WANYUE TANG, Western University, Lanzhou University
High-Codimension Bifurcation Analysis of a Predator-Prey System with Fear Effects

In this talk, we present a predator-prey model incorporating the fear effect and apply bifurcation theory to investigate higher-codimension Bogdanov-Takens (BT) and Hopf bifurcations. We demonstrate that multiple types of higher-codimension BT bifurcations can arise, including codimension-2, -3, and -4 cusp bifurcations, codimension-3 focus (elliptic) bifurcations, and other codimension-4 bifurcation types. Explicit conditions for the onset of these bifurcations are derived. In addition, we conduct a Hopf bifurcation analysis and employ normal-form theory to compute focus values up to the sixth order. Nevertheless, an exhaustive numerical search reveals that the generalized Hopf bifurcation is of codimension three, indicating that at most three limit cycles can bifurcate from the Hopf critical point associated with an equilibrium point. [This is joint work with Dr. Pei Yu.]