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Testing isomorphism between tuples of subspaces.

Given a Gram matrix of a set of vectors, how can one determine if those vectors span the same set of lines? If no two vectors are orthogonal, then one must simply compute the products of triples of the inner products for a complete characterization. In real Euclidean space, this has a direct connection to special types of combinatorial objects called two-graphs. These products can help one characterize frames with certain traits. Generalizing, given two tuples of subspaces, can you tell whether the tuples are isomorphic? In this talk theory and algorithms to address this fundamental question will be presented. I will focus on isomorphisms in which the ambient vector space is acted on by either a unitary group or general linear group. If isomorphism also allows permutations of the subspaces, then the problem is at least as hard as graph isomorphism. Otherwise, we provide a variety of polynomial-time algorithms to test for isomorphism. (Received August 22, 2021)