



# Horizon-Independent Optimal Prediction with Log-Loss in Exponential Families

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We study online learning under logarithmic loss with regular parametric models. Hedayati and Bartlett (2012b) showed that a Bayesian prediction strategy with Jeffreys prior and sequential normalized maximum likelihood (SNML) coincide and are optimal if and only if the latter is exchangeable, and if and only if the optimal strategy can be calculated without knowing the time horizon in advance. They put forward the question what families have exchangeable SNML strategies. This paper fully answers this open problem for one-dimensional exponential families. The exchangeability can happen only for three classes of natural exponential family distributions, namely the Gaussian, Gamma, and the Tweedie exponential family of order 3/2.

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