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Albantakis, L. Automata and Animats: From Dynamics to Cause-Effect Structures (2017)

en Imari Walker, S. (ed), 2017, From Matter to Life - Information and Causality

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in Chapter 14 by Albantakis and Tononi, who consider the distinction between 'being' and 'happening', utilising cellular automata (CA) as a case study. Most prior work on dynamical systems, including CA, focuses on what is 'happening' - the dynamical trajectory of the system through its state space - that is, they take an extrinsic perspective on what is observed. Often, complexity is characterised using statistical methods and information theory. In a shift of focus to that of causal architecture, Albantakis and Tononi consider what the system 'is' from its own intrinsic perspective, utilising the machinery of integrated information theory (IIT), and demonstrate that intrinsic (causal) complexity (as quantified by integrated information Φ in IIT) correlates well with dynamical (statistical) complexity in the examples discussed. These and similar approaches could provide a path forward for a deeper understanding of the connection between causation and information as hinted at in the beginning of this chapter.

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