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Supervised Classification of Satellite Image Processing using Neural Networks

K. Srilatha, M. Udaya Sri, G. Udaya Lakshmi, M.G. Vineela, G. Varapriya, CH. Suneetha

Abstract: ***Now a day's satellite image processing plays a major role. By using remote sensing technique, we can classify the satellite images like LISS (Linear image self-scanner), LANDSAT satellite image by using ERDAS imagine software. By using ERDAS imagine software, the classification of an satellite images will take more time. Rather than ERDAS imagine software we can use NEURAL NETWORKS in MATLAB software for classifying the satellite images by using the corresponding code with respect to the image by simply changing the file name. This paper includes the method like supervised and classification by using ERDAS imagine software and MATLAB code. The aim of this projects is to realize the image classification using NEURAL NETWORKS.***

Keywords : Image Processing, MATLAB software, Supervised classification, hyper spectral satellite image.

I. INTRODUCTION

Remote sensing is defined as the collection of data and modifying pictures by using enhancement and restoration techniques.

Stages of Remote Sensing:

1.Emission of electromagnetic radiations from sun.
2. The energy can be transmitted from sun to the surface of the earth.
3. Electromagnetic rays from sun will interact with the earth's surface then it will get reflected and transmitted to the remote sensor.
4. The transmitted energy will be analyzed.

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***** Correspondence Author
K. Srilatha*, M.Tech, ECE department, Asst. professor of Bapatla Women's Engineering College, Acharya Nagarjuna University, Andhra Pradesh, India. Email : srilathakolati@gmail.com .
M. Udaya Sri, ECE department, Bapatla Women's Engineering College, Acharya Nagarjuna University, Andhra Pradesh, India. Email: udaya48.ece@gmail.com.
G. Udaya Lakshmi, ECE department, Bapatla Women's Engineering College, Acharya Nagarjuna University, Andhra Pradesh, India. Email:
M.G. Vineela, ECE department, Bapatla Women's Engineering College, Acharya Nagarjuna University, Andhra Pradesh, India. Email:vinumanda1998@gmail.com .
G. Varapriya, ECE department, Bapatla Women's Engineering College, Acharya Nagarjuna University, Andhra Pradesh, India. Email: varapriya25.ece@gmail.com .
CH. Suneetha, ECE department, Bapatla Women's Engineering College, Acharya Nagarjuna University, Andhra Pradesh, India. Email: suneethachalla44@gmail.com .

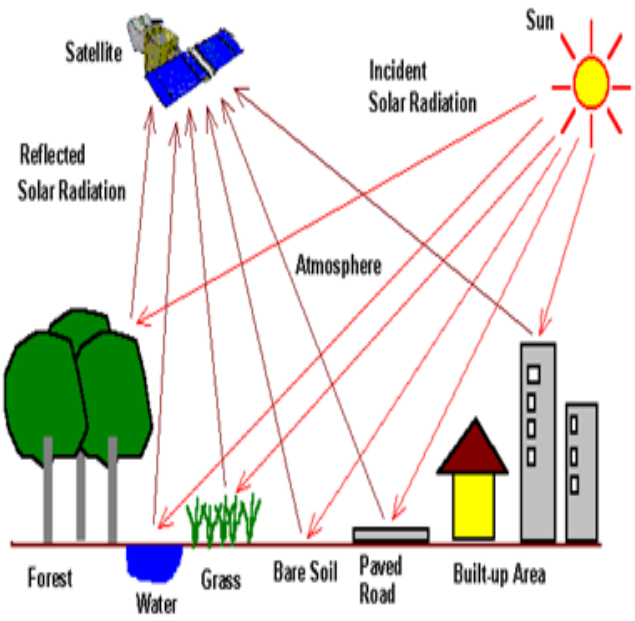

Fig 1: Stages of Remote Sensing

By using platforms, we can collect the data.
It can be classified into 3 types. They are
1.ground-based platform
2.airborne platform
3.satellite platform

1.1 Ground based platforms:

This type of platforms primarily located on the ground. Some of these platforms are placed at certain height with the help of the ground. Hence it is known as ground-based platforms. Cameras mounted on the vehicles, towers are the examples for the ground-based platforms.

