MSAT: Multi-stage adaptive threshold for Deep Spiking Neural Networks

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ABSTRACT

Spiking Neural Networks(SNNs) can do inference with low-power consumption natively because of its spike sparsity. Compared with the other two traning method: STDP and BP, Conversion from Artifical Neural Networks(ANNs), is a more easlier way to acheive deep SNNs and commly have the approximate performance compared with ANN. However, Conversion SNNs suffer from a accuracy degration and more latency at inference time. Lots of studys have tryed to make a trade-off between improving accuracy and reduce the latency using varied method including adjust ANN topology when mapping ANN to SNN, using a more efficient fring mechanism et.al Here we analyze conversion loss layer-to-layer and point it out that membrane potential matters in both SNN accuracy and inference latency. Acutally, we give a new perspective that most of current conversion method is optimization membrane potential to achieve higher accuracy and short latency. Meanwhile, Different from current converson schemes which use the same threshold in a layer and invary with inference time, we propose a multi-stage adaptive threshold for deep spiking neural Networks. We examine the performance on Classifiction on CIFAR-10 and Objection detection on VOC and COCO to valid our Biological interpretability.

Keywords: Spiking Neural Network(SNN), Conversion, Multi-stage adaptive threshold, Objection detection, deep SNNs

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3 METHODOLOGY

3.1 New Perspective on Conversion Loss

3.2 Multi-stage adaptive threshold

3.2.1 Level 3

3.2.1.1 Level 4

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