COMPUTER SCIENCE
WEEKLY LUNCH SEMINAR

QUANTUM COMPLEXITY OF ESTIMATING LOCAL PHYSICAL QUANTITIES

Friday, March 25 | 12:00 - 1:00 p.m. | Engineering East Hall E2221

Speaker: **Justin Yirka**
Undergraduate student, Department of Computer Science

Abstract

Complexity theory in the quantum setting has found striking applications in the study of physically motivated problems. This talk will present results studying the complexity of two problems related to measurement on quantum systems at low temperatures. We show that both of these estimation problems are intractable in the worst case: namely that they are complete for the class PQMA[log]. This class corresponds to the set of problems efficiently decidable by a machine with access to a logarithmic number of queries to a QMA oracle, i.e. problems which are "slightly harder" than those in QMA, where QMA is the quantum analogue of the prominent classical complexity class NP. The study of the first of these two problems was initiated by Ambainis [CCC 2014], who showed that hardness held for log-local measurements and systems. Our results improve on this earlier work by showing that hardness holds even for 1-local measurements (i.e. measurement of a single qubit) and 5-local systems – a formerly open question posed by Ambainis [CCC 2014].

This work was completed in conjunction with Sevag Gharibian, Ph.D. (VCU) and Xiaodi Wu, Ph.D. (U of Oregon). Necessary background on quantum computing will be covered, in addition to the methods used to achieve our results.

Biography

Justin Yirka is an undergraduate student at VCU pursuing a B.S. in Computer Science and a B.S. in Mathematical Sciences. He is currently funded by a VCU Presidential Scholarship, and is a member of the Honors College. Justin has been a URA in the VCU Quantum Computing Lab under Dr. Sevag Gharibian since Spring 2015. Previously, Justin completed a research project evaluating the data overhead of the Transmission Control Protocol, awarded Best Poster at the 2015 VCU Symposium for Undergraduate Research and accepted for the 2016 National Conference on Undergraduate Research. Justin plans to graduate in Spring 2018 and to pursue a graduate degree in Computer Science thereafter, in a research area yet to be determined.

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