

Taming the quantum tiger

Umesh Vazirani ^{*1}

¹ *University of California at Berkeley, Berkeley, California 94720, USA*

Abstract. Quantum computation has taught us that a quantum system is best visualized as a wild tiger rather than a tame Schrodinger's cat. Indeed the exponential power of quantum systems, which makes quantum computers possible, is also an enormous obstacle to analyzing and understanding physical systems. Is there a way to tame the quantum tiger and neutralize this curse of exponentiality? In this talk I will address this question in two settings:

1. Are there general classes of quantum systems whose states can be efficiently (polynomially) computed on a traditional classical computer?

2. Is it possible for a classical experimentalist to test that an untrusted quantum system behaves as commanded? For example, is it possible to test that a claimed quantum computer is really quantum?

The talk will discuss recent breakthroughs in both settings, as well as many exciting open questions. I will make every attempt to keep the discussion widely accessible.

^{*}vazirani@eecs.berkeley.edu