# Mathematics Faculty Search

## Mathematical Biology

Candidate interview for
assistant professor

## Alan Veliz-Cuba

### University of Nebraska

*https://sites.google.com/site/alanvelizcuba/*

Veliz-Cuba is a postdoc in the Department of Mathematics at Unversity of Nebraska-Lincoln.

Research interests include mathematical biology, systems biology, discrete mathematics, dynamical systems theory, boolean networks and REUs.

Veliz-Cuba is interested in using and developing algebraic tools (algebraic geometry, Boolean algebra, combinatorics, graph theory, symbolic computation) to study problems arising in systems biology; he is also interested in the relationship between discrete and continuous dynamical systems. In particular, he is interested in modeling biological systems such as gene regulatory networks and study how the network topology constrains the dynamics. This is a key factor in understanding systems biology, because such systems are robust to changes in the parameters and it has been hypothesized that the cause of this robustness is that the topology of the network determines the qualitative features of the dynamics. He is also interested in how biology can contribute to mathematics, by generating new kind of problems, providing a unique perspective to study them and guiding the direction of research in pure and applied mathematics.

**IOWA STATE UNIVERSITY**



## TEACHING DEMO

**401 Carver**
**Friday, March 2 at 9:00**

## HOSPITALITY

**404 Carver**
**Friday, March 2 at 2:45 p.m.**

## COLLOQUIUM

**298 Carver**
**Friday, March 2 at 3:10 p.m.**

## *An algebraic approach to reverse engineering discrete and continuous models of biological systems*

Discrete models have been used successfully in modeling biological systems such as gene regulatory networks. When certain regulation mechanisms are unknown it is important to be able to identify the best model with the available data. In this context, reverse engineering of discrete dynamical systems from partial information is an important problem. We will present a framework and algorithm to reverse-engineer the possible wiring diagrams of a discrete model from data. The algorithm consists on using an ideal of polynomials to encode all possible wiring diagrams, and choose those that are minimal using the primary decomposition. We will also show that these results can be applied to reverse-engineer continuous models.