

Multi-layer Cellular Neural Networks: Deep and Shallow Architectures

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摘 要：

Allowing computers to model our world well enough to exhibit what we call intelligence has been the focus of more than half a century of research. To achieve this, it is clear that a large quantity of information about our world should somehow be stored, explicitly or implicitly, in the computer. Because it seems daunting to formalize manually all that information in a form that computers can use to answer questions and generalize to new contexts, many researchers have turned to learning algorithms to capture a large fraction of that information. Much progress has been made to understand and improve learning algorithms, but the challenge of artificial intelligence (AI) remains. Multi-layer cellular neural networks is introduced for the purpose of mimicking human brains and is widely studied in many aspects.

This presentation focuses on the mathematical foundation for multi-layer cellular neural networks. Due to the learning algorithm and training processing of the networks, the investigation of the so-called mosaic solutions is most essential. The mosaic solution space forms a sofic space in classical symbolic dynamical systems. The topological entropy, zeta function, and Hausdorff dimension are computed to describe the complexity of the mosaic solution space. Furthermore, the influence of the boundary conditions are elucidated.