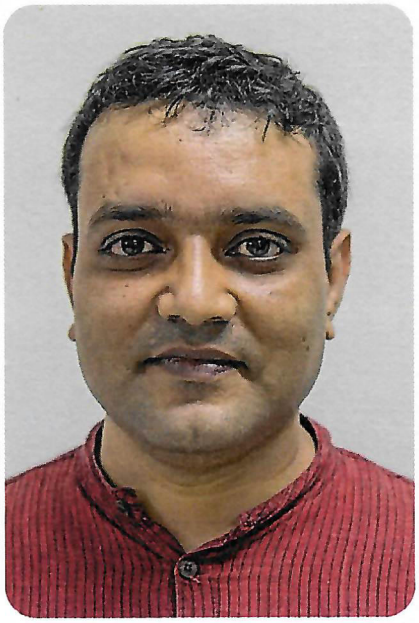
Non-Local and Quantum Advantages in Network Coding for Multiple Access Channels



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PAMU Seminar Room, ISI

Devising reliable communication with a high rate in a network consisting of multiple transmitters and receivers is a problem of importance in communication theory. Interestingly, resources like nonlocal quantum correlations have been shown to be useful in enhancing the performance of some communication networks. In this talk, we present our results on entanglement-assisted communication over classical network channels. We consider multiple access channels, an essential building block for many complex networks, and develop a framework for n-senders and 1-receiver multiple access channels based on nonlocal games. We obtain generic results for computing correlation assisted sum-capacities of these channels. The considered channels introduce less noise on winning and more noise on losing the game, and the correlation assistance is classified as local (L), quantum (Q), or no-signaling (NS). Furthermore, we consider a broad class of multiple access channels such as depolarizing ones that admix a uniform noise with some probability and prove general results on their sum-capacities. Finally, we apply our analysis to three specific depolarizing multiple access channels based on Clauser-Horne-Shimony-Holt, magic square, and Mermin-GHZ nonlocal games. In all three cases we find enhancements in sum-capacities on using nonlocal correlations. We obtain either exact expressions for sum-capacities or suitable upper and lower bounds on them.

Reference: Jiyoung Yun, Ashutosh Rai, Joonwoo Bae, Non-Local and Quantum Advantages in Network Coding for Multiple Access Channels, arXiv:2304.10792 [quant-ph] (2023).

Everyone is invited to attend

Santanu K. Maity, 10/07/23

Head, PAMU