New computational approaches to the classification of combinatorial structures

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The identification and classification of combinatorial designs embedded in finite projective planes have long been important problems in finite geometry and combinatorics. Despite significant progress, these problems remain computationally challenging, particularly when the structures under investigation are large and the number of possible configurations is enormous.
In this talk, we examine computational techniques developed in the literature for identifying and classifying such structures, with particular emphasis on their computational complexity and practical limitations. We discuss how theoretical insights and carefully chosen restrictions can be exploited to reduce the search space, and present our approaches to improving computational efficiency. Through suitable constraints and optimized search procedures, we demonstrate how computations that might otherwise require years can, in certain cases, be completed in days.

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