A COMPUTATIONAL APPROACH TO HIERARCHICAL EMERGENCE

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The functional architecture of complex systems is crucial for understanding their inner workings and enabling effective methods for their prediction and control. In this talk, I will introduce a computational approach to characterise emergent macroscopic processes in terms of how they express self-contained informational, interventional, and computational properties. This framework reveals functional architecture in the form of a hierarchy of nested self-contained processes, which determines what computations take place at what level. I will illustrate this approach on paradigmatic models from statistical physics and computational neuroscience, and will present an application to study the capabilities and internal representations of AI agents.

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