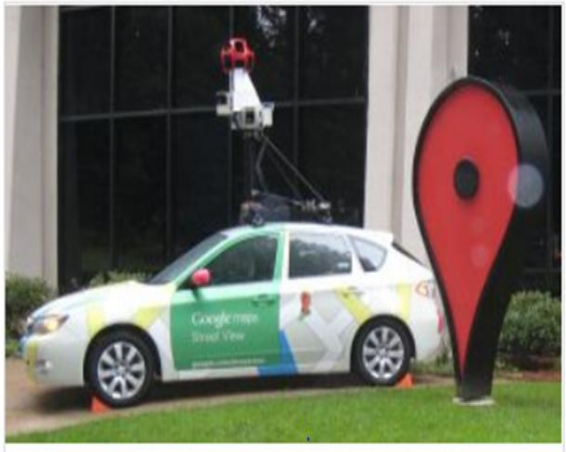

Fig 2: Ground Based Platform

1.2 Air borne platforms:

This type of platform is present at a higher altitude from the ground surface. As the name suggest it will present in the air which is at a distance from few meters to few kilometers. Drones, helicopters, aerial cameras are the examples for the air borne platforms. By using this type of platform large area can be covered compared to ground based platforms.

Fig 3: Air Borne Platforms

1.3 Satellite platform:

This type of platform is at a great height from the earth surface. This type of platforms ranges from few hundred kilometers to few thousand kilometers.

Fig 4: Space Borne Platform

II. REMOTE SENSORS

Remote sensors can be classified into two types, they are
1. On the basis of energy used by the sensor
2. On the basis of sensor function.

2.1 On the basis of energy used by the sensor:

It can be classified into two types. They are
1.Active sensor and
2.Passive sensor.

1. Active Sensor:

Active sensor is a radar instrument and it is used for measuring signals transmitted by the sensor and that signal was reflected by the earth surface. This type of sensor uses their own source of energy and the earth surface is occupied this energy and it will get reflected back which is received by the sensor. Cameras are active sensors when the camera flash is turned off.

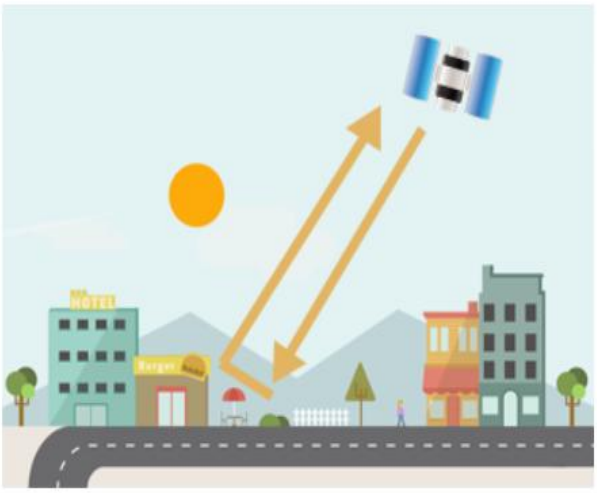

Fig 5: Active Sensor

2.Passive Sensor:

This type of sensor do not have their own source of energy. The earth is illuminated by sun (or) solar energy. The sun energy from the earth surface is reflected itself and is received by the sensor. This is known as passive sensor. Camera will act as a passive sensor when the camera uses sunlight without using camera flash.

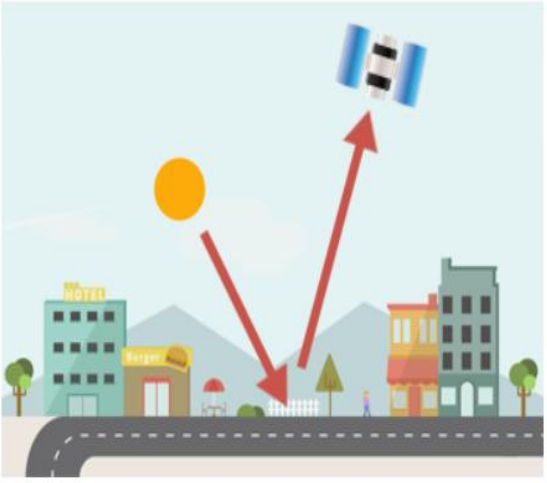

Fig 6: Passive Sensor

2.2 On the basis of sensor function:

It can be divided into two types. They are
1. Framing system and
2. Scanning system.

1. Framing System:

In framing system, here a lens is used to gather the light which is passed through various filters and then focused on a target. Scanning system is used to capture the image within the large area.

2. Scanning System:

In scanning system, the sensor measure point to point. Microwave Rader meter, optical scanners, multispectral scanner are few examples of scanning system sensor.

