

AIPHA/LIAM WEEKLY SEMINAR

Presented by : Xiaodan Ding

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Title : Global stability of a reaction-diffusion equation with Gamma-Ricker nonlinearity and double delays

Time : 11:00 AM–12:00 PM, Friday, October 23, 2026

Location : Room 277, LIAM Lab, Kinsmen Building



Abstract

We study a reaction-diffusion model for tick population dynamics subject to homogeneous Neumann boundary conditions and incorporating two distinct constant time delays. We introduce a Gamma-Ricker type growth function. A central analytical difficulty lies in the sublinear case, where the lack of smoothness of the nonlinearity prevents the direct application of standard regularity and stability techniques. To address this challenge, we develop a novel approach that combines model-specific differential inequality, maximum principle arguments, and dynamical systems techniques. Within this framework, we establish new criteria ensuring the global asymptotic stability of the positive steady state. Our results recover, as a special case, all known sharp stability conditions for the linear case and, more importantly, resolve a longstanding open problem for nonsmooth sublinear reproduction functions. These findings significantly advance the theoretical understanding of delayed diffusive population models with nonsmooth nonlinearities and offer new insights into the long-term behavior of tick population dynamics.

About The Speaker

Xiaodan Ding is a PhD candidate at Changsha University of Science and Technology. She has been a visiting PhD student at York University since November 29, 2025, for a one-year research stay. Her research focuses on differential equations and dynamical systems, with a particular interest in delayed reaction-diffusion equations for tick population dynamics. Her work includes stability analysis and the theory of traveling wave solutions for such models.