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Author

Noelle, David

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Toward a Simulation Platform for Comparing Computational Cognitive Neuroscience Models

David Noelle

University of California, Merced

Abstract: While computational cognitive models serve many purposes, perhaps their primary utility is in formalizing specific hypotheses in order to facilitate evaluation in light of empirical results. Such evaluations are inherently relative, comparing the explanatory power of proposed models to alternatives. Direct comparisons are hindered, however, when competing hypotheses are framed within different cognitive architectures, as the contributions of non-focal aspects of those architectures cannot necessarily be yoked. In order to help address this problem, a novel computational framework for model comparison is proposed, grounded in gross neuroanatomy. This framework supports the hierarchical specification of connections between brain systems, producing computational architectures based on neuroscientific data. This approach shifts from modeling particular cognitive processes, which might differ across cognitive architectures, to modeling established brain systems, for which there may be greater consensus. The framework supports the direct comparison of models of a given system by fixing the function of other systems.