An Efficient Optimum Size Determination of Artificial Neural Network for Satellite Image Classification

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Abstract:

The determination of the optimum size of an artificial neural network (ANN) is one of the most important steps in making the use of ANN for a wide range of applications practical. In general terms, smaller network learns faster and generalize better than its bigger counterpart. However, it has difficulty in learning when presented with huge and more complicated information. On the other hand, larger ANN requires longer training time but is very reliable in processing large and complex data set. Recent approaches in determining the optimum size of ANN require the "trial and error" method involving several training runs, making the process time consuming and impractical. This research focuses on the development of an efficient and practical method of ANN optimum size determination. The procedure involves the identification of the large ANN active units at the early stage of training. In this method, it is assumed that the optimum ANN size is related to the number of ANN active units. The size of the ANN is adjusted, based on the proportion of the active and less active units in the network, at the early stage of training. The size adjustment involves the removal of neurons in the middle layer. The procedure involves one training run, avoiding the series of re-trainings implemented using the conventional methods. Training is also faster because most of the values of the active ANN units are retained after the size adjustment. The developed method is tested using the data from satellite images in northern Japan. The results showed that trained ANN using the developed method is more efficient and accurate compared to ANN with unadjusted size.