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**Edward D. Kim\*** (edward.d.kim@gmail.com). *Subset partition graphs and an approach to the Linear Hirsch conjecture.*

In this talk, we will consider topological and combinatorial approaches to relaxations of the Hirsch Conjecture. Combinatorial abstractions of the graphs of polyhedra are receiving renewed interest as an approach to the linear Hirsch and polynomial Hirsch conjectures, since Santos disproved the Hirsch conjecture, which was relevant in the theoretical worst-case running time of the simplex method for linear optimization. We will give a survey of several classical combinatorial abstractions for polyhedral graphs. Then we show how they fit into a more general framework, which leads to some variants of these earlier abstractions. This flexible framework is defined by combinatorial properties, with each collection of properties taken providing a variant for studying the diameters of polyhedral graphs. We present a variant which has superlinear diameter, which together with some combinatorial operations gives a concrete approach for disproving the linear Hirsch conjecture. (Received September 20, 2012)