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Combinatorics in Analyzing L-Function Coefficients and Applications to Low-Lying Zeros

Questions on the distribution of coefficients of L-functions can often be reduced to combinatorial questions, where it is not always clear what is the right object to study. I will discuss some earlier joint results with Ram Murty on effective equidistribution of coefficients in elliptic curve families, and discuss how the perspective gained there helped in attacking other problems. These range from extending results for cuspidal newforms to square-free levels and increasing the support of the higher level densities, which lead to the best bounds on vanishing to high order at the central point.