Statistics > Methodology

Approximate group context tree: applications to dynamic programming and dynamic choice models

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(Submitted on 1 Jul 2011)

The paper considers a variable length Markov chain model associated with a group of stationary processes that share the same context tree but potentially different conditional probabilities. We propose a new model selection and estimation method, develop oracle inequalities and model selection properties for the estimator. These results also provide conditions under which the use of the group structure can lead to improvements in the overall estimation.
Our work is also motivated by two methodological applications: discrete stochastic dynamic programming and dynamic discrete choice models. We analyze the uniform estimation of the value function for dynamic programming and the uniform estimation of average dynamic marginal effects for dynamic discrete choice models accounting for possible imperfect model selection.
We also derive the typical behavior of our estimator when applied to polynomially β-mixing stochastic processes. For parametric models, we derive uniform rate of convergence for the estimation error of conditional probabilities and perfect model selection results. For chains of infinite order with complete connections, we obtain explicit uniform rates of convergence on the estimation of conditional probabilities, which have an explicit dependence on the processes' continuity rates.
Finally, we investigate the empirical performance of the proposed method in simulations and we apply this approach to account for possible heterogeneity across different years in a linguistic application.

Subjects: **Methodology (stat.ME)**; Statistics Theory (math.ST)
Cite as: **arXiv:1107.0312 [stat.ME]**
(or **arXiv:1107.0312v1 [stat.ME]** for this version)

Submission history

From: Alexandre Belloni [view email]
[v1] Fri, 1 Jul 2011 19:57:21 GMT (64kb)

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