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**Alexandra Hoey, Jonas Iskander, Steven Jin\*** (sjin6816@umd.edu) and **Fernando Trejos Suárez**. *An Unconditional Explicit Bound on the Error Term in the Sato-Tate Conjecture.*

Let  $f(z) = \sum_{n=1}^{\infty} a_f(n)q^n$  be a holomorphic cuspidal newform with even integral weight  $k \geq 2$ , level  $N$ , trivial nebentypus, and no complex multiplication (CM). For all primes  $p$ , we may define  $\theta_p \in [0, \pi]$  such that  $a_f(p) = 2p^{(k-1)/2} \cos \theta_p$ . The Sato-Tate conjecture states that the angles  $\theta_p$  are equidistributed with respect to the probability measure  $\mu_{\text{ST}}(I) = \frac{2}{\pi} \int_I \sin^2 \theta \, d\theta$ , where  $I \subseteq [0, \pi]$ . Using recent results on the automorphy of symmetric-power  $L$ -functions due to Newton and Thorne, we construct the first unconditional explicit bound on the error term in the Sato-Tate conjecture, which applies when  $N$  is squarefree as well as when  $f$  corresponds to an elliptic curve with arbitrary conductor. In particular, if  $\pi_{f,I}(x) := \#\{p \leq x : p \nmid N, \theta_p \in I\}$ , and  $\pi(x) := \#\{p \leq x\}$ , we show the following bound:

$$\left| \frac{\pi_{f,I}(x)}{\pi(x)} - \mu_{\text{ST}}(I) \right| \leq 58.1 \frac{\log((k-1)N \log x)}{\sqrt{\log x}} \quad \text{for } x \geq 3.$$

As an application, we give an explicit bound for the number of primes up to  $x$  that violate the Atkin-Serre conjecture for  $f$ . (Received August 10, 2021)