

The structure of large sum-free sets of integers

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A subset A of integers is called sum-free if it contains no triple of elements x, y, z with $x + y = z$. Here we provide a structure characterization of sum-free subsets of $\{1, 2, \dots, n\}$ of density at least $2/5 - c$, where $c > 0$ is an absolute constant. As an application, we derive a robust stability version of Hu's theorem [Proc. Amer. Math. Soc. 80 (1980), 711-712] about the maximum size of a subset of $\{1, 2, \dots, n\}$ which is a union two sum-free sets. We use this result in conjunction with the method of hypergraph containers to show that the number of subsets of $\{1, 2, \dots, n\}$ that can be partitioned into two sum-free sets is $\Theta(2^{4n/5})$, confirming a conjecture of Hancock, Staden and Treglown.