-approximation algorithm for ChVD, which is of independent interest. In polynomial time, it either decides that G has no chordal deletion set of size k, or outputs a solution of size $O(k^4 \log^2 k)$.