

Research Highlight: Improved Bounds on Sidon Sets via Lattice Packings of Simplices

Work of Dr. Mladen Kovačević (ECE, NUS) and Dr. Vincent Tan (ECE and Math, NUS)

A B_h set (or Sidon set [Sid32] of order h) in an Abelian group G is any subset $\{b_0, b_1, \dots, b_n\}$ of G with the property that all the sums $b_{i_1} + \dots + b_{i_h}$ are different up to the order of the summands. Let $\phi(h, n)$ denote the order of the smallest Abelian group containing a B_h set of cardinality $n + 1$. It is shown by Dr. Vincent Tan and his postdoc Dr. Mladen Kovačević that

$$\lim_{h \rightarrow \infty} \frac{\phi(h, n)}{h^n} = \frac{1}{n! \delta_L(\Delta^n)},$$

where $\delta_L(\Delta^n)$ is the lattice packing density of an n -simplex in Euclidean space. This determines the asymptotics exactly in cases where this density is known ($n \leq 3$) and gives improved bounds on $\phi(h, n)$ in the remaining cases. The corresponding geometric characterization of bases of order h in finite Abelian groups in terms of lattice coverings by simplices is also given.

This paper will appear in the SIAM Journal on Discrete Mathematics [KT17].

References

- [KT17] M. Kovačević and V. Y. F. Tan. Improved bounds on sidon sets via lattice packings of simplices. *SIAM J. on Discrete Mathematics (To appear)*, 2017+. arXiv:1610.01341 [math.CO].
- [Sid32] S. Sidon. Ein Satz über Trigonometrische Polynome und Seine Anwendung in der Theorie der Fourier-Reihen (in German). *Math. Ann.*, 106(1):536–539, 1932.