Topology in combinatorics and data

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In this talk, we will discuss some topological problems arising from graphs and data. Given a graph, one may consider the coloring on this graph by labeling its vertices by colors. If colors are taken by points in a given topological space, we would get a *chromatic* space. There are interesting connections between the Poincare polynomial of the obtained chromatic space and the chromatic polynomial of the graph.

The notion of chromatic space is a generalization of configuration space. More precisely the classical configuration spaces can be considered as the chromatic spaces of a complete graph. Indicated from its successful applications to classical configuration spaces and braid diagrams, the Morse theory might have potential applications to some new mathematical objects related to chromatic spaces.

We will also discuss some topological questions from data analysis. The discrete Morse theory might be the potential tool for exploring some new mathematical objects arising from biomolecular and social networks. The talk will report our current progress on the topics.