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A Universal Prediction Lemma and Applications to Universal Data Compression and Prediction

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ABSTRACT

A universal prediction lemma is derived for the class of prediction algorithms that only make inferences about the conditional distribution of an unknown random process based on what has been observed in the training data.

The lemma is then used to derive lower bounds on the efficiency of a number of universal prediction and data compression algorithms. These bounds are non-asymptotic in the sense that they express the effect of limited training data on the efficiency of universal prediction and universal data compression.