

Application for KRMP 2018-2019

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Project start date: September 2018, **Project end date:** June 30, 2019

Title of project: How much information is lost when reducing a Boolean network to its most powerful nodes?

Abstract: We use entropy measures, in particular the Determinative Power of nodes in a Boolean network to find the amount of information lost when reducing the network to a subnetwork. This provides an estimation of how a smaller subnetwork faithfully represents the full network. The analysis will be done for a collection of networks that follow diverse topologies and types of Boolean rules. First, we determine the total amount of information held in the parent networks and the corresponding subnetworks. The subnetworks are obtained eliminating nodes one by one in the increasing order of their Determinative Power. Then we create a ratio of entropy measures for each subnetwork and its parent network. We analyze statistically the impact of removing nodes by involving Monte Carlo simulations to mitigate the effect of the initial state of the network.

Purposes of the project:

1. Identify the best procedure for reducing a Boolean network to a subnetwork.
2. Define the statistical approach for quantifying the loss of information upon network reduction.
3. Select the most relevant types of topologies and dynamical rules governing the dynamics of the network.
4. Prepare Matlab codes for simulations and data collection.
5. Run codes and collect data. Generate graphical representations.
6. Collect data for all network simulations.
7. Analyze the data and the results involving both numerical and analytical approaches.
8. Write the KRMP report.

Timetable:

Month	Purpose items
September 2018-January 2019	1, 2, 3, 4, 5
January - March 2018	4,5,6
April - May 2018	6, 7, 8
June 2018	8
July 2018-forward	Preparing paper for publication.