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Tight Bounds for Chordal/Interval Vertex Deletion Parameterized by Treewidth

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Michał Wlodarczyk

Abstract: In Chordal/Interval Vertex Deletion we ask how many vertices one needs to remove from a graph to make it chordal (respectively: interval). We study these problems under the parameterization by treewidth (tw) of the input graph G. On the one hand, we present an algorithm for Chordal Vertex Deletion with running time 2^O(tw)*|V(G)|, improving upon the running time 2^O(tw^2)*|V(G)|^O(1) by Jansen, de Kroon, and Wlodarczyk (STOC'21). When a tree decomposition of width tw is given, then the base of the exponent equals 2^(omega-1)*3+1. Our algorithm is based on a novel link between chordal graphs and graphic matroids, which allows us to employ the framework of representative families. On the other hand, we prove that the known 2^O(tw log tw)*|V(G)|-time algorithm for Interval Vertex Deletion cannot be improved assuming Exponential Time Hypothesis.

Presenter: WLODARCZYK, Michał

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