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**Jesus A De Loera\*** ([deloera@math.ucdavis.edu](mailto:deloera@math.ucdavis.edu)), Davis, CA 95616. *Subgraph Isomorphism through Polynomial Ideals and their relaxations.*

Given two graphs  $G$  and  $H$ , the *subgraph isomorphism problem* asks whether there is a subgraph of  $G$  isomorphic to  $H$ . Instances of this question include a wide range of famous questions in Graph Theory (e.g. graph isomorphism, existence of hamiltonian cycles or cliques, etc).

We investigate the convex-algebraic-geometric nature of such questions. Starting with a non-linear encoding of the problem using polynomial ideals we present a hierarchy of relaxations each yielding relevant computational information. In particular, we derived some results on the estimation the number of distinct isomorphic subgraph inside  $G$  and connections to the multiplicity of eigenvalues of the adjacency matrices of  $G$  and  $H$ .

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