**Department of Mathematics and Statistics Colloquium**

# Boolean Approximations of Differential Equations Models in Biology that Capture Bistability

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Abstract: Boolean network (BN) and finite dynamical system (FDS) models of complex biological interactions have recently emerged as viable companions to differential equations models. Unlike differential equations models, FDS models do not require detailed knowledge and information about the reaction kinetics of the biological interactions. Instead, FDS provide "coarse-grained" approximations of the system's dynamics and are qualitative in nature. This makes them better suited for the modeling of large biological networks, where many important details about the individual interactions and reactions may be unknown. However, it is not immediately clear whether such models are capable of capturing the multi-stability behavior exhibited by many biological systems, a feature that would generally depend on the specific values of the model parameters. The talk will present some background on BN and FDS models, then use examples from biology to construct BN approximations of differential equations models. We will use the lactose (lac) operon in E. coli and the spruce budworm outbreaks in a forest as examples to show that BN models can capture the bistable behavior of those systems.

**Monday, September 28 at 3:45 in Roop 103**

**refreshments at 3:30**