Spiking Neural Networks

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April 7, 2022

Abstract

Use of Deep Neural Network, commonly referred to as *deep learning* spiked in recent years and has been used as a tool for impressive advancements in the field of *Artificial Intelligence (AI)* Spiking Neural Networks draw inspiration from the Purpose of this project is to demonstrate the capabilities of a Spiking Neural Network and compare it to a more conventional Object Recognition Deep Neural Network

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1 Architecture of the Spiking Neural Network

When it comes to building a neural network, one has to establish an architecture or an arrangement of layers and how they connect with each other. It is particularly important, when the network increases in complexity. Object classification + localization being a demanding task for a network to solve, we have adopted a published and well-tested architecture for the task – ResNet.

1.1 ResNet

ResNet is named for its property, where convolutional layers of the network are residually connected with each other using shortcut connections (He, Zhang, Ren, and Sun (2015)). According to the authors of the original paper on ResNets, addition of residual connections improves model's convergence, or ability for model's loss to move towards a minimum with a decreasing trend. Meanwhile, ResNets converge faster than their plain counterparts, the complexity of ResNets is much lower than complexity of well established Visual Geometry Group (VGG) Networks given the same depth (3.6 billion FLOPs (Float Point Operations) vs. 19.6 billion FLOPs) (He et al. (2015)).

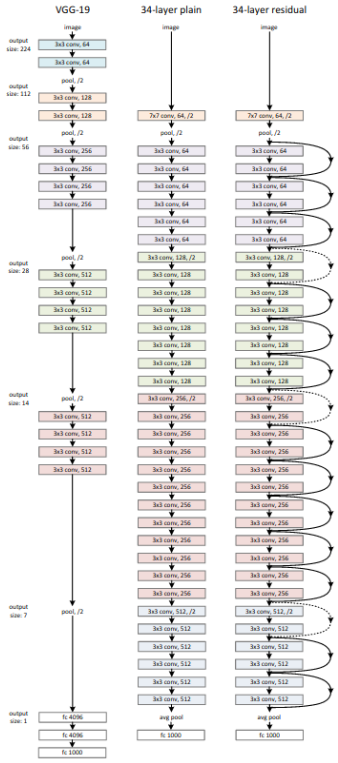

Figure 1: Architectures of VGG/Plain Network/ResNet

References

He, K., Zhang, X., Ren, S., & Sun, J. (2015). *Deep residual learning for image recognition.* arXiv. Retrieved from `https://arxiv.org/abs/1512.03385` doi: 10.48550/ARXIV.1512.03385