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香港中文大學
The Chinese University of Hong Kong

Institute of Theoretical Computer Science and Communications

ITCSC Seminar

On The Power of A Unique Quantum Witness

By
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October 19, 2009 (Monday)
4:30pm - 5:30pm
Rm. 121, Ho Sin Hang Engineering Building, CUHK

Abstract:
In a celebrated paper, Valiant and Vazirani raised the question of whether the difficulty of NP-complete problems was due to the wide variation of the number of witnesses of their instances. They gave a strong negative answer by showing that distinguishing between instances having zero or one witnesses is as hard as recognizing NP, under randomized reductions.

We consider the same question in the quantum setting and investigate the possibility of reducing quantum witnesses in the context of the complexity class QMA, the quantum analogue of NP. The natural way to quantify the number of quantum witnesses is the dimension of the witness subspace W in some appropriate Hilbert space H. We present an efficient deterministic procedure that reduces any problem where the dimension d of W is bounded by a polynomial to a problem with a unique quantum witness. The main idea of our reduction is to consider the Alternating subspace of the d-th tensor power of H. Indeed, the intersection of this subspace with the d-th tensor power of W is one-dimensional, and therefore can play the role of the unique quantum witness.

Joint work with Jain, Kerenidis, Santha

***** ALL ARE WELCOME *****