Source Coding Problems with Conditionally Less Noisy Side Information

Abstract:
A computable expression for Heegard and Berger’s rate-distortion function has eluded information theory for nearly three decades. Heegard and Berger’s single-letter achievability bound is well known to be optimal for physically degraded side information; however, it is not known whether the bound is optimal for arbitrarily correlated side information (general discrete memoryless sources). In this paper, we consider a new setup where the side information at one receiver is conditionally less noisy than that at the other. The new setup includes degraded side information as a special case, and it is motivated by the literature on degraded and less noisy broadcast channels. Our key contribution is a converse proving the optimality of Heegard and Berger’s achievability bound in a new setting, where the side information is conditionally less noisy and one distortion function is deterministic. The less noisy setup is also generalized to two different successive-refinement problems.