

# An empirical comparison between formulations of a P, NP-complete and graph isomorphism problem

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## **Abstract**

Two simple graphs are isomorphic if and only if there exists permutation matrix  $P$  such that  $PGP^t = H$ , where  $G$  and  $H$  are adjacency matrices. An empirical comparison between common formulations of a problem in P, an NP-complete problem and the Graph Isomorphism (GI) problem is presented in search of insight about how / how not to classify GI. Observations suggest that as an integer program, its corresponding relaxed feasible region is the Birkhoff polytope (like P-problems) but modified by cuts (like NP-complete problems).