A friendly generalization of split graphs

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A graph is split if its vertex set admits a partition (K, S) such that K is a clique and S is a stable set. We define a graph to be Maya-Tupi if its vertex set admits a partition (A, B) such that A induces a complete multipartite graph where each part has at most two vertices, and B induces a disjoint union of cliques of size at most 2. Maya-Tupi graphs generalize split graphs and are not chordal (and hence not perfect).

We prove that it is possible to calculate the chromatic number, a minimum chordal completion and the treewidth of a graph in this class in time $O(n + m)$. As our algorithms depend heavily on knowing the Maya-Tupi partition of the input graph, we provide a recognition algorithm for our class which produces a partition when one exists, and runs in polynomial time. We discuss the forbidden induced graph characterization of the restriction of our class to some classic graph classes, e.g., trees and cographs. Finally, we outline some future lines of work and present open problems.

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