

# Recurrent Misconceptions of Computation

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## Abstract

Computationalism, the view that mental states are computational states, has been rejected by various subcommunities in cognitive science in the recent past, from dynamicists who view brains as intrinsically dynamical systems, to proponents of an embodied and situated view of cognition that emphasizes the interactions of brains and the bodies they control as well as the intrinsic embeddedness of cognitive systems in their environments. The major line of attack advanced by dynamicists, criticizes the “non-dynamical nature” of computational systems. Specifically, van Gelder (1998) has argued that what is essential to computation is the notion of an effective procedure, and essential to that is the notion of discrete steps in an algorithm. He claims that this discreteness, in both its temporal and non-temporal aspects, prevents computation from explaining many aspects of cognition, which he considers to be fundamentally dynamical phenomena. Another attack, also advanced by dynamicists, challenges the role of representation in cognitive science in general, and a fortiori can be seen as a challenge to the role of computation in cognitive science. Especially psychologists have argued that certain allegedly “cognitive” tasks have nothing to do with cognition proper, but are really motor control tasks that can be explained and modeled in the language of dynamical system without resorting to manipulations of representations (e.g., see Thelen and Smith, 1994). Other criticisms come from philosophers who, for example, argued that mental states are relationally individuated (Putnam, 1975), while computational states are not (Fodor, 1981), from which it is concluded that computation cannot explain mentality (Putnam, 1988, Fodor, 1994). Another line of attack is pursued by those who argue that computations are arbitrarily attributable to physical objects (Putnam 1988, Searle 1992), while mentality is not. While the different critiques of computationalism vary, they share a common theme: computation fails as an explanatory notion for mind, because computation necessarily neglects the real-time, embodied, real-world constraints with which cognitive systems intrinsically cope.