

# Analyzing Nonlinear Dynamical Systems with Many Parameters

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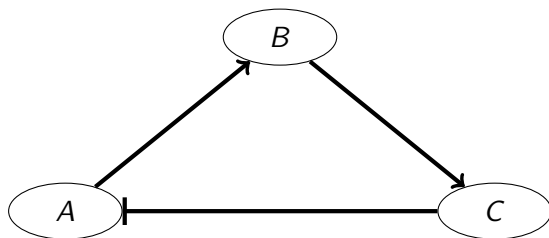
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# Regulatory Networks

Collection of species (DNA, RNA, proteins)



Dynamics of the system depend on parameters e.g.

- How much does  $A$  affect  $B$ ?
- How much of  $A$  is needed to have an effect?
- How sensitive is the response to the amount of  $A$ ?

We care about how different parameters may give different behaviors. However, the number of parameters can grow very large, which can make it difficult or impossible to analyze the dynamics.

## My Mentors' Work

My mentors have developed methods and software that allow for a more efficient way to understand the overall dynamics of these kinds of biological systems.

Can create a coarser model by simplifying parameters, which can:

- Reduce the total number of parameters
- Make the model more "discrete" to allow for better computational techniques
- Allow the use of certain algebraic tools

# My Project

The questions I will be exploring this summer:

How can the same techniques be used to create a general purpose tool for studying any nonlinear dynamical system with few variables and many parameters? How can we make sure this is efficient?

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