E. A. Pchelintsev, S. M. Pergamenshchikov (TSU, Tomsk, Russia). **Sequential change-point detection for Markov chains.**[1] We consider a change-point detection problem in Markov process $(X_n)_{n\geq 0}$. We assume that the disruption occurs at some integer $\nu \geq 0$, i.e. the random variables $(X_n)_{0\leq n\leq \nu}$ and $(X_n)_{n\geq \nu+1}$ are homogeneous Markov chain with a transition densities $f^*(y|x)$ and $f(y|x)$ respectively. Let the change-point ν is an integer random variable with the values in $\mathcal{I}_N = \{0, \ldots, N\}$ and independent on the observations $(X_n)_{n\geq 1}$. We use the uniform prior distribution, i.e. $\pi_i = \mathbf{P}(\nu = i) = (N+1)^{-1}$ for $0 \leq i \leq N$. Bayesian probability measure on the σ - field $\mathcal{I}_N \otimes \mathcal{B}_\infty$ defined as

$$\widetilde{\mathbf{P}}(I \times A) = \sum_{i\in I} \pi_i \mathbf{P}_i(A) \tag{1}$$

for any $I \subseteq \mathcal{I}_N$ and $A \in \mathcal{B}_\infty$. Let $\mathcal{M}_\alpha$ be the set of all stopping times τ with values in $\mathcal{I}_N$ for which $\widetilde{\mathbf{P}}(\tau < \nu) \leq \alpha$. For any $\lambda > 0$ we define the disruption moment in the following form

$$\tau^*_\lambda = \min\left\{k \geq 0 :\, Q^{N-k}_\lambda(g)(R_k, X_k) = R_k\right\}\,, \tag{2}$$

where the mapping Q and Roberts – Shiryaev statistics R are defined in [1].

Theorem. There exist $0 < \lambda_\alpha < \infty$ such that $\tau^*_{\lambda_\alpha} \in \mathcal{M}_\alpha$ for $0 \leq \alpha \leq 1$ and the stopping time (2) with $\lambda = \lambda_\alpha$ is optimal, i.e.

$$\widetilde{\mathbf{E}}(\tau^*_{\lambda_\alpha} - \nu)_+ = \inf_{\tau\in\mathcal{M}_\alpha} \widetilde{\mathbf{E}}(\tau - \nu)_+\,. \tag{3}$$

REFERENCES

[1] E.A. Pchelintsev, S.M. Pergamenshchikov, R.O. Tenzin. Non-asymptotic sequential change-point detection for Markov chains with applications in the epidemic statistical analysis // Preprint.- 2022.- URL:https://hal.science/hal-03871920 (accepted in Sequential Analysis).

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