AIPHA/LIAM WEEKLY SEMINAR

Presented by : **Xin Feng**
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Title : **Harvest-Induced Overcompensation and Hydra Effects: Linking Discrete-Time and Continuous-Time Population Models**

Time : 11:00 AM–12:00 PM, Friday, November 6, 2026

Location : Room 277, LIAM Lab, Kinsmen Building

Abstract

The hydra effect occurs when increased mortality, such as harvesting, leads to an increase in equilibrium population size. In this talk, we investigate this response in one-dimensional population models incorporating harvest-induced overcompensation. Starting from discrete-time models in which harvesting precedes density-dependent growth, we derive continuous-time approximations that capture the reduction in intraspecific competition through a harvest-dependent effective carrying capacity. We compare the discrete-time and continuous-time formulations in terms of positive equilibria, local stability, and threshold conditions for hydra effects.

The results reveal closely related equilibrium structures, with identical or corresponding conditions for increased equilibrium population size in several cases. Our analysis further demonstrates that overcompensation alone does not guarantee a hydra effect: the compensatory feedback must exceed a threshold at which the indirect benefit of reduced density dependence outweighs the direct loss caused by harvesting.

Finally, we fit the resulting dose–response curves to representative datasets exhibiting inverted U-shaped responses. These fits illustrate the ability of the models to describe nonmonotonic responses associated with hydra and hormetic effects.

About The Speaker

Xin Feng is a Ph.D. student at the School of Mathematics and Statistics, Shaanxi Normal University. Since December 2025, he has been conducting research as a visiting Ph.D. student at York University.

His research focuses on mathematical population dynamics, particularly the hydra effect, hormesis, and overcompensation. His work also includes stability and bifurcation analysis and harvesting models.

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