

# STUDY OF NATURAL COMPUTING TECHNIQUE TO CAPTURE THE TERRAIN FEATURES

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**ABSTRACT:** Image classification is most appearing area in today's world. As we know Remotely Sensed images are major sources of data & information which is used in various fields such as Environmental impact analysis, Forest study, rural to urban change observation (Urban Planning), Mineral Prospecting etc. Classification' is one of the most usual digital techniques used as information extraction method from remotely sensed data. Scientists and practitioners have made great effort in developing advance classification approaches and techniques for improving classification accuracy. This paper gives an overview of various nature inspired techniques used to solve various complexity in image classification such as Ant Colony Optimization, Biogeography Based Optimization, Particle Swarm Optimization, Artificial Neural Network, Artificial Bee Colony Optimization etc.

**KEYWORDS:** Image classification, Nature inspired computing, Artificial Intelligence, remote sensing, Satellite Images.

## I. INTRODUCTION

### 1.1 Image classification

Image classification refers to the task of extracting information classes from multiband images. Digital image classification is the most appealing area which application shown in everywhere, it demands in every area like industry application, medical diagnosis and research area. [11] With the rapid development of digital images, computer storage and Internet technology, there are huge amounts of multimedia data (images, video, audio, etc.) to generate, store and share every day. Image has a long history in information dissemination. Because of its intuitive and easy to understand, it is widely used in business, medicine, geography, military, and many other fields [12][13]. The main objective of image classification is to categorized all pixels into digital image.[1][2].Classification also plays very important role in the remote sensing and satellite image classification. Remote Sensing Classification is a complex process and requires consideration of many factors. The major steps of image classification may include resolution of a suitable classification system, selection of training samples, feature extraction, image preprocessing, selection of suitable classification methods, post-classification processing, and accuracy assessment. [8] Satellite image classification is generally based on number of factors such

as ease of use, software availability and performance measured by all classification accuracy. [14][15] Image classification basically classified in two categories. Image classification basically classified in two categories which are known as supervised classification and unsupervised classification. An unsupervised classification technique, in which the objects are classified based on its similarity which is called as cluster. On the other hand in supervised classification technique classification performed based on the training set which is called as the learning from the example.

### 1.2 Nature inspired computing

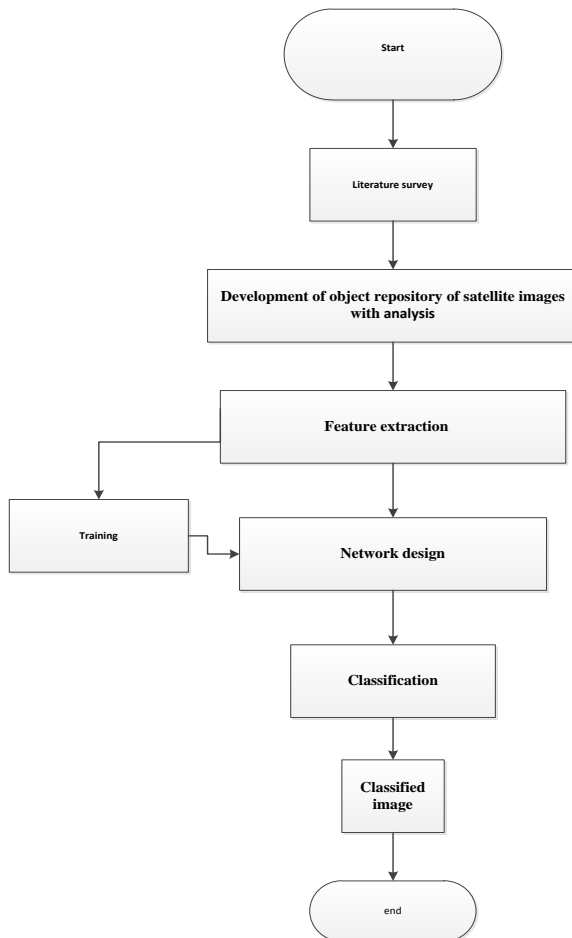
Nature inspired computing is an emerging computational paradigm for dealing with large, complex and dynamic real world problems. Nature inspired computing draws on the principles of emergence, self-organization and complex systems [3, 4]. It aims to develop new techniques, algorithms and computational applications by getting ideas by observing how nature behaves to solve complex problems. Natural systems are one of the rich sources of inspiration for inventing new intelligent systems. Swarm intelligence is one of the scientific fields that are based on natural swarms, such as ant colonies, bee colonies, group behavior of bacterium, rivers (group of water drops) etc. Evolutionary computation [8], neural networks [7], ant colony optimization [6], bee colony optimization [16], particle swarm optimization [9], DNA computing [5] electromagnetism-like optimization [3] intelligent water drops [10] etc. are some of the techniques which are to some extent based on or takes inspiration from naturally occurring phenomena.

