Artificial Intelligence and Category Theory

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Previous work on transactional systems such as databases, information systems and music, had identified the topos as the data structure of choice with cartesian products and the monad as the computational unit, rolling the process forwards and backwards. Neural net systems cannot be handled by this approach as the data structures are tensor products involving more complex data vectors. Such data structures are represented by monoidal categories, best treated as 2-categories to handle the extra level in the data structure. A monad is still appropriate for handling the processing between the layers of the neural net but will now be in the form of a 2-monad to accommodate the extra level. The whole is now a 3-category with (arrows between arrows) between (arrows between arrows) as the activity in a neural net. It may be possible to combine our earlier approach using the topos with the current neural net work by introducing the concept of a monoidal topos where the cartesian product is augmented by an additional tensor product.