V.V. Ulyanov (HSE University and Lomonosov MSU). Non-Asymptotic Analysis of Short Asymptotic Expansions for Integer-valued Sums with Applications.

Let $X_1, \dots, X_n$ be independent random variables with finite moments of the fourth order. Put $S_n = X_1 + \dots + X_n$ with mean $\mu = \mathbf{E}S_n$ and variance $\sigma^2 = \mathbf{Var}S_n$. For $i = 3, 4$, let $L_i = \sigma^{-3} \sum_{k=1}^n \mathbf{E}(X_k - \mathbf{E}X_k)^i$ be Lyapunov's ratious of the third and fourth orders resp. Given an integer-valued random variable ξ with characteristic function $v(t) = \mathbf{E}\, e^{it\xi}$ $(t \in \mathbf{R})$, put $\mathrm{V}(\xi) = -\sup_{0<t<2\pi}(\ln|v(t)|/(1-\cos t))$. The talk is based on the paper: Bobkov S.G. and Ulyanov V.V. *The Chebyshev–Edgeworth Correction in the Central Limit Theorem for Integer-Valued Independent Summands,* Theory Probab. Appl., 2022, v.66, no.4, pp. 537–549, where the following theorem is proved:

Theorem. *Let the integer-valued random variables $X_1, \dots, X_n$ be independent and have finite 4-th moments. Then we have with some absolute constant $c > 0$*

$$\sup_{k\in\mathbf{Z}} \left| \mathbf{P}\{S_n \le k\} - \Phi_3\left(\frac{k + 1/2 - \mu}{\sigma}\right) \right| \le \frac{c\sigma^2}{\mathrm{V}}\, L_4,$$

where $\mathrm{V} = \sum_{k=1}^n \mathrm{V}(X_k)$ *and*

$$\Phi_3(x) = \Phi(x) - \frac{L_3}{6}(x^2 - 1)\varphi(x), \qquad x \in \mathbf{R},$$

with $\Phi(x)$ and $\varphi(x)$ as the standard normal distribution function and its density function resp.

The application of the Theorem to the problem of approximation to the distribution of k-series is discussed also, see details in Su Z., Ulyanov V.V. and Wang X. *On approximation of sums of locally dependent random variables via perturbations of Stein operator,* Theory Probab.Appl., 2025, v.70, no.1, pp. 24–36.