Linear Leakage: Better Robustness for Spiking Neural Network

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(Pt9)Abstract—**As the third-generation neural networks, Spiking Neural Networks (SNNs) have the potential to replace ANNs in noisy input scenarios due to the advantages of low power consumption and high robustness. In this paper, we propose a method that uses linear leakage on Leaky-integrate-fire (LIF) neurons of direct training of SNNs. First, this paper provides an in-depth analysis of the process of integrating and firing spikes on LIF neurons based on the linear leakage method, and finally demonstrates the inverse relationship between the leakage parameters τ_m and spiking rate (1/T) in linear leakage. Second, this paper designs experiments on the application of the linear leakage method to three different network models based on MNIST and Cifar10 datasets. The experimental results show that the linear leakage method in this paper has stronger robustness compared to the no-leakage and exponential leakage approaches. This finding provides a new idea with practical significance for the further study of LIF models of SNNs.**

(Pt9)Keyword—**Spiking neural networks, Spatio-temporal backpropagation, Leaky-integrate-fire neuron, Robustness, Noise attacks**

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