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Model selection for the robust efficient signal processing observed with small Lévy noise

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Abstract

We develop a new model selection method for an adaptive robust efficient nonparametric signal estimation observed with impulse noise which is defined by a general non-Gaussian Lévy process. On the basis of the developed method, we construct estimation procedures which are analyzed in two settings: in non-asymptotic and in asymptotic ones. For the first time for such models, we show non-asymptotic sharp oracle inequalities for quadratic and robust risks, i.e., we show that the constructed procedures are optimal in the sense of sharp oracle inequalities. Next, by making use of the obtained oracle inequalities, we provide an asymptotic efficiency property for the developed estimation methods in an adaptive setting when the signal/noise ratio goes to infinity. We apply the developed model selection methods for the signal number detection problem in multi-path information transmission.

Keywords Model selection · Non-asymptotic estimation · Robust estimation · Oracle inequalities · Efficient estimation · Statistical signal processing techniques and analysis

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