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Graph matroid families

In rigidity theory and related fields, we often work with matroids defined on the edge set of a graph, such as rigidity matroids, sparsity matroids, or the various matroids appearing in matrix completion problems. In each of these cases, we in fact have a family of matroids, one defined for each finite graph, with the members fitting together in a certain natural way.

Graph matroid families arise as the abstraction of this setup. Roughly speaking, a graph matroid family is a family of matroids defined on the edge set of each finite graph in a way that is isomorphism-invariant and such that taking subgraphs corresponds to matroid restriction. Starting from the 1970s, this notion has been independently rediscovered (and seemingly forgotten) multiple times. However, recent results suggest that graph matroid families - despite their rather general definition - have a rich structure, whose investigation is still in its early stages. This framework also clarifies the relationship between the combinatorial structure of a graph, and the properties of the various matroids associated to it.

In the talk, I will outline the basic theory behind this notion, with an emphasis on examples and open questions.