APPLICATION OF OPTIMIZATION TECHNIQUES TO IMPROVE MACHINE LEARNING SYSTEMS

Machine learning is one of the rapidly developing fields, which has led to numerous theoretical breakthroughs and is one of the very few techniques which finds application in various fields. Machine Learning has been one of the key areas attracting many researches taking it as a vital research directions, to deploy the techniques in various fields such as Machine Translation, Speech Recognition, Image Recognition, Recommendation System etc.,

Optimization strategies has recently become the integral part of Machine Learning, drawing the attention of researchers across the industries. It is evident that with the exponential growth of data and the increasing complexity of models have paved the way for diverse optimization techniques to improvise the Machine Learning Algorithms. The essence of most machine learning algorithms is to build an optimization model and learn the parameters in the objective function from the given data[1].

Most of the machine learning problems are much more flexible that, once formulated, can be solved as optimization problems, thereby increasing the probability of finding solutions for more critical challenges. Still, applying optimization in the fields of deep neural network, reinforcement learning, meta learning, variational inference and Markov chain Monte Carlo witness different difficulties and challenges. As it is known that the optimization methods pertaining to specific machine learning fields are distinct and complex at times, this as inspiring vertical to research for a more generic optimization methods.

Deep Neural Networks (DNNs) have shown great success in pattern recognition and machine learning. There are two very popular NNs, i.e., convolutional neural networks (CNNs) [2] and recurrent neural networks (RNNs), which play important roles in various fields of machine learning. CNNs are feed forward neural networks with convolution calculation. CNNs have been successfully used in many fields such as image processing [3], video processing [4] and natural language processing (NLP) [5]. NNs are a kind of sequential model and very active in NLP [6],. Besides, RNNs are also popular in the fields of image processing [7] and video processing [8]. In the field of constrained optimization, RNNs can achieve excellent results [9], [10]. In these

works, the parameters of weights in RNNs can be learned by analytical methods, and these methods can find the optimal solution according to the trajectory of the state solution.

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