# Recent advances in graph and hypergraph decompositions

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In 1853, Steiner asked for which natural numbers $n > k > r$ exists a collection $S$ of $k$-subsets of $\{1, \ldots, n\}$ such that every $r$-subset of $\{1, \ldots, n\}$ is contained in precisely one element of $S$. These 'Steiner systems' have applications in many areas of mathematics.

Despite extensive research, Steiner's question remained unanswered for more than 150 years. Recently, a blend of probabilistic, algebraic and combinatorial techniques led to the resolution of this problem (for large enough $n$) in the more general setting of hypergraph decompositions [4,2,3,5] (a Steiner system is equivalent to a clique decomposition of a complete uniform hypergraph). The developed techniques have also led to progress towards other decomposition problems, e.g. the resolution of the Oberwolfach problem from 1967 [1].

This talk will provide an overview over recent advances in this area, highlighting the use of probabilistic techniques and the central role of the absorbing method.

## References

[1] S. Glock, F. Joos, J. Kim, D. Kühn, and D. Osthus, *Resolution of the Oberwolfach problem*, arXiv:1806.04644.

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[4] P. Keevash, *The existence of designs*, arXiv:1401.3665.

[5] P. Keevash, *The existence of designs II*, arXiv:1802.05900.