

I.E. Livieris and P. Pintelas, A survey on algorithms for training artificial neural networks, Technical Report 08-01, Department of Mathematics, University of Patras, 2008.

Abstract - Literature review corroborates that artificial neural networks are being successfully applied in a variety of regression and classification problems. Due of their ability to exploit the tolerance for imprecision and uncertainty in real-world problems and their robustness and parallelism, artificial neural networks have been increasingly used in many applications. It is well-known that the procedure of training a neural network is highly consistent with unconstrained optimization theory and many attempts have been made to speed up this process. In particular, various algorithms motivated from numerical optimization theory have been applied for accelerating neural network training. Moreover, commonly known heuristics approaches such as momentum or variable learning rate lead to a significant improvement. In this technical report we compare the performance of classical gradient descent methods and examine the effect of incorporating into them a variable learning rate and an adaptive nonmonotone strategy. We perform a large scale study on the behavior of the presented algorithms and identify their possible advantages. Additionally, we propose two modifications of two well-known second order algorithms aiming to overcome the limitations of the original methods.