ASYMPTOTICALLY MINIMAX PREDICTION FOR MARKOV SOURCES

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ABSTRACT

We argue the problem of sequential prediction by the Jeffreys mixture for Markov sources with finite alphabet. For memoryless case, slight modification of the Jeffreys mixture was shown to be asymptotically minimax with respect to logarithmic cumulative regret. For the case of binary alphabet 0,1, it yields Laplace like rule (k+1/2)/(n+1), where n is the length of the given sequence and k is the number of occurrences of '1' in it. It is extended to the case of Finite State Machine (FSM; a certain kind of Markov model), where the Jeffreys prior contains stationary probabilities and differs from the Dirichlet prior. As a result, the prediction rule is not the form of (k+alpha)/(n+beta) and strict computation is not easy. In this talk, we explain this situation and further discuss the case of the parametric model defined by a context tree. We also report results of numerical experiments using an approximation formula of Jeffreys rule and the Monte Carlo method. This talk is based on joint works with Andrew Barron and Tsutomu Kawabata.