

Graph-theoretical questions arising from DNA self-assembly

Abstract: The chemical and physical properties of DNA strands contain a high degree of information which allows DNA to serve as building material for assembling nanostructures. These complexes have a wide range of applications, including drug delivery and molecular scaffolding. In this talk, we focus on assembling graph-like structures using branched junction DNA molecules which are star-shaped molecules that join together through adhesion sites at the end of their arms. We describe a combinatorial representation of these molecules and consider the problem of optimally building a target graph under different laboratory settings. We show how this question gives rise to new graph invariants and how these invariants can be studied through edge-colorings and graph decompositions.