III. RESOLUTION:

Resolution refers to the size of the smallest feature that can be detected by a satellite sensor. It can be classified into four types. They are

1. Spatial resolution
2. Spectral resolution
3. Radiometric resolution and
4. Temporal resolution .

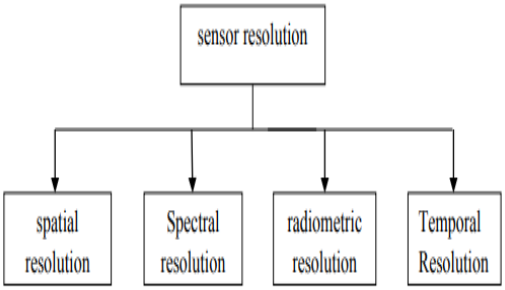

Fig 7: Resolution Types

3.1 Spatial Resolution:

Spatial resolution is defined as to represent the width of the pixel. The main advantage of the spatial resolution is to increase biostatic images. In the below figure, let us consider a spatial resolution of an pixel is 30 meters. That is each pixel denotes an area of30m/30m on the earth surface. If the resolution is high then the image is more clear to visible. If the resolution is low then the image is not clear to visible.

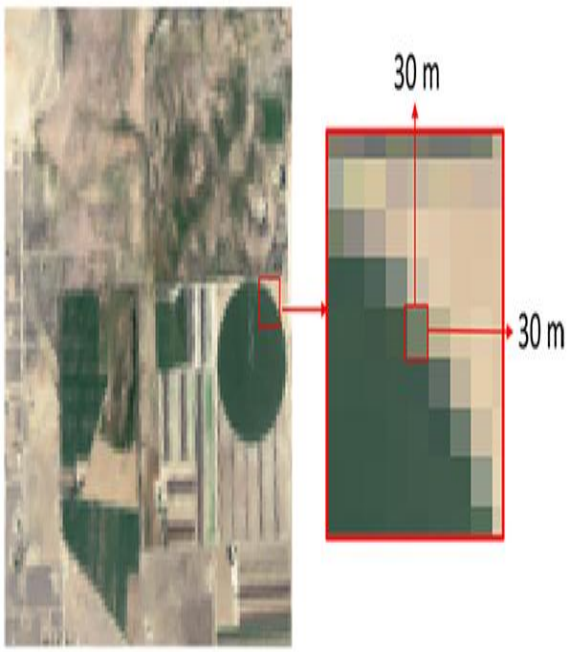

Fig 8: Spatial Resolution

3.2 Spectral Resolution:

Spatial resolution defines the wavelength intervals in an electromagnetic spectrum. Simply it is used to represent the number of bands in an image. If the resolution is high then the wavelength range of a particular band is narrow.

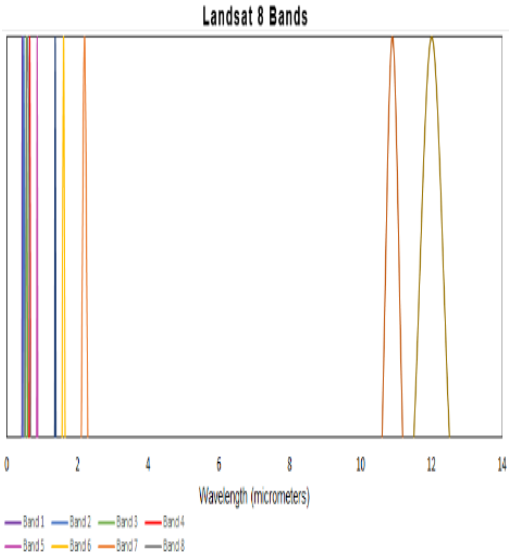

Fig 9: Spectral Resolution

3.3 Radiometric Resolution:

It is defined as to represent the color depth of an image. It describes the information about image contrast, brightness. Typically, it is expressed as the number of bits for each band. The greater the radiometric resolution the greater the range of intensities of radiation the sensor is able to distinguish and record.

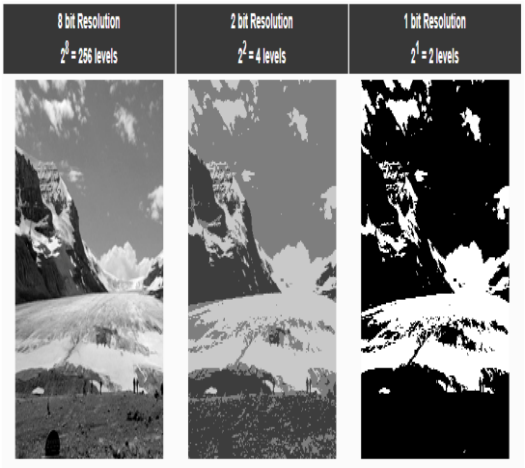

Fig 10: Radiometric Resolution

3.4 Temporal Resolution:

This type of resolution is used to revisit the same area after some period of time. It plays a very important role in remote sensing applications like vegetation changes, flood occurrence, deforestation. The main advantage is low noise distortion in the obtained image but its efficiency is low.

