

Spectral Graph Theory and New Stability Measures for Deterministic Gene Regulatory Networks

Fusun Akman¹ and Devin Akman²

1: Illinois State University

2: University of Illinois at Urbana-Champaign

Abstract

We analyze the deterministic Boolean dynamics of a generic GRN with n genes by studying the asymmetric adjacency matrix of its phase space consisting of 2^n states, and obtain exact formulas for many parameters of the GRN, including the number and sizes of its attractors using spectral graph theory techniques. We also introduce new stability measures with respect to stochastic perturbations and investigate the effects of canalizing Boolean update functions with simulations.