

# On the Structure and Complexity of Finite Computations

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**Abstract.** One of the most fundamental concepts of science and computation is the notion of change: a system goes from a state to another state due to external manipulations or due to internal processes at various time-scales. If we allow continuous change, then we need to use calculus. If the state set is discrete, then algebraic automata theory, or more precisely semigroup theory, is the right tool. Semigroups provide a 'calculus of events', a general model of computation.

What is computable with  $n$  states? What is the complexity of a computational structure? What are the basic building blocks of semigroups? How they are put together? - these are the leading questions in our research in computational semigroup theory. In this talk, we will summarize our recent progress and describe how answering these questions will also help understanding complex systems.