1146-14-312 **Kaitlyn Phillipson** (kphillip@stedwards.edu), **Grigoris Paouris** (grigoris@math.tamu.edu) and **J. Maurice Rojas*** (rojas@math.tamu.edu), TAMU 3368, College Station, TX 77843-3368.
Faster Solution to Smale's 17th Problem for Binomial Systems.

Suppose $F := (f_1, \ldots, f_n)$ is a system of n-variate polynomials with f_i having degree at most d and the coefficient of $x_1^{a_1} \cdots x_n^{a_n}$ in f_i being an independent complex Gaussian of mean 0 and variance $\frac{d!}{a_1! \cdots a_n!}$. Recent progress on Smale's 17th Problem by Lairez (building on seminal work of Shub, Smale, Beltran, Pardo, Burgisser, and Cucker) has resulted in deterministic algorithms that find a single (complex) approximate root of such an F using just $(n+d)^{O(\min n,d)}$ arithmetic operations on average.

Suppose $\mathcal{A}$ is the union of the exponent vectors in the monomial term expansions of $f_1, \ldots, f_n$. We give a deterministic algorithm that, when $\#\mathcal{A} \leq n+1$, finds a (complex) approximate root using just $(n + \log d)^{O(1)}$ arithmetic operations on average. This special case includes the case of binomial systems, whose numerical solution is a key step in polyhedral homotopy algorithms for solving arbitrary polynomial systems. Furthermore, our approach allows Gaussians with arbitrary variance. (Received January 25, 2019)