1154-11-1941 **Sayok Chakravarty*** (s7chakra@ucsd.edu) and **Aitzin Cornejo-Reynoso**. *Extremal and Probabilistic Results for Sum-Difference Sidon Sets.*

Let $\mathcal{A} \subset [N]$. For $1 \leq i \leq n$, define

$$\sigma(i) := \left|\left\{(a,b) \in \mathcal{A}^2 \, : \, a \leq b, a+b=i\right\}\right|$$

and

$$\delta(i) := \left|\left\{(a,b) \in \mathcal{A}^2 \, : \, a \leq b, b-a=i\right\}\right|$$

$\mathcal{A}$ is called Sidon if $\sigma(i) \leq 1$ for all i. We say a set $\mathcal{A}$ is $\mathrm{SD}_{2,g}$ if $\sigma(i)+\delta(i) \leq g$ for all i. In 1932 Hungarian mathematician Simon Sidon posed the following question: how dense can a $\mathrm{SD}_{2,g}$ set be? We have shown if $\mathcal{A} \subset [N]$ is $\mathrm{SD}_{2,g}$, then

$$|\mathcal{A}| \leq \sqrt{gN} + \left(\frac{1}{2}\sqrt{g} + \frac{1}{2}\right)\sqrt[4]{N} + 1$$

We also consider the related probabilistic problem for $\mathrm{SD}_{2,2}$ sets. Let $A \subset [N]$ be a random subset in which each element of $[N]$ is chosen for membership in A with probability p. We find a threshold for a random set being $\mathrm{SD}_{2,2}$ with probability that tends to $1/0$ as $N \to \infty$.

We have found similar results for random sets $\mathcal{A} \subset [N]$ such that any $j \in \left[\frac{N}{2}, \frac{5N}{6}\right]$ can be represented as a sum and difference of two elements from $\mathcal{A}$ in at least 1 way. (Received September 16, 2019)