Associative Neural Network

An associative neural network (ASNN) is a combination of an ensemble of the feed-forward neural networks and the K-nearest neighbor technique. The introduced network uses correlation between ensemble responses as a measure of distance among the analyzed cases for the nearest neighbor technique and provides an improved prediction by the bias correction of the neural network ensemble both for function approximation and classification. Actually, the proposed method corrects a bias of a global model for a considered data case by analyzing the biases of its nearest neighbors determined in the space of calculated models. An associative neural network has a memory that can coincide with the training set. If new data become available the network can provide a reasonable approximation of such data without a need to retrain the neural network ensemble.

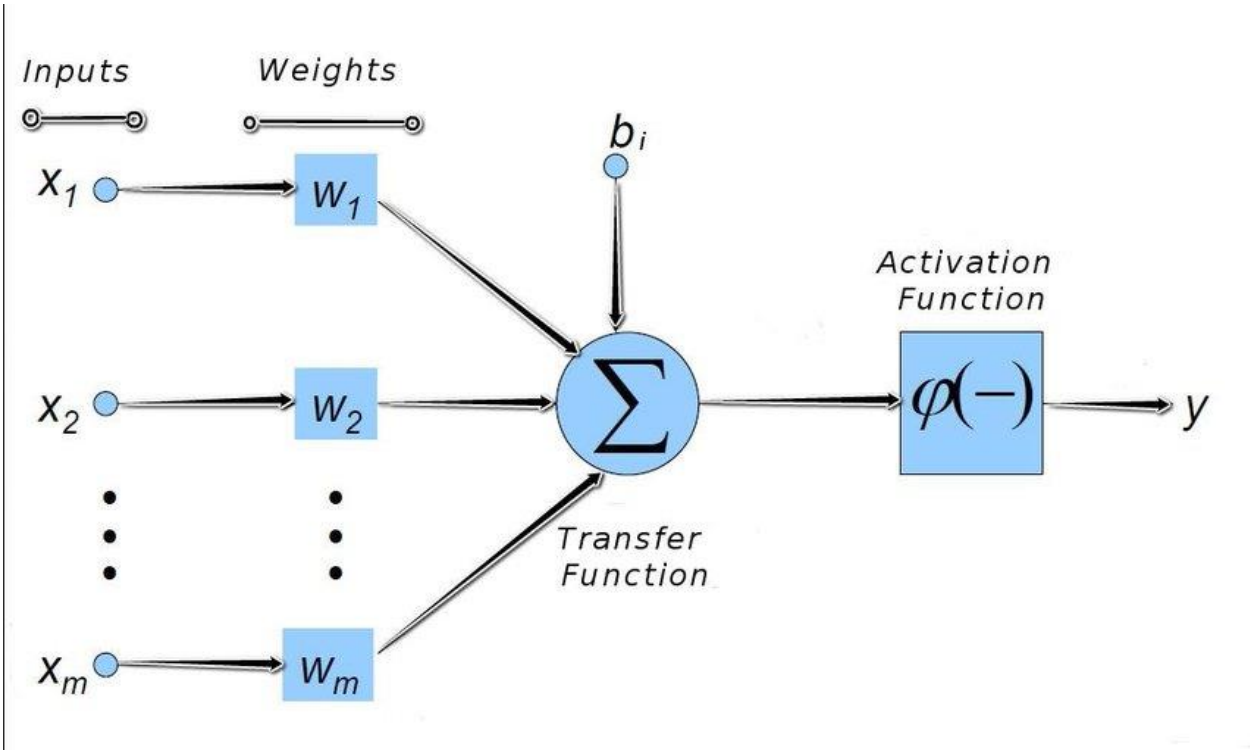
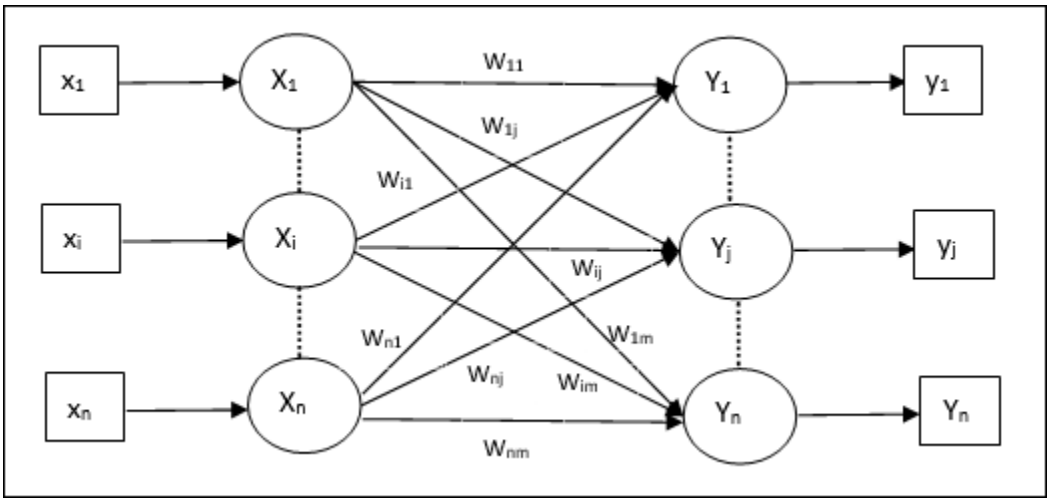


Fig. KNN network

The traditional multi-layer neural network (MLP) is a memory-less approach. This means that after training is complete all information about the input patterns is stored in the neural network weights and input data are no longer needed, i.e. there is no explicit storage of any presented example in the system complicated, there is

no guarantee that all details of f, i.e. its fine structure, will be represented. Thus, the global model can be inadequate because it does not describe equally well the entire state space with poor performance of the method being mainly due to a high bias of the global model in some particular regions of space. The same problem of bias is also pertinent if neural networks are used for classification. The MLP variance can also contribute to poor performance of this method. However, the variance can be decreased by analyzing a large number of networks, i.e. using artificial neural network ensemble, and taking, for example, a simple average of all networks as the final model. The problem of bias of MLP cannot be so easily addressed simply by using larger neural networks since such networks can fall in a local minimum and thus can still have a considerable bias. Thus, one of the motivation for this article is to provide a method that can estimate and correct bias of neural networks for both regression and classification.



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