Predator-prey with distributed delay: insights and challenges

Abstract:
Predator-prey models with Holling type I functional response and discrete delay incorporated have been studied in various excellent papers and are quite well known. However, to make such models more realistic the next logical step is to consider that in real life delays are rarely of the same length all the time, but rather follow a distribution.

In our study we have considered systems with distributed delays and studied the dynamics using bifurcation analysis. The point of interest is how different would the resulting dynamics be across various distributions and does it compare to similar model with discrete delay? We would be interested to know what is the set of characteristics across parameter space and distributions that will result in the model exhibiting similar dynamics. Local stability analysis shows that systems with various distributions of delay share quite a few properties with each other and with discrete delay system. The most interesting aspect of predator-prey models is the dynamics of sustained population of both predator and prey. Due to tractability issues these dynamics are hard to establish theoretically. Therefore, we employed numerical bifurcation tools such as DDEBif and XPP AUTO software to study the local and global dynamics around coexistence equilibrium and to establish conditions upon which the behavior of solutions across the systems with various distributions are similar to each other and comparable to the solutions of the system with the discrete delay.

All Faculty, staff, students and guests are welcome to attend
Light refreshments will be provided