

Classification of IRS LISS-III Images by using Artificial Neural Networks

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ABSTRACT

The purpose of this paper is to classify the LISS-III satellite images into different classes as agriculture, urban and water body. Here pixel based classification is used to classify each pixel of the satellite image as belonging to one of those three classes. To perform this classification, a neural network back propagation technique is used. The neural network consists of three layers: input layer, hidden layer and output layer. During training of a network, the sample inputs are given to the input layer which then propagate the hidden layer and then later to the output layer. Each neuron in hidden layer will receive the inputs from all the neurons of the corresponding synaptic weights and summed up. Each neuron of output layer will also get the input from all the neurons of hidden layer which are also multiplied with their corresponding weights. The outputs of the output layer are compared with desired result. The error between desired output and actual output is calculated to obtain error matrix. For each input, both local and global classification is obtained. In local classification, the neural network is trained using a particular image and that same image is given as input. In global classification, a new input is given for the network rather than the images with which it has been trained. Accuracy is then calculated for both the local and global classification.

General Terms

Image Mining, Classification Technique, Neural Networks, Pattern Recognition

Keywords

Image classification, Neural Networks, back propagation algorithm, LISS-III Multispectral images

1. INTRODUCTION

Neural networks are used as statistical tools in a variety of fields, including Psychology, Statistics, Engineering, Economics and even Physics. They are used also as models of cognitive processes by neuro and cognitive scientists. Basically, Neural networks are built from simple units, sometimes called neurons or cells, by analogy with the real thing. These units are linked by a set of weighted connections. Learning is usually accomplished by modification of the connection weights. Each unit codes or corresponds to a feature or a characteristic of a pattern that we want to analyze or that we want to use as predictor. These networks usually organize their units into several layers. The first layer is called the input layer; the last one is the output layer. The intermediate layers are called the hidden layers. The information to be analyzed is fed to the neurons of the first layer and then propagated to the next layer and so on until the last layer. Each

unit receives some information from other units and processes this information, which will be converted into the output of the unit. The goal of the network is to learn or to discover some association between input and output patterns, or to analyze, or to find the structure of the input patterns. The learning process is achieved through the modification of the connection weights between units. Bischof et al. [1992] describes multi spectral classification of land-sat images using neural networks. Heerman et al. [1992] describes the classification of multi spectral remote sensing data using a back propagation Neural network. Hepner et al.[1990] have given a comparison to conventional supervised classification by using minimal training set in Artificial Neural Network. Mohanty [1996] have classified remotely sensed data by using Artificial Neural Network based on software package. In this paper, Artificial Neural Network is used for classification of IRS-1D data, which has been implemented. The back propagation algorithm is applied for classification of image for each input in both local and global classifications are applied. In local classification, the neural network is trained using a particular image and that the same image is given as input. In global classification, a new input is given for the network rather than the images with which it has been trained. Accuracy is calculated for both local and global classification.

2. STUDY AREA AND CHARACTERISTICS

Indian Remote Sensing (IRS-1D) satellite gives PAN(Panchromatic) high spatial resolution and LISS-III (Linear Imaging self scanning sensor) gives high spectral resolution data. Indian Remote Sensing Satellite (IRS)-1C/1D gives high resolution PAN, LISS-III, WIFS data. Topographic maps on 1:50000 scale are used. Classified landuse / landcover [level III] map generated from LISS-III data is used to assess the damage to agriculture crops. The two data sets acquired for this research were collected via IRS-1D satellites using LISS-III sensors in the multispectral (MS) mode by NRSA, Hyderabad, Andhra Pradesh (A.P) , India. The characteristics of IRS-1D, LISS-III data are summarized in Table1.

3. METHODOLOGY

The purpose of this study is to classify satellite image by both local and global classifications and compare the accuracy of each of the classifications. In addition, the accuracy of the training is improved by finding the saturation point, where regardless of the number of Indian epochs through the training data, the accuracy will not increase further. The methodology is:

- To apply local classification to the input image for each of the training data sets 100, 500 and 1000 respectively.

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Raffaela Di Napoli



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