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Large matchings in uniform hypergraphs and the conjectures of Erdos and Samuels

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In this paper we study conditions which guarantee the existence of perfect matchings and perfect fractional matchings in uniform hypergraphs. We reduce this problem to an old conjecture by Erd\H {o}s on estimating the maximum number of edges in a hypergraph when the (fractional) matching number is given, which we are able to solve in some special cases using probabilistic techniques. Based on these results, we obtain some general theorems on the minimum d-degree ensuring the existence of perfect (fractional) matchings. In particular, we asymptotically determine the minimum vertex degree which guarantees a perfect matching in 4-uniform and 5-uniform hypergraphs. We also discuss an application to a problem of finding an optimal data allocation in a distributed storage system.

Subjects: **Combinatorics (math.CO)**; Probability (math.PR)

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