Technical Report

Modular, Hierarchical, and Geometrical Neural Networks

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Abstract

In order to apply neural networks to large scale, real world tasks, several obstacles have to be overcome. One main deficiency is long learning time. A closer look at the brain reveals that the topology of the brain is considerably different from current neural network models. We show that modular and hierarchical toplogies (also common in the brain) offer a potential solution to speed up learning. To build modular and hierarchical network topologies, knowledge from "conventional" pattern recognition, can be used. In particular the relationship between image pyramids and hierarchical neural networks is investigated. Another major difference between current neural networks and brains is the spatial location of neurons, whereas units in neural networks have no spatial location. To bridge this gap, algorithms for spatial location assignment and learning of spatial locations are discussed.