



# 北京理工大学

## 数学与统计学院学术报告

# Large Deviations for Multivariate Heavy-Tailed Hawkes Processes

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**时间:** 2025.4.10 上午10:00-11:30

**地点:** 文萃楼E409

**摘要:** Hawkes processes capture the amplification and cascade effects of risks across space and time that prevail in various scientific, engineering, and business contexts. This talk develops sample path large deviations for multivariate Hawkes processes with power-law heavy tails in the offspring distributions. Our results address sufficiently general rare event sets by revealing the most likely configurations of (multiple) large clusters that could trigger the target events. These results also lay the foundation for precise theoretical insights and efficient rare event simulation in practical systems subject to clustering and mutually exciting risks. Our proof hinges on several technical developments. First, we provide a detailed probabilistic analysis of the spatiotemporal structure of large jumps in multi-type branching processes, which helps reveal the hidden regular variation in the tail behavior of Hawkes process clusters. Next, we establish the asymptotic equivalence between a suitably scaled multivariate Hawkes process and a coupled Lévy process with multivariate hidden regular variation. Along the way, we derive a sample path large deviations principle for such Lévy processes, which is of independent interest given the importance of Lévy models and the prevalence of hidden regular variation.

**报告人简介:** 汪星宇, 阿姆斯特丹大学数量经济学系的博士后, 于美国西北大学获得博士学位。研究内容包括应用概率、机器学习和随机模拟等, 2022 年获得西北大学Nemhauser 最佳论文奖和 2023 年获得George Nicholson竞赛 (INFORMS) 第二名。