### 1.3 Proposed Methodology

The proposed methodology will consist of the following steps:

1. *Definition of classification classes:* depending upon objective and characteristics of image data, classification classes should be clearly defined.
2. *Selection of feature:* Establish the feature to discriminate between classes using multispectral, multitemporal characteristics, texture etc.
3. *Sampling of training data:* Training data should be sampled in order to determine decision tree. Classification techniques will be selected on the basis of training data set.
4. *Estimation of Universal Statistics:* Compare various classification techniques with training data.

5. *Classification*: Depending on decision rule, all pixels are classified in single class. There is different classifier also used in classification.
6. *Verification of result*: The classified results should be checked and verified for their accuracy and reliability.



**Fig1:** Flow chart of proposed methodology for image classification.

The rest of the paper is organized as follows: Section II describes Related Researches: A Review that is used for the classification of image, and Section III AND IV give the conclusion and future work.

## II. RELATED RESEARCHES: A REVIEW

### 2.1 Hybrid Approach Image Classification using SVM Classifier and SURF Descriptor.

*H. Kundra et al 2015 [16]*: Image features are really very important for any retrieval image system. SURF method is advanced version of SIFT used to match feature point of training and test images. SVM classifier is an outcome feature point and classified the images. These terms are applied in image classification for analysis for better results better results are achieved in term of accuracy and matching time.

### 2.2 Image Classification Approach Using Neural Network and Fuzzy Classification.

*Pooja Kamavisdar, Sonam Saluja, Sonu Agrawal et al 2013 [17]*: explained image classification approach using neural network and fuzzy classification. Image classification refers to the labeling of images into one of a number of decided categories. Classification includes image sensors; image pre-processing, object detection, object segmentation; feature extraction and object classification. Many classification techniques have been developed for image classification. In this survey different classification techniques are considered.

### 2.3 Artificial Neural Network for Classification of High Resolution Remotely Sensed Images.

*Saeed Ojaghi1, Hamid Ebadi1, Farshid Farnood Ahmadi et al 2015 [18]*: explained artificial neural network for Classification of High Resolution Remotely Sensed Images and Assessment of Its Performance. Image classification is always one of the most important issues in remote sensing and obtained information from image classification is most widely used in this field and other applications like urban design, natural resource management, agriculture and etc. The reason of this study is to assess the performance of multi-layer perceptron neural networks to categorize high resolution images.

### 2.4 Analysis of Satellite Image Classification Using Artificial Neural Network.

*Priyanka Sharma, Urvashi Mutreja et al 2013 [19]*: analyzed and classified images using artificial neural network. Remote Sensing Satellites are used for various applications of resources survey and management. For analysis of remotely sensed data, ANN has become a widespread tool. As we know Remotely Sensed images are major sources of data & information which is used in different fields such as Environmental impact analysis, Forest survey, rural to urban change detection (Urban Planning), Mineral Prospecting etc. Classification' is one of the most common digital techniques used as information extraction method from remotely sensed data. They examined remotely sensed data analysis with neural network and unsupervised classification method of ANN for classification of satellite images.

### 2.5 Extraction of satellite Image Classification Using Particle Swarm Optimization.

*H. Kundra et al 2010 [20]*: Extraction of cartographic features is most time consuming. The extraction of cartographic feature form digital satellite imagery required for interpretation. The Knowledge one needs the topographic object and their appearance in satellite image in order to recognize these objects and extract the object and implement the algorithm. Swarm Computing is used to Land Cover Mapping and Satellite Image object extraction.

### 2.6 Impact of features on Classification accuracy of Satellite Images Using Artificial Neural Network.

*Mr. Anand Upadhyay, Dr (Mr.) Santosh Kumar Singh, Mr. Vipin.G.Shukla et al 2014 [21]:* They proposed the artificial neural network with back propagation of error to classify the LISS-III satellite images. Its multi-spectral images which are stacked together and their different features are used for the classification. In this classification the relative study is performed on different types of training sets which are used for the classification training.

