

Markov blankets: Realism and our ontological commitments

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Abstract

The authors argue that their target is orthogonal to the realism and instrumentalist debate. I argue that it is born directly from it. While the distinction is helpful in illuminating how some ontological commitments demand a theory of implementation, it's less clear whether different views cleanly map onto the epistemic and metaphysical uses defined in the paper.

Bruineberg and colleagues argue there is a conflation between two uses of Markov blankets. Some use Markov blankets in an epistemic way while others use them to make ontological claims about the physical world. To solve this conflation, they propose that we should classify the former as Pearl blankets and the latter as Friston blankets. While this strategy provides a helpful labeling scheme for different uses, a need for a distinction of this kind is indicative of a more substantial problem. Thus, solving this conflation targets a symptom of a broader problem rather than targeting what is at issue in the first place. The authors note that their discussion is orthogonal to the realism and instrumentalism debate in cognitive science, but I argue that their distinction is better understood as a case study born directly from this debate. Computational models play different roles in our scientific theories. We can understand them as purely formal, or we can take them as literally representing physical systems. But, regardless of our position, we need to say something about how our formal, non-physical models relate to the concrete, physical world.

Pearl blankets are Markov blankets used in the formal sense while Friston blankets are taken to be or to genuinely represent concrete boundaries. This distinction rests on how scientists use Markov blankets in their theorizing. But distinguishing between uses leads to a question of how we should frame the difference between Pearl and Friston blankets as scientific posits, not just how they are used within a theory. We could understand the distinction most straightforwardly as delineating between the formal and the physical. One way to cash this out is by thinking about Markov blankets at either the algorithmic level or the implementation level within the Marrian framework. Pearl blankets are purely formal models at the algorithmic level deployed irrespective of the nuts and bolts of the physical system while Friston blankets are implementations of Markov blankets themselves. Because realism proposes that our best scientific theories provide us with knowledge of the objective world – which ontologically commits us to the entities they posit – Markov blankets understood at the implementation level are a bona fide example of a realist position while Markov blankets understood at the algorithmic level and deployed in the Pearl sense demonstrate an instrumentalist position. Because of this, the distinction is not orthogonal to the realism and instrumentalist debate: it's a case study within it.

The authors argue that Friston users have an additional explanatory task because we can't simply read our ontology off of the mathematics. What is needed is an explanation of how a formal construct can be understood in a such metaphysically laden way. This is exactly correct: To complete the theory an account of implementation is required. What is needed for proper reification is an account that maps the formal mathematical model to the boundaries of the physical world. While it is still an open question how we should formulate the implementation relation, there are some views that could be adopted. One approach is to argue that there must be some resemblance between the model and the target system such that some specified features are necessarily consistent between the two (Curtis-Trudel, 2021). Resemblance may help to alleviate some conceptual issues regarding irregular boundaries. Another viable option comes from Bogacz (2015). Bogacz proposes a theory of implementation that maps different elements of the model onto different neural populations within the cortex where the mapping between the variables in the model and the elements of the neural circuitry may not be “clean” but rather “messy” (Bogacz, p. 209). Different views will map the formal computation onto the physical world in different ways, but what is important is that the relation between the formal model and the physical world is accounted for.

One worry, though, is that the distinction between Pearl blankets and Friston blankets is overly restrictive. There are additional ways to understand how Markov blankets are used over and above the Pearl and Friston senses. For example, one might be a realist without being committed to physical implementation: It is possible to have ontological commitments to mathematical entities at Marr's algorithmic level without ontologically committing oneself to implementation level features. Scientific realism proposes that we are ontologically committed to the existence of the posits that do explanatory work in our best scientific theories. Depending on your view of explanation, non-causal, formal properties can play a robust explanatory role that meets the criterion for scientific realism (Williams & Drayson, forthcoming). This goes beyond the epistemic use and stops just short of the metaphysical use blurring the distinction between Pearl and Friston blankets by neglecting to carve out space for a mathematical ontology. If one can hold ontological commitments about formal entities, do they also have an additional explanatory debt? Do they now count as Friston blankets? Because you can have ontological commitments at both the formal and physical levels, the distinction between Pearl and Friston uses blurs and additional explanatory requirements become unclear.

Different uses of Markov blankets provide a case study within the instrumentalism and realism debate in cognitive science. Some accept the formal model as an epistemic tool while others use the formal model to make ontological claims. As with all formal models, for proper reification, some account of implementation is needed. But, once the distinction is considered within the context of the realism and instrumentalism debate in which it belongs, it become unclear that the distinction is able to do the work that it sets out to do in the first place because it fails to leave room for additional ways in which one can take on a realist stance about formal models.

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