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Erdős-Falconer distance problem over finite fields

Abstract: The Erdős-Falconer distance problem asks for the smallest number α such that if $E \subset \mathbb{F}_q^d$ and $|E| \geq Cq^\alpha$ then the distance set $\Delta(E)$ contains the whole field $\mathbb{F}_q$ or covers a positive proportion of all distances. Iosevich and Rudnev (2004) proved that if $|E| \geq 4q^{\frac{d+1}{2}}$ then $\Delta(E) = \mathbb{F}_q$. It has been proved that the exponent $\frac{d+1}{2}$ can not be improved in odd dimensions, even we only wish to cover a positive proportion of all distances. In even dimensions, it has been conjectured that in order to cover a positive proportion of all distances, the right exponent should be $d/2$. In this talk, we are going to discuss about recent results in this direction.