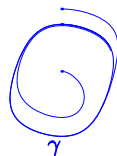
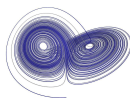
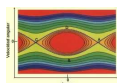


Seminario del Grupo GISDA

Grupo de Investigación en
Sistemas Dinámicos y Aplicaciones

A second-order nonstandard finite difference scheme for eco-epidemiological predator-prey models



Expositor: Juan Barajas-Calonge (Doctorante)

Institución: Universidad del Bío-Bío

Fecha: Miércoles 3 de Septiembre, 2025.

Horario: 16:00 a 17:00 hrs.

Lugar: Sala de seminarios.

Abstract: In this talk, we construct a dynamically consistent second-order nonstandard finite difference (NSFD) scheme to numerically solve a generalized eco-epidemiological predator-prey model. We prove that the proposed scheme preserves some essential qualitative features of the generalized model. These features are equilibrium points, stability, and positivity of populations, which are satisfied regardless of the time step size, i.e., the method is unconditionally stable, making this scheme a very attractive numerical method. The design of the scheme relies on the usual nonlocal approximation of the right-hand side function while the nonstandard denominator functions are defined depending not only on the time step size but also on the state variables. We prove that the NSFD scheme is convergent with the desired order. The proposed methodology can be used to design other second-order NSFD numerical schemes for other mathematical models similar to the prey-predator model presented in this talk. Finally, we present numerical examples that support the mathematical analysis and show the advantages of the constructed NSFD schemes.