

Title: Noise-based Logic versus Quantum Supremacy

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Abstract: Quantum Supremacy is an expression coined to indicate that there are some hard computational problems that quantum computers can solve exponentially faster than a classical-physical Turing machine (that is, a digital computer).

Noise-based Logic (NBL) is a deterministic computation scheme that utilizes a digital computer and a physical true random number generator (TRNG).

Recently, several computational problems have been identified where NBL also deterministically offered an exponential speedup compared to a digital computer. In the case of phonebook search, at proper conditions, NBL can even be exponentially faster than Grover's quantum algorithm that offers only a polynomial speedup compared to a digital computer. The newest result is the implementation of the Deutsch-Jozsa problem in NBL. The Deutsch-Jozsa quantum algorithm was historically the first one that was able to offer quantum supremacy. NBL offers the same speedup class.

Open philosophical questions emerge about the role of true randomness in the speedup.