ARTIFICIAL NEURAL NETWORK ALGORITHMS FOR REMOTE SENSING IMAGE CLASSIFICATION – AN OVERVIEW

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ABSTRACT

Remote sensing described as any procedure by which information on an item, region or phenomena is collected without being connected; the word remote sensing is more precisely linked with assessing interactions of the earth's surface materials and electromagnetic radiation. In recent years, the remote sensing community has been focusing on the neural network method to data classification because this methodology requires no previous knowledge of statistical data distribution and quick categorisation. This study focuses on the examination and utilisation of several neural network algorithms used in remote sensing image classification process.

Keywords: *Remote sensing, image processing, artificial neural network algorithms*

1. INTRODUCTION

Remote sensing images spanning a vast geographical region with high time frequencies provide a unique chance to get land use and land cover information through the picture analysis and classification process.
The categorisation of remote sensors is a complicated procedure that involves several elements under consideration. The critical phases of classification might include establishing an appropriate classification system, training sample selection, picture pre-processing, function extraction, selection of appropriate classification methodologies, post-classification processing and accuracy evaluation. Generally, techniques to image classification may be divided into a supervised and unattended, para-metric and non-parametric or hard and soft or per-pixel, sub-pixel and per-fiel classification. [1]
Information and non-linear transformation are a typical representation of the artificial neural (ANN) network by replicating human brains' routes. ANN offers several benefits compared to statistical grading: parallel processing, self-reliance, self-learning, adaptive, non-linear processes and association ability. ANN offers several benefits. Retro-sensing image categorisation achieves relative high accuracy [2] [3].

1.1. Image classification in remote sensing

Classification of images is a critical task with various environmental features such as agriculture, lakes, industry, open spaces, the road forest & plant agriculture, industrial waterways, roads, undeveloped areas. Based on identifying significant features that have high discrimination and the classifier's training in classifying the picture to increase classification accuracy, classification methods may be created. [4].

Neural networks are one of the most intriguing developments in remotely sensed data processing since the invention of the maximum probability method. Neural methods have often been proved to be more precise than other techniques.

2. Artificial Neural Networks

A neural network is a collection of fundamental units called neurons, which compute a non-linear input function. All inputs have a weight given, which decides how this input affects the total node output. The neural network may arbitrarily approximate any non-linear function by a suitably interconnected number of nodes and setting weights at acceptable levels [5]. The basic structure of the ANN shown in figure.1.

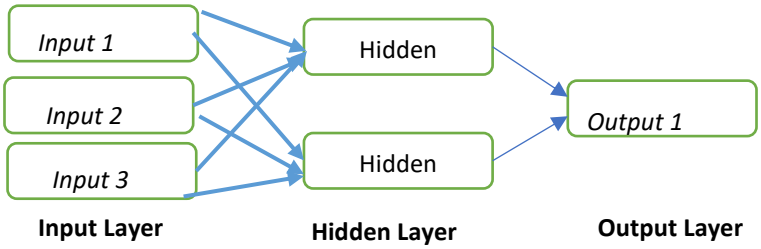

Figure.1. Structure of Artificial Neural Network

As the name implies, the Input Layer takes the inputs given by the programmer in numerous distinct formats. Hidden layer, the hidden layer has input and output layers between them. It calculates all traits and patterns that are concealed Input is translated to the output transmitted by this layer via the hidden layer. This alters the layer of output. The artificial neural system enters and calculates the weighted input total and has a bias. This calculation is shown equation 1 as a transfer function.

$$\sum_{i=1}^{n} Wi * Xi + b$$

Eq.(1)

It decides that the weighted total is given to the output as an entrance to an activation function. Choose whether a node should fire or not. Activate functions. Only those that are fired make the output layer. A change in the weight of the link completes the learning process. The number of hidden layers and neurons varied according to various neural network topologies.

2.1. Image Classification Algorithms in ANN

In general, single structures and two hidden layers are adequate to handle any sort of data [6].In particular, image classification has frequently been employed by the multi-capacity (MLP) network trained by a background propagation or associated learning method. Neural feed-forward networks are particularly promising for supervised applications in classification [7].

In groups or clusters that the analyst cannot guide to a large number of unknown pixels in an image using the mirror value, uncontrollably categorised pictures are employed. The K-means and the Iterative Self-Organising Data Analytic are two commonly utilised clustering algorithms for unmonitored categorisation. The supervised method and valuable information categories are first investigated, and their spectral separability is investigated, while the computer determines a spectrally separable class in an unsupervised way and then defines its informational value. [8]

In addition, neural networks are quicker and can enable data and information from other sources to be included in the estimate. Neural networks are used in various distant sensing applications, and new applications are often presented [9] [10]. The central aspect of image processing is classification. This approach allows us to find suitable characteristic parameters [11] [12].

Table 1.describes the different ANN algorithms used in the remote sensing image classifications process

Author	Country	Application	Algorithms	Remarks
Wang, 2010	China	Wetland's classification accuracy	Back Propagation Artificial Neural Networks (BP ANN)	The findings demonstrate that BP ANN with cleaning sample taught greatly increased the accuracy of wetland categorisation
Bruzzone & Serpico, 1997	Italy	Learning methodology to accelerate training in skewed data with a multi-layer sensor.	The multi-computer perceptron Ž. MLP, trained by the EBP Ž. method	The training is more reliable to adopt since the weights, in the beginning, are more consistent.
Foody, 1997	UK	Land cover Classification	Back-propagation learning algorithm and fuzzy classification and	The precision of the fuzzy categorisation has been evaluated
.,	India	Land use land cover Classification	Supervised back-propagation learning algorithm was	Used to prepare landslide hazard zonation of an area
Sari et al., 2015	Algeria	Processing satellite images	Unsupervised self-organising algorithm	Identified the ability of self-organising map to the unsupervised classification of satellite images
Atkinson & Tatnall, 1997)	Italy	Test and validate a soil moisture content	feed-forward multi-layer perceptron	The ANN algorithm enables a quick release in the order of timeliness necessary
Foody, G. M, 2004	UK	An increase in classification accuracy.	Neural networks of MLP and RBF (radial basis function)	The results indicate that the RBF classification might be a better method than MLP for some remote sensing applications.
Perumal & Bhaskaran, 2010	India	Classification using neural networking of semi-supervised remote sensing	Kernel-based (semi supervised) algorithms	Provides more effective ways to use additional pixels both labeled and unlabeled

Table.1 describes the different ANN algorithms used in the remote sensing image classifications process carried by various applications. The approaches supervised are often more common, despite labelling examples in actual circumstances harder to acquire. Deep neural networks (CNN) have recently shown significant promise for great performance in the categorisation of hyperspectral pictures. The procedure under supervision offers some benefit over the unattended. [13].

3.CONCLUSION

For land-use and cover-mapping, detecting change, improving map quality, and categorising images with supervised classification techniques, the ANN classes have been used. We will, in future, employ ANN Classification for distantly sensed images for land use and land cover analysis. The photos may be used to

monitor and measure the city's urban evolution, the forest, agricultural land surveys etc. New algorithms must be developed to classify more classes and more land cover and land use.

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