Adaptive efficient estimation for generalized semi-Markov big data models

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Abstract

In this paper we study generalized semi-Markov high dimension regression models in continuous time, observed at fixed discrete time moments. The generalized semi-Markov process has dependent jumps and, therefore, it is an extension of the semi-Markov regression introduced in Barbu et al. (Stat Inference Stoch Process 22:187–231, 2019a). For such models we consider estimation problems in nonparametric setting. To this end, we develop model selection procedures for which sharp non-asymptotic oracle inequalities for the robust risks are obtained. Moreover, we give constructive sufficient conditions which provide through the obtained oracle inequalities the adaptive robust efficiency property in the minimax sense. It should be noted also that, for these results, we do not use neither sparse conditions nor the parameter dimension in the model. As examples, regression models constructed through spherical symmetric noise impulses and truncated fractional Poisson processes are considered. Numerical Monte-Carlo simulations confirming the theoretical results are given in the supplementary materials.

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