

Lewis University
Dr. James Girard Summer Undergraduate
Research Program 2020
Faculty Mentor - Project Application

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Graph Theoretical Design Strategies for Modeling Self-Assembling DNA

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Abstract

Self-assembly is a term used to describe the process of a collection of components combining to form an organized structure without external direction. The unique properties of double-stranded DNA molecules make DNA a valuable structural material with which to form nanostructures, and the field of DNA nantechnology is largely based on this premise. By modeling nanostructures with discrete graphs, efficient DNA self-assembly becomes a mathematical puzzle. These nanostructures have wide-ranging applications, such as containers for the transport and release of nano-cargos, templates for the controlled growth of nano-objects, and in drug-delivery methods. This research project centers around the exploration of the graph theoretical and combinatorial properties of DNA self-assembly, as well as development of computational tools to aid in answering fundamental questions that arise.