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On strong Sidon sets of integers

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Abstract: Let $\mathbb{N}$ be the set of natural numbers. A set $A \subset \mathbb{N}$ is called a *Sidon set* if the sums $a_1 + a_2$, with $a_1, a_2 \in S$ and $a_1 \leq a_2$, are distinct, or equivalently, if

$$|(x + w) - (y + z)| \geq 1$$

for every $x, y, z, w \in S$ with $x < y \leq z < w$. We define strong Sidon sets as follows: For a constant α with $0 \leq \alpha < 1$, a set $S \subset \mathbb{N}$ is called an α-*strong Sidon set* if

$$|(x + w) - (y + z)| \geq w^\alpha$$

for every $x, y, z, w \in S$ with $x < y \leq z < w$.

The motivation of strong Sidon sets is that a strong Sidon set generates many Sidon sets by altering each element a bit. This implies that a dense strong Sidon set will guarantee a dense Sidon set contained in a sparse random subset of $\mathbb{N}$.

In this talk, we are interested in how dense a strong Sidon set can be. This is joint work with Yoshiharu Kohayakawa, Carlos Gustavo Moreira and Vojtěch Rödl.

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