
Curse of Markovian Memory in Recursive Algorithms

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Résumé

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Theory and application of stochastic approximation (SA) has grown within the control systems community since the earliest days of adaptive control.

This paper takes a new look at the topic, motivated by recent results establishing remarkable performance of SA with (sufficiently small) constant step-size $\alpha > 0$. *If averaging is implemented to obtain the final parameter estimate, the*

This paper obtains very different conclusions in the more common case of geometrically ergodic Markovian disturbance :

(i) The target bias is identified, even in the case of non-linear SA, and is in general non-zero. The remaining results are established

(ii) the bivariate parameter – disturbance process is geometrically ergodic in a topological sense;

(iii) the representation for bias has a simpler form in this case, and cannot be expected to be zero if there is multiplicative noise;

(iv) the asymptotic covariance of the averaged parameters is within $O(\alpha)$ of optimal. The error term is identified, and may be removed by learning.

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