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Title: Computability and Dynamical Systems

Abstract:
In this presentation, we discuss the link between dynamical systems and computation theory. First, we introduce the concept of dynamical systems via real world examples from biology and physics. We then consider this class of systems in terms of control theory, focusing on the problem of observability. Next, we show how they can be used to simulate Turing Machines (by encoding the tape, state, and transitions) and use results on the decidability of the Halting Problem and Mortality Problem to show that observability is undecidable. Finally, we consider evolution rules for dynamical systems and show that convergence is also undecidable given standard string mutation operators.