YUMING ZHAO, University of Waterloo

An operator-algebraic formulation of self-testing

We give a new definition of self-testing for quantum correlations in terms of states on C^*-algebras. We show that this definition is equivalent to the standard definition for any class of finite-dimensional quantum models which is closed under submodels and direct sums, provided that the correlation is extreme and has a full-rank model in the class. This last condition automatically holds for the class of POVM quantum models, but does not necessarily hold for the class of projective models by a result of Mančinska and Kaniewski. For extreme binary correlations and for extreme synchronous correlations, we show that any self-test for projective models is also a self-test for all POVM models. The question of whether there is a self-test for projective models which is not a self-test for POVM models remains open.

An advantage of our new definition is that it extends naturally to commuting operator models. We show that an extreme correlation is a self-test for finite-dimensional quantum models if and only if it is a self-test for finite-dimensional commuting operator models, and also observe that many know finite-dimensional self-tests are in fact self-tests for infinite-dimensional commuting operator models.

Joint work with Connor Paddock, William Slofstra, and Yangchen Zhou