1137-47-258 **Tsz Chiu Kwok*** (tckwok0@gmail.com), **Lap Chi Lau**, **Yin Tat Lee** and **Akshay Ramachandran**. *The Paulsen Problem, Continuous Operator Scaling, and Smoothed Analysis.*

The Paulsen problem is a basic open problem in operator theory: Given vectors $u_1, \dots, u_n \in \mathbb{R}^d$ that are ϵ-nearly satisfying the Parseval's condition and the equal norm condition, is it close to a set of vectors $v_1, \dots, v_n \in \mathbb{R}^d$ that exactly satisfy the Parseval's condition and the equal norm condition? We consider the squared distance $\inf_v \sum_{i=1}^n \|u_i - v_i\|_2^2$ where the infimum is over the set of exact solutions. Previous results show that the squared distance of any ϵ-nearly solution is at most $O(\text{poly}(d, n, \epsilon))$ and there are ϵ-nearly solutions with squared distance at least $\Omega(d\epsilon)$. The fundamental open question is whether the squared distance can be independent of the number of vectors n.

We answer this question affirmatively by proving that the squared distance of any ϵ-nearly solution is $O(d^{13/2}\epsilon)$. Our approach is based on a continuous version of the operator scaling algorithm. We first define a dynamical system based on operator scaling to give a looser bound, and then we show that the dynamical system will converge faster by slightly perturbing the input vectors. (Received February 05, 2018)