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THE CHINESE UNIVERSITY OF HONG KONG
Institute of Network Coding
and
Department of Information Engineering
Seminar

The Quantum Entropy Cone of Stabilizer States

by

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Date : 22 August 2013 (Thursday)
Time : 11:00 am - 12:00 pm
Venue: Room 833, Ho Sin Hang Engineering Building
The Chinese University of Hong Kong

Abstract

It is now well-known that entropy vectors for classical multi-party systems satisfy inequalities beyond the the well-known Shannon inequalities. Since the discovery of the first non-Shannon inequality by Yeung and Zhang for 4-party systems, many additional inequalities have been found. However, the existence of analogous non-standard inequalities for entropy vectors for quantum systems, using the von Neumann entropy, remains a challenging open question.

However, for a special class of states known as stabilizer states, we can completely characterize the 4-party entropy cone. Its closure is the cone obtained by adding the Ingleton inequality to the standard inequalities of strong subadditivity and weak monotonicity. The Ingelton inequality is the simplest linear rank inequality. Although this is the only linear rank inequality for 4-party systems, many infinite families of linear rank inequalities have been obtained for larger n-party systems. We also show that stabilizer states satisfy all linear rank inequalities which can be obtained using common information.

The key result is based on the fact that stabilizer states are simultaneous eigenstates of subgroups of stabilizer groups, which were introduced in connection with the construction of quantum error correction codes. This allows us to make a connection between the inequalities satisfied by stabilizer states and the work of Chan and Yeung connecting groups and entropy inequalities.

Based on joint work with N. Linden, F. Matus and A. Winter

Biography

Mary Beth Ruskai received an MA in mathematics and PhD in physical chemistry from the University of Wisconsin in 1969. Her postdoctoral positions included a year at MIT with Elliott Lieb in 1971-72 which led to their proof of the strong subadditivity of quantum entropy. From 1977 to 2002 she was a Professor at the University of Massachusetts Lowell. Since 2003 she has been a Research Professor at Tufts University and is now also an Associate Member of the Institute for Quantum Computing in Waterloo. Her numerous visiting positions include appointments at the University de Geneva, the Rockefeller University, the University of Vienna, The Bunting Institute, the Courant Institute of Mathematical Sciences, Case Western Reserve University, the University of Michigan, and Georgia Tech. She has participated in programs on Quantum Information Theory at MSRI in Berkeley, the Fields Institute in Toronto, the Institute for Theoretical Physics at UCSB and the Mittag-Leffler Institute in Stockholm (for which she was the chief scientific organizer in 2010). She has participated in and co-organized many shorter workshops. She serves an Associate Editor of Communications in Mathematical Physics and the Journal of Mathematical Physics. She has published over 70 papers in refereed journals.

****ALL ARE WELCOME ****

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