Traversable Wormholes as Quantum Channels, or Quantum Channels as Traversable Wormholes?

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NOTE: Unfortunately, I am not able to be present for the last day of the conference. If possible, may I please request a slot on one of the earlier days? Thank you for your consideration.

Abstract

In the context of AdS/CFT, a wormhole which connects two asymptotically AdS regions can be rendered traversable by acting with a correlated deformation in both boundary CFTs [1]. This deformation sources a null energy condition-violating shock in the bulk which opens up the wormhole throat, and the subsequent transmission of information through the wormhole was argued to correspond to teleportation across the CFTs [2]. More generally, the traversable wormhole in AdS can be understood as a bipartite unitary channel across the two CFTs, where features of the bulk space-time correspond to parameters of the channel [3]. It is at least (if not more) exciting, however, to go in the other direction and characterize information-theoretic aspects of bipartite unitary channels geometrically. To this end, I will describe how to obtain a bound on such channels' entanglement capacities which would be completely unapparent without the space-time picture. I will also give a geometric explanation of what constrains the ability of such channels to function as partial entanglement witnesses.

References

[1] P. Gao, D. L. Jafferis and A. Wall, JHEP **1712**, 151 (2017) [arXiv:1608.05687].

[2] J. Maldacena, D. Stanford and Z. Yang, Fortsch. Phys. **65**, no. 5, 1700034 (2017) [arXiv:1704.05333].

[3] N. Bao, A. Chatwin-Davies, J. Pollack and G. N. Remmen, JHEP **1811**, 071 (2018) [arXiv:1808.05963].

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