

CONFERENCE PAPER PROPOSAL

An Analysis of Neural Network Pruning in Relation to the Lottery Ticket Hypothesis

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February 26, 2020

Abstract

This paper aims to analyze the novel “lottery ticket” approach for pruning neural networks and compare it to traditional techniques on dense feed-forward neural networks by the means of identifying winning tickets. We explore the precise conditions required to identify and make use of these winning tickets and see how and whether they concur with contemporary research hypotheses as well as our own.

Keywords — neural networks, lottery ticket hypothesis, network pruning, network compression, architecture search

Field of research: neural networks in representation learning

Research question: What does the lottery ticket hypothesis imply and can we verify its validity?

Expected results: Insights into the pruning process of randomly-initialized dense feed-forward neural networks in relation to the *lottery ticket hypothesis*.

1 INTRODUCTION

Neural network pruning refers to the process of removing weights from (dense) neural networks that are perceived to be least important to the network’s performance, with the goal of improving efficiency in terms of energy and memory consumption. In the context of pruning such dense, randomly-initialized, feed-forward neural networks, the *lottery ticket hypothesis* was quite recently proposed by Frankle and Carbin. This hypothesis points out that such networks develop sub-regions of well-initialized random weights in some successful structure, referred to as a *winning ticket*. As opposed to traditional pruning approaches, this *winning ticket* network is retrained on its own with the original random weights before training. In traditional pruning methods, weights are removed without retraining the resulting network. Frankle and Carbin motivate their theory with experimental finding which serve as evidence in favor of their conjecture as to how will this perform when the sub networks are randomly reinitialized. In their experiments, they deem that the weights are more important for the winning tickets along with the structure. In different neural network training scenerio’s however, other people have conducted experiments with seemingly contradictory results. For example, Liu et al. recently conducted and published experiments that “suggest that the value of automatic structured pruning algorithms sometimes lie in identifying efficient structures and performing implicit architecture search, rather than selecting ‘important’ weights.”

2 OUR WORK

In our research paper, we further explore the findings of Frankle and Carbin. We investigate the lottery winning ticket hypothesis in greater detail and its implications on the network pruning and training. We attempt to identify the precise conditions and the parameters under which the lottery tickets can be found. We also examine how it performs in different types of neural networks and on what types of datasets and assess their performance. We then compare the experiments performed by Frankle and Carbin regarding the winning ticket conjecture with the findings of Liu et al. and estimate whether the conjecture may hold true.