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Extremal primes for elliptic curves without complex multiplication

Fix an elliptic curve E over $\mathbb{Q}$. An "extremal prime" for E is a prime p of good reduction such that the number of rational points on E modulo p is maximal or minimal in relation to the Hasse bound. In this talk, I will discuss what is known and conjectured about the number of extremal primes $p \leq X$, and give the first non-trivial upper bound for the number of such primes when E is a curve without complex multiplication. The result is conditional on the hypothesis that all the symmetric power L-functions associated to E are automorphic and satisfy the Generalized Riemann Hypothesis. In order to obtain this bound, we use explicit equidistribution for the Sato-Tate measure as in recent work of Rouse and Thorner, and refine certain intermediate estimates taking advantage of the fact that extremal primes have a very small Sato-Tate measure.