1135-68-2775 **Zak Webb*** (zakwwebb@gmail.com). *Quantum advantage via non-local games.*

Provable quantum advantages usually require some assumption on the computational model, either through an explicit computation assumption or else a restricted model of computation. Recently, Bravyi, Gosset, and König gave an explicit problem separating constant depth quantum and classical circuits without these assumptions.

In this work, we extend their results using non-local games and give a problem exactly solvable using a constant depth quantum circuit, but for which any k-bounded fan-in randomized circuit solving the problem with probability more than $\exp(-\Theta(n^{1-\gamma}))$ is of depth at least $\frac{\gamma}{2}\frac{\log n}{\log k}$, where $\gamma \in (0,1)$ is any fixed constant and n is the problem input size. In other words, we construct a problem that is easily solved by a constant depth quantum circuit, but that no classical circuit can solve with non-negligible probability. Our proof proceeds by showing that any classical circuit solving our problem yields a classical strategy for the parallel-repeated Mermin magic-square game, which previous work has ruled impossible. (Received September 26, 2017)