PEIXUE WU, Syracuse University

Classical communication over quantum channels: does entanglement help?

A fundamental question in quantum information theory is whether entangling the inputs across multiple uses of a quantum channel can increase the rate at which it transmits classical information. An old conjecture dating back nearly three decades ago asserted that it cannot. In 2009, Hastings dis proved this conjecture by proving that there exist channels for which entangled inputs strictly increase the communication rate. His argument, however, is probabilistic: it shows that suitably chosen random channels exhibit this effect, but it does not identify any specific one. In this talk, I will discuss how to construct an explicit construction of a channel with such an entanglement advantage. On the other hand, we show that for phase-covariant and all qubit-to-qubit channels, there is no entanglement advantage.