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Exact Algorithms for s-Club Finding and Related Problems

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The Clique problem is one of the best-studied problems in computer science. However, there exist only few studies concerning the important Clique generalization, called the s-Club problem. In particular there have been no intensive investigations with respect to the parameterized complexity of this problem. We show that s-Club is fixed-parameter tractable with respect to the number of vertices in the solution. In terms of polynomial time data reduction, we show that s-Club does not admit a polynomial many-to-one kernel. In contrast to that we give a cubic-vertex Turing kernel. In this context we also show an interesting connection to the approximation of a solution for s-Club, and give a combined algorithm to exploit this connection. In order to obtain efficient fixed-parameter algorithms, it is often useful to change the parameterization. Therefore, we analyze s-Club with a dual parameterization, which we define as the s-Club Vertex Deletion problem. We show that this problem is fixed-parameter tractable with respect to the number of vertices in the solution. We also introduce the s-Club Cluster Vertex Deletion problem, which is a generalization of the Cluster Vertex Deletion problem.

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