

On Binary Codes and Non-Interactive Simulation

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Abstract: Given a pair of i.i.d. sequences (X^n, Y^n) , what are the possible joint distributions of random variables (U, V) such that $U \rightarrow X^n \rightarrow Y^n \rightarrow V$ forms a Markov chain? This problem is termed non-interactive simulation of random variables. In this talk, we leverage proof techniques in coding theory and Fourier analysis to derive new bounds for the non-interactive simulation problem. Previous bounds in the literature were derived by applying data processing inequalities concerning maximal correlation or hypercontractivity. We show that our bounds are sharp in some regimes, and are also tighter than the existing ones in some other regimes. As by-products of our analyses, various new properties of the average distance and distance enumerator of binary block codes are established. Finally, by using an existing hypercontractivity bound for non-interactive simulation, a new bound on the average distance is derived.