Title:
Universal Denoising for the Finite-Input-General-Output Channel

Author(s):
Amir Dembo and Tsachy Weissman

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Abstract:

We consider the problem of reconstructing a finite-alphabet signal corrupted by a known memoryless channel with a general output alphabet. The goodness of the reconstruction is measured by a given loss function. We (constructively) establish the existence of a universal (sequence of) denoiser(s) attaining asymptotically the optimum distribution-dependent performance for any stationary source that may be generating the noiseless signal. We show, in fact, that there is a whole family of denoiser sequences with this property. These schemes are shown to be universal also in a semi-stochastic setting, where the only randomness assumed is that associated with the channel noise. The scheme is practical, with complexity $O(n^{1+})$ (for any > 0) and working storage size sub-linear in the input data length. This extends recent work that presented a discrete universal denoiser for recovering a discrete source corrupted by a DMC.