

A case study of computational methods:  
uniquely  $K_r$ -saturated graphs

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The phenomenal development of computing power and powerful algorithms during the last fifty years has had a profound impact on modern life as well as on science and mathematics. However, computational approaches have not been as heavily utilized in discrete mathematics as in other areas of mathematics, primarily because of two main challenges: “combinatorial explosion” of the space of objects, and symmetry present from representing isomorphism classes of objects as labeled objects on a computer. The goal of work in this area is to combine computational techniques of combinatorial optimization (such as integer programming) with techniques for symmetry reduction (such as from combinatorial generation) to search for objects with desired isomorph-invariant properties. I will discuss these techniques and illustrate their use in the context of uniquely  $K_r$ -saturated graphs. (Based on joint work with Derrick Stolee, Iowa State University.)