IV. IMAGE ENHANCEMENT:

Image enhancement is used to increase the quality of the picture (or) image. It is used to remove the noise in the image and increase the contrast and revealing details.

Image enhancement can be classified into three types, they are

1.spatial enhancement
2. spectral enhancement and
3. radiometric enhancement.

4.1 Spatial Enhancement:

This technique modified pixel values based on the neighborhood pixel. It deals with spatial frequency. Spatial frequency is the difference between the highest and lowest set of pixels. According to Jensen, spatial frequency is" the number of changes in brightness value per unit distance for any particular part of an image". When compared to high spatial frequency, low spatial frequency image consists of small change in pixel value.

4.2 Spectral Enhancement:

Spectral enhancement method is also known as image transformation method. It involves manipulation of multiple bands of data from single multispectral image. By applying mathematical operation on an image to get a new raw image. It is the process of creating a new spectral data from available bands. New data is creating by applying arithmetic operations (addition, subtraction, multiplication and division) to corresponding pixels in the existing bands.

4.3 Radiometric Enhancement:

This technique is used to improve the contrast between certain images. It can be classified into three types. They are
1. contrast stretching
2. level slicing and
3. image thresholding and masking.

1. Contrast Stretching:

It is used to improve the picture quality. Let us assume 'm' is the thresholding value and 'r' is the gray level value. If r<m then it will be represented as white. The range of the pixel is 0 to 255. Then 124 or 125 is the thresholding values.
All the values of less than 124 or 125 is represented as black and greater than 124 or 125 is represented as white.

2. Level Slicing:

It is used to brighter the desired range of gray level, but it preserves the background and gray level tonalities of the image most of the bits are stored in 4,5,6,7 planes.

3. Image Thresholding and Masking:

Thresholding is used to prepare a binary mask for an image. contrast stretching yields to thresholding. It is used to create a binary image from a single or multi band image. This process is used to separate foreground pixels. In this process if the pixel value is below the threshold value then it is mapped to 0(black). If the pixel value is above the threshold value then it is mapped to 255(white).

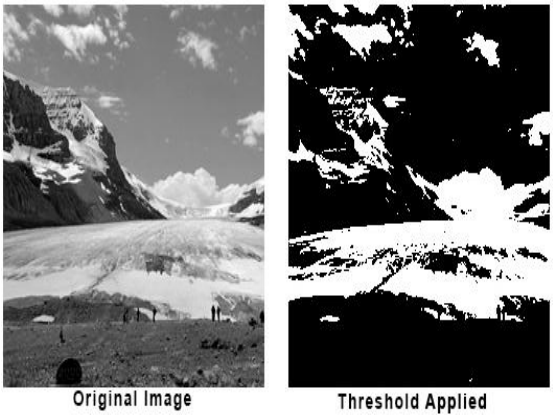

Fig 11: Image Thresholding and Masking

V. IMAGE CLASSIFICATION AND ANALYSIS

It can be classified into two types. They are
1.per-pixel classification
2.object-oriented classification

5.1 Per-Pixel Classification:

In per-pixel classification individual image pixels are analyzed by the spectral information that they contain. This classification is generally done by grouping pixels into predefined classes. This method is the most widely used and easiest method to classify an image. It can be classified into two types
1. Supervised classification
2. Unsupervised classification

1. Supervised Classification:

This classification is used to extract quantitative information from an image. It is defined by the user and user can select the sample pixels from an image that pixels can be represented by some classes like class 1. Supervised classification is also known as human-guided classification

2. Unsupervised classification:

This type of classification is based on the software analysis of an image without any user providing sample classes. here, the system can be determine which pixels are related and group them into some classes. The user can specify only about the output classes.

5.2. Object Oriented Classification:

Object oriented classification is used to group pixels into representative shapes and sizes. This process is also known as multi resolution segmentation. It produces homogeneous image by grouping pixels. In this classification we can classify the objects based on the texture and context.

fig 12: Object Oriented Classification

VI. SOFTWARE:

MATLAB software means MATRIX Laboratory. It is a multi-programming language, high performance language and by using this software we can analyze data and develop algorithms. In this software we can save the file as 'filename. m'. MATLAB provides various toolboxes like image processing, neural networks, signal processing, database and wavelet toolboxes and so on.

MATLAB screen includes mainly three windows they are

1. Editor window- it is simple text editor window. In this window we can write the code for programs and executed.
2. Command window- It is used to display the errors in the program
3. Workspace window- It is used to display the names of each variable, its value, size of the variable in bytes and class.

Neural Networks are also called as artificial neural networks. These are typically organized in layers. Layers are made up of a number of interconnected nodes which contain activation keys. which communicates to one or more hidden layers.

