



深圳北理莫斯科大学

УНИВЕРСИТЕТ МГУ-ППИ В ШЭНЬЧЖЭНЕ

SHENZHEN MSU-BIT UNIVERSITY

# 应用数学讲座

Научный Семинар по Прикладной Математике  
Research Seminar on Applied Mathematics

## 应用数学报告（75）

报告人 / Докладчик / Speaker: 杨叙 副教授（北方民族大学）

题目 / Название / Title: A general continuous-state nonlinear branching process

时间 / Время / Time: 10 Feb. 2023, 8:00-12:00

地点 / Место / Venue: 腾讯会议: 140-462-177

摘要 / Аннотация / Abstract:

we consider the unique nonnegative solution to the following generalized version of the stochastic differential equation for a continuous-state branching process:

$$X_t = x + \int_0^t \gamma_0(X_s) ds + \int_0^t \int_0^\infty \gamma_1(X_{s-}) W(ds, du) \\ + \int_0^t \int_0^\infty \int_0^\infty \gamma_2(X_{s-}) z \tilde{N}(ds, dz, du),$$

where  $W(dt, du)$  and  $N(ds, dz, du)$  denote a Gaussian white noise and an independent spectrally positive Poisson random measure, respectively, and  $\gamma_0, \gamma_1$  and  $\gamma_2$  are functions on  $\mathbb{R}^+$  with both  $\gamma_1$  and  $\gamma_2$  taking nonnegative values. Intuitively, this process can be identified as a continuous-state branching process with population-size-dependent branching rates and with competition. Using martingale techniques we find rather sharp conditions on extinction, explosion and coming down from infinity behaviors of the process. Some Foster–Lyapunov-type criteria are also developed for such a process. More explicit results are obtained when  $\gamma_i, i = 0, 1, 2$  are power functions.