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Abstract

Alzheimer's disease as the most case of dementia has become a critical challenge for the healthcare system in the 21st century. Between 2000 and 2018 deaths from Alzheimer's increased 146.2% and the economic and healthcare system are influenced by expensive costs for addressing this disease. Therefore, early diagnosis of the disease is of high importance, and utilizing computer systems and artificial intelligence is advantageous. So far, many studies on the diagnosis of this disease using structural magnetic resonance imaging based on two-dimensional and three-dimensional convolutional neural network approaches have been performed and valuable results have been obtained. Although the power of deep artificial neural networks has increased dramatically in recent years, the need for large amounts of data as well as the high energy consumption of these models remains challenging. To overcome these challenges, spiking neural networks with neuroscience-based processes have been introduced. In this thesis, we develop a model of convolutional spiking neural network embedding a biologically based reinforcement learning law using structural magnetic resonance imaging to diagnose Alzheimer's disease. The results show that the computational model of the convolutional spiking neural network performs well in diagnosing disease based on structural magnetic resonance imaging. Also, compared to artificial neural network models, this method requires fewer data and has a lower computational cost.