**Paper summary**

This paper serves as the introduction to a special issue of the journal \*Chaos\*, dedicated to exploring new paradigms of computation that go beyond traditional digital systems. The authors argue that the limitations of Moore’s Law—the observation that computing power doubles roughly every two years—are becoming increasingly apparent due to physical and economic constraints. As a result, they advocate for a shift in focus toward \*intrinsic computation\*, which examines how natural systems like brains, weather patterns, or biological networks inherently process information without being explicitly designed to do so. By contrast, \*designed computation\* refers to human-engineered systems like conventional computers. The paper emphasizes the need to bridge these two concepts to develop more efficient, adaptable, and powerful computing technologies.

The authors highlight the potential of nonlinear and chaotic dynamical systems as substrates for computation. Unlike digital systems, which rely on binary logic, these systems can exploit their inherent complexity to perform computations in novel ways. For example, "chaogates"—logic gates that leverage chaotic dynamics—can be reconfigured on the fly to perform different functions, offering flexibility and efficiency. The issue also explores quantum computing, biological networks, and other unconventional approaches, all unified by the goal of understanding how information is processed in diverse systems. The paper underscores the interdisciplinary nature of this research, drawing on insights from physics, biology, computer science, and mathematics.

Historically, the foundations of this work trace back to pioneers like Kolmogorov, Shannon, and Wiener, who laid the groundwork for information theory, cybernetics, and chaos theory. The paper revisits their contributions while highlighting modern advances that make this an opportune moment to revisit these ideas. Key challenges include developing metrics to quantify computational power in dynamical systems and creating frameworks to compare their performance with traditional computers. The authors envision future applications such as energy-efficient processors, brain-inspired AI, and systems capable of self-organization and adaptation.

Ultimately, the paper frames this research as both a scientific and technological imperative. By studying how nature computes, researchers can unlock new possibilities for engineering and understanding complex systems. The special issue brings together theoretical and experimental work to push the boundaries of computation, offering a roadmap for future innovation. The authors conclude by calling for collaboration across disciplines to overcome existing roadblocks and usher in a new era of computing that transcends the limitations of the digital paradigm.