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Whitney's Theorem and Subideals of Monomial Ideals

The reconstruction of a graph from certain subgraphs has always been an interesting topic in graph theory and is still an open question. The vertex-deck (or simply the deck) of a graph G is the family of all its subgraphs which are obtained by removing exactly one vertex of G . Similarly we can define the edge-deck of a graph G .

The main question is whether one can uniquely determine a graph from its unlabeled vertex-deck. In 1964, Harary conjectured that any two graphs with at least four edges and the same edge-deck are isomorphic.

Long before that, in 1932 Whitney proved that if the line graphs of two simple graphs G and H are isomorphic, then G and H are also isomorphic except for the cases K_3 and $K_{1,3}$. Using this result, Hemminger proved that the edge reconstruction conjecture for graphs is equivalent to the vertex reconstruction conjecture for line graphs.

Trying to extend Whitney's theorem to hypergraphs, Berge introduced two hypergraphs \mathcal{E}_p and \mathcal{O}_p and proved that if two hypergraphs have isomorphic $(p-1)$ -edge-decks then they are isomorphic only if they do not contain an $\mathcal{E}_p - \mathcal{O}_p$ pair. In 1987 Gardner proved the other direction under extra hypotheses.

In this talk we will discuss the ideal theory of hypergraphs with isomorphic $(p-1)$ -edge-decks, using the results mentioned above.