

How to Control the World: Optimizing Native-Invasive Population Dynamics



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Location: AB7 220

Friday, November 16, 10:30-11:30 am

Abstract:

Mathematics can help us decide what choices to make when managing the world around us - whether the issue is in the environment, manufacturing, engineering or a wide variety of other fields.

This talk we will look at a competition model between two species where ecological disturbance is the control variable. The original inspiration for this problem came from observing cottonwood-tamarisk population dynamics in the American southwest. Flooding, fire, or other periodic disturbance can be critical to the life cycle of native species (especially plants); without it, invasive non-native species have an opportunity to displace established ones. A question, then, is whether the restoration of disturbance can restore a native plant as the dominant species - preferably without excessive economic damage to human development.

The basic model is a system of differential equations. The functional that we want to optimize balances economic impact against the desire to maximize the native population. The control is constrained so that disturbance can not exist outside of limited time frames that occur periodically. Numerical results are presented for several different combinations of parameters.