AIPHA/LIAM WEEKLY SEMINAR

Presented by : **Shun Zhi**
Ph.D. Student, Guangzhou University



Title : **Turing patterns induced by cross-diffusion in a predator-prey model with Smith-type prey growth and additive predation effects**

Time : 11:00 AM–12:00 PM, Friday, November 13, 2026

Location : Room 277, LIAM Lab, Kinsmen Building

Abstract

We investigate a two-dimensional predator–prey model that incorporates self- and cross-diffusion, Smith-type prey growth and additive predation effects. By linearizing about the unique positive homogeneous steady state, we obtain exact criteria for the onset of Turing instability. These criteria reveal that when the prey density at the homogeneous steady state falls into a certain interval, strong predator cross-diffusion destabilizes the homogeneous state.

Using the predator cross-diffusion coefficient as the bifurcation parameter, we derive the corresponding amplitude equations and, for these equations, establish sharp, explicit conditions that guarantee the existence and stability of steady-state patterns. Numerical simulations corroborate the analytical predictions and demonstrate that the prey distribution can develop a rich variety of Turing patterns, such as spots, stripes, holes, and their hybrids, depending on the strength of predator cross-diffusion.

About The Speaker

Shun Zhi is a Ph.D. student in Applied Mathematics at Guangzhou University. Since September 2026, he has been furthering his research as a visiting Ph.D. student at York University.
His research is primarily focused on reaction-diffusion systems for population dynamics.

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