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Brain-Like Cognitive Engineering Systems

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Abstract:

Technology scaling and advancing device technologies have played a major role in making computational engines continuously more efficient. Yet that efficiency is still a couple of orders of magnitude away from what the human brain is capable of. Bridging that gap using traditional models and techniques is becoming increasingly harder due to implicit limitations and/or bounds in the devices, architectures and computational paradigms.

The main question to ask is if computational techniques inspired by our current understanding of how the brain functions could help to overcome some if not most of these limitations. In this presentation we will explore a number of the properties of the brain function, and how these can/may map into the emerging nanotechnologies. Just to name a few: approximate pattern-based computation; close intertwining of logic and memory; 3D integration; learning-based programming model; sparsity and function-specific mapping. These observations will be illustrated with concrete examples.