### 2.7 Hybrid Bio-inspired techniques Land Cover Feature Extraction: A Remote Sensing Perspective.

*V.K Panchal et al 2012 [22]:* Recent advances in the theoretical and practical implementations of biogeography have led to the exploration of new bio-inspired techniques which can prove to be the building blocks of hybrid bio-inspired techniques. This aspect was discovered while considering the exploration of bio-inspired intelligence for developing generic optimization algorithms that can be adapted for performing the given land cover feature extraction task at hand. Certain bio-inspired techniques when integrated with the existing optimization techniques can drastically improve their optimization capability hence leading to better feature extraction. We propose a generic architectural framework of a hybrid biologically inspired technique that is characterized by its capability to adapt according to the database of expert knowledge for a more efficient, focused and refined feature extraction. Since our hybrid feature extractor possesses intelligence for selective cluster identification for application of either of the constituent techniques which is in turn based on an inefficiency analysis, we term our classifier as the hybrid bio-inspired pattern analysis based intelligent classifier. Our hybrid classifier combines the strengths of the modified BBO Technique for land cover feature extraction with the Hybrid ACO2/PSO Technique for a more refined land cover feature extraction. The algorithm has been tested for the remote sensing application of land cover feature extraction.

### III. CONCLUSION

There are various Natural Computing techniques used for classifying satellite images and to execute feature extraction and classification in a narrow sense in a step. The classification difference taken over a period of time can be used for trend analysis. Such techniques can indeed be applied for a variety of purposes. The paper deals with image classification using Particle Swarm Optimization, Artificial Neural Network, Fuzzy Classification, classifier and descriptor.

### IV. FUTURE SCOPE

In the future, Natural Computing has the potential to dramatically change the way we think and do Computing and Mathematics. The challenge for computer scientists and mathematicians is to provide models for the emerging computing architectures, to develop new programming techniques appropriate for Natural Computing and to apply them to various domains.

### REFERENCE

- [1] T. Lillesand, "M. and Kiefer, R., W., 1994. Remote Sensing and Image Interpretation," New York.
- [2] T. M. Lillesand, R. W. Kiefer, and J. W. Chipman, Remote sensing and image interpretation: John Wiley & Sons Ltd, 2004. M. Caetano, "IMAGE CLASSIFICATION", ed. ESA ADVANCES TRAINING COURSE LAND REMOTE SENSING, 2009.
- [3] Wilner, M., Bio-inspired and nanoscale integrated computing, Wiley, 2009.
- [4] Yoshida, Z., Nonlinear Science: the Challenge of Complex Systems, Springer 2010.
- [5] Adleman, L. M. (1994). Molecular computation of solutions to combinatorial problem. Science, 1021–1023.
- [6] Dorigo, M., & Stutzle, T. (2004). Ant Colony Optimization. Prentice-Hall.
- [7] Farley, B., & Clark, W. A. (1954). Simulation of Self Organizing Systems by Digital Computer. IRE Transactions on Information Theory, 76-84.
- [8] Fraser, A. S. (1958). Monte Carlo analyses of genetic models. Nature, 208-9
- [9] Kennedy, J., & Eberhart, R. C. (1995). Particle Swarm Optimization. In Proceedings of the Fourth IEEE International Conference on Neural Networks (pp. 1942-1948). Perth, Australia: IEEE Service Center.
- [10] Shah Hybrid Bio-inspired techniques Land Cover Feature Extraction: A Remote Sensing Perspective -Hosseini, H. (2007). Problem Solving by Intelligent Water Drops. Proc. IEEE Congress on Evolutionary Computation, (pp. 3226-3231). Singapore.
- [11] R. C. Gonzalez, R. E. Woods, S. L. Eddin: —Digital Image Processing Using Matlab 5th Impression, Pearson Education, New Delhi, India, 2009.
- [12] Benedikson, J.A., 1990. Neural network approaches versus Statistical methods in Classification of Multi source Remote Sensing data. IEEE Transactions on Geo Science and Remote Sensing
- [13] Rui Y, Huang T S, Chang S F, "Image retrieval: Current techniques, promising directions, and open issues", *Journal of Visual Communication and Image Representation*, vol. 10, no. 1, pp. 39-62, 1999
- [14] Mather P.M. and Pal, M., 2005. Support vector machines for classification in remote sensing, *International Journal of Remote Sensing* 26(5): 1007-1011.
- [15] Jensen J. R., 2009, Artificial Neural Networks and Remote Sensing, *Geography Compass* 3(2): 630-646
- [16] H. kundra Hybrid Approach Image Classification using SVM Classifier and SURF Descriptor. *International Journal of Computer Science and Information Technologies*, Vol. 6 (1), 2015, 249-251
- [17] Pooja Kamavisdar, Sonam Saluja, Sonu Agrawal Extraction of satellite Image Classification Using Particle Swarm Optimization et al 2013, Image Classification Approach Using Neural Network and Fuzzy Classification.