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Birkhoff–von Neumann Graphs that are PM-compact

A well-studied object in combinatorial optimization is the perfect matching polytope $\mathcal{PM}\mathcal{P}(G)$ of a graph G . A graph G is ‘Birkhoff–von Neumann’ if $\mathcal{PM}\mathcal{P}(G)$ is characterized solely by non-negativity and degree constraints, and G is ‘PM-compact’ if the combinatorial diameter of $\mathcal{PM}\mathcal{P}(G)$ equals one. Each of the corresponding decision problems has a graph-theoretical $co - \mathcal{NP}$ characterization; there is a striking similarity between these characterizations. However, neither of them is known to be in \mathcal{NP} . We give a complete characterization of graphs that are Birkhoff–von Neumann as well as PM-compact. Joint work with Nishad Kothari, Xiumei Wang and Yixun Lin (see <https://arxiv.org/abs/1807.07339>).