Emulation, Reduction, and Emergence in Dynamical Systems

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Abstract

The received view about emergence and reduction is that they are incompatible categories. I argue in this paper that, contrary to the received view, emergence and reduction can hold together. To support this thesis, I focus attention on dynamical systems and, on the basis of a general representation theorem, I argue that, as far as these systems are concerned, the emulation relationship is sufficient for reduction (intuitively, a dynamical system DS1 emulates a second dynamical system DS2 when DS1 exactly reproduces the whole dynamics of DS2). This representational view of reduction, contrary to the standard deductivist one, is compatible with the existence of structural properties of the reduced system that are not also properties of the reducing one. Therefore, under this view, by no means are reduction and emergence incompatible categories but, rather, complementary ones.

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