



## **ABSTRACT**

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### **Title**

Quantum Computing and Zeros of Zeta Functions

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### **Abstract**

A possible connection between quantum computing and Zeta functions of finite field equations is described. Inspired by the 'spectral approach' to the Riemann conjecture, the assumption is that the zeroes of such Zeta functions correspond to the eigenvalues of finite dimensional unitary operators of natural quantum mechanical systems. The notion of universal, efficient quantum computation is used to model the desired quantum systems. Using eigenvalue estimation, such quantum circuits would be able to approximately count the number of solutions of finite field equations with an accuracy that does not appear to be feasible with a classical computer. For certain equations (Fermat hypersurfaces) it is shown that one can indeed model their Zeta functions with efficient quantum algorithms, which gives some evidence in favor of the hypothesis.

