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L^p AVERAGES OF THE DISCRETE FOURIER TRANSFORM AND APPLICATIONS

The discrete Fourier transform has proven to be an essential tool in many geometric and combinatorial problems in vector spaces over finite fields. In general, sets with good uniform bounds for the Fourier transform appear more ‘random’ and are easier to analyze. However, there is a trade-off: in many cases, obtaining good uniform bounds is not possible, even in situations where many points satisfy strong pointwise bounds. To address this limitation, a new approach has been proposed: one attempts to replace the need for *uniform* (L^∞) bounds with suitable bounds for the L^p *average* of the Fourier transform. In subsequent joint works, the authors applied this approach successfully to improve known results in the Fourier restriction problem in $\mathbb{F}_q^n$ and in the study of orthogonal projections in $\mathbb{F}_q^n$. In this talk, we discuss this general approach, provide several examples, and highlight some recent applications.

The talk is based on a series of papers with Jon Fraser.