

# **Structural Rounding on a Parameterized Graph Class using Heuristics**

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## **Abstract**

Structural rounding is a framework for approximating NP-hard optimization problems on graphs near structured classes [10]. It has previously been empirically shown to outperform standard 2-approximations for VERTEX COVER on near-bipartite graphs [21]. Though promising, it is unclear if these findings are representative of structural rounding in general since the remainder of the framework's theoretical results have yet to be tested in practice. In this thesis, we consider the problem of DOMINATING SET on near-bounded treewidth graphs. We engineer structural rounding in this setting and test its performance against a log D-approximation algorithm. We implement two treewidth heuristics to improve runtime during editing, at the cost of theoretical guarantees on solution quality. We show that for both methods editing to smaller target treewidth increases edit set sizes but improves overall solution quality, which contradicts structural rounding's previous evaluation. We also present a synthetic graph generator that allows us to produce tunable random graphs with bounded distance to a target treewidth.