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Efficient congruencing, Fourier restriction theory, and Waring's problem

We report on recent progress concerning Vinogradov's mean value theorem, and related systems of equations of only approximately translation-dilation invariant nature. Based on the application of "efficient congruencing", these ideas may also be applied to establish mean value estimates of the shape

$$\int_{[0,1]^t} \left| \sum_{1 \leq n \leq N} a_n e(\alpha_1 n^{k_1} + \dots + \alpha_t n^{k_t}) \right|^{2s} d\alpha_1 \dots d\alpha_t \ll N^\epsilon \left(\sum_{1 \leq n \leq N} |a_n|^2 \right)^s \quad (a_n \in \mathbb{C}),$$

of significance in Fourier restriction theory. We will also announce progress on the problem of establishing the asymptotic formula in Waring's problem for fourth and higher powers.