I am Kexue Zhang, an Assistant Professor in the Department of Mathematics and Statistics at Queen's University.

My research interests are primarily in applied mathematics, with a particular focus on the theory and applications of systems and control. I am also interested in dynamic equations on time scales.

Hybrid Systems and Control

Feedback control is a mechanism that utilizes system information derived from measurements as a feedback signal to achieve the desired performance of a control system. A specific type of feedback control, known as event-triggered control, offers an efficient approach to updating the feedback control signal at a sequence of discrete time moments. These moments are determined by specific events that occur only when the measurement of system states exceeds a pre-defined threshold. The advantage of this control paradigm is its ability to enhance the efficiency of control implementations while still ensuring the desired performance levels of the system. This research focuses on event-triggered control issues for hybrid systems, which are dynamic systems exhibiting both continuous and discrete behaviors. Additionally, it extends to other control methods, such as self-triggered control, sampled-data control, impulsive control, and hybrid control, with applications in areas such as distributed optimization, robotic control, and disease control.

Time-Delay Systems on Time Scales

The prevalence of time delays in various physical processes has led to the application of functional differential equations across multiple fields. As a result, the theory of time-delay differential equations has garnered significant interest. Similarly, time-delay difference equations are employed to model various real-world phenomena. From a mathematical modeling perspective, it is more accurate to represent dynamic processes through dynamic equations on hybrid time domains encompassing continuous and discrete time, known as time scales. The theory of time scales was first introduced by Stefan Hilger in 1988 as a means to unify continuous and discrete analysis. This research focuses on the qualitative analysis and control challenges of time-delay systems on time scales.