

# Identifying Switching Behavior and Bifurcations in Interaction Networks

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## Abstract

DSGRN is a computational framework that allows for a mathematically justifiable, rigorous screening of potential network designs for a wide variety of dynamical behaviors. In previous work, Gameiro et.al. showed that network models can be screened for hysteresis, a prerequisite for robust bistable switches. Using the DSGRN database to search across parameter space for monostable  $\rightarrow$  bistable  $\rightarrow$  monostable behavior yields a qualitative match to more traditional ODE methods at a much reduced computational cost.

In this talk we discuss sheaf-theoretic methods to perform a more accurate screening for hysteresis. These methods also provide for the detection of cusp bifurcations (as well as other higher codimension bifurcations) that organize hysteretic behavior and allow for the control of switching behavior.

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