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*Fourier optimization and quadratic forms*

The study of integers and primes represented by binary quadratic forms is a classical problem, going back to Fermat. We will discuss a Fourier analysis approach to this problem, based on joint work with Andrés Chirre. For a given form and integer  $\ell \geq 2$ , this approach gives us strong estimates for the average number of representations of integers that are multiples of  $\ell$ . This leads to unconditional upper bounds on the number of primes in short intervals represented by a given form, and, conditionally on the generalized Riemann hypothesis, an upper bound on the maximum gap between such consecutive primes. The latter extends a method of Carneiro, Milinovich, and Soundararajan.