Online Learning with Non-Identical Sampling Processes

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Online learning is an important family of algorithms in learning theory and widely used for many practical applications. Its main advantage is the low complexity of computation. Here we consider online algorithms based on kernel methods and conduct error analysis by approximation in reproducing kernel spaces.

Classical learning is often done in the setting that the samples are drawn independently from an identical distribution (i.i.d). Such conditions are always not satisfied for real situations. Here we study the online learning algorithms with samples independently drawn from a non-identical sequence of probability distributions. Error bounds are given in terms of the approximation properties of target functions and the parameters of the learning algorithms.

We also consider online learning by Gaussians. The variance of a Gaussian kernel is a measurement of the frequency range of function components or features retrieved by learning algorithms induced by The Gaussian. The learning ability and approximation power increase when the variance of the Gaussian decreases. Thus it is natural to use Gaussians with decreasing variances for online algorithms when samples are imposed one by one.