Covering graphs with few complete bipartite subgraphs

Author(s)
Herbert Fleischner, Egbert Mujuni, Daniël Paulusma, Stefan Szeider

Abstract
We consider computational problems on covering graphs with bicliques (complete bipartite subgraphs). Given a graph and an integer k, the biclique cover problem asks whether the edge-set of the graph can be covered with at most k bicliques; the biclique partition problem is defined similarly with the additional condition that the bicliques are required to be mutually edge-disjoint. The biclique vertex-cover problem asks whether the vertex-set of the given graph can be covered with at most k bicliques, the biclique vertex-partition problem is defined similarly with the additional condition that the bicliques are required to be mutually vertex-disjoint. All these four problems are known to be NP-complete even if the given graph is bipartite. In this paper, we investigate them in the framework of parameterized complexity: do the problems become easier if k is assumed to be small? We show that, considering k as the parameter, the first two problems are fixed-parameter tractable, while the latter two problems are not fixed-parameter tractable unless P=NP.

Keywords
Bicliques;
Parameterized complexity;
Covering and partitioning problems