

Neurosymbolic AI : combining Data and Knowledge

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Abstract:

The focus in AI today is very much on using just data for learning, but one should not learn what one already knows. The challenge therefore is to use the available knowledge to guide and constrain the learning, and to reason with the resulting models in a trustworthy manner. This requires the integration of symbolic AI with machine learning, which is the focus of neurosymbolic AI, often touted as the next wave in AI.

I will argue that Neurosymbolic AI = Logic + Probability + Neural Networks. This will allow me to specify a high-level recipe for incorporating background knowledge into any neural network approach. The recipe starts from neural networks, interprets them at the symbol level by viewing them as “neural predicates” (or relations) and adding logical knowledge layers on top of them. The glue is provided by a probabilistic interpretation of the logic. Probability is interpreted broadly, it connects also to fuzzy logics, and it provides the quantitative differentiable component necessary to connect the symbolic and subsymbolic levels.

Finally, I will show how the recipe and its ingredients can be used to develop a neurosymbolic AI machine.