

НАЦИОНАЛЕН СЕМИНАР ПО СТОХАСТИКА

секция „Изследване на операциите, вероятности и статистика“

Поредната сбирка на *Националния семинар по стохастика* ще се проведе на **20 октомври 2026 г.** (вторник) от **14:00** часа в зала **503** на ИМИ-БАН. Доклад на тема:

"Product of Spacings Estimation: Applications in Step-Stress Testing and Finite Mixture Models "

ще изнесе **Николай И. Николов** (ИМИ-БАН, секция ИОВС).

Abstract: The maximum product of spacings (MPS) technique has proven to be a powerful alternative to the maximum likelihood (ML) method for estimating unknown lifetime and mixture parameters. It is particularly useful when regularity conditions are violated or standard estimators fail under small sample sizes. This talk considers the extension of the MPS framework across two distinct statistical applications: step-stress accelerated life testing (SSALT) and finite distribution mixtures.

The adaptation of the MPS approach for simple SSALT is investigated under different censoring schemes. Specifically, the framework is applied to the tampered failure rate model with Weibull distributed lifetimes. Within this SSALT setup, the MPS and ML estimators are shown to be asymptotically equivalent under adjusted regularity conditions. While the conventional ML technique fails to produce finite parameter estimations when a certain stress level has no failures, the adjusted MPS estimators exist with high probability, offering a robust alternative for finite samples and poorly designed experiments.

The parameter estimation problem is further considered for a Beta-Uniform mixture model, which finds application in analyzing unadjusted p-values for large-scale multiple comparisons. To reduce the computational complexity of solving the associated non-linear systems, a generalization of the expectation-maximization (EM) algorithm based on the minorize-maximize method is introduced for the numerical derivation of the MPS estimators. Simulation analysis and real data examples confirm that the MPS approach produces more robust estimations compared to the classical ML technique and the method of moments.