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Parameterised and Fine-grained Subgraph Counting, modulo 2

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Abstract: Given a class of graphs C, the problem ParitySub(C) is defined as follows. The input is a graph H in C together with an arbitrary graph G. The problem is to compute, modulo 2, the number of subgraphs of G that are isomorphic to H. The goal of this research is to determine for which classes C the problem ParitySub(C) is fixed-parameter tractable (FPT), i.e., solvable in time f(|H|)·|G|^{O(1)}.

Curticapean, Dell, and Husfeldt (ESA 2021) conjectured that ParitySub(C) is FPT if and only if the class of allowed patterns C is matching splittable, which means that for some fixed B, every H in C can be turned into a matching (a graph in which every vertex has degree at most 1) by removing at most B vertices.

Assuming the randomised Exponential Time Hypothesis, we prove their conjecture for (I) all hereditary pattern classes C, and (II) all tree pattern classes, i.e., all classes C such that every H in C is a tree.
We also establish almost tight fine-grained upper and lower bounds for the case of hereditary patterns (I).

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