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Parameterized Graph Algorithms using Restricted Modular Partitions

The modular-width of a graph is the maximum number of children of a node in the modular tree decomposition of the graph. Graphs with small modular-width are useful in solving algorithmic problems, since we can often solve the problem recursively on the modules, then use brute-force over the small set of modules to combine these solutions. This works as long as we are able to solve the problem efficiently in the modules themselves. Therefore, each module could be in any graph class that allows efficient algorithms. For a graph class \mathcal{G} , we thus define the \mathcal{G} -modular cardinality of a graph G as the minimum size of a modular partition of G into modules that belong to \mathcal{G} . We will discuss the complexity aspects of computing the \mathcal{G} -modular cardinality for a variety of graph classes, including cographs, cliques, edgeless graphs, and then discuss how it can be useful to design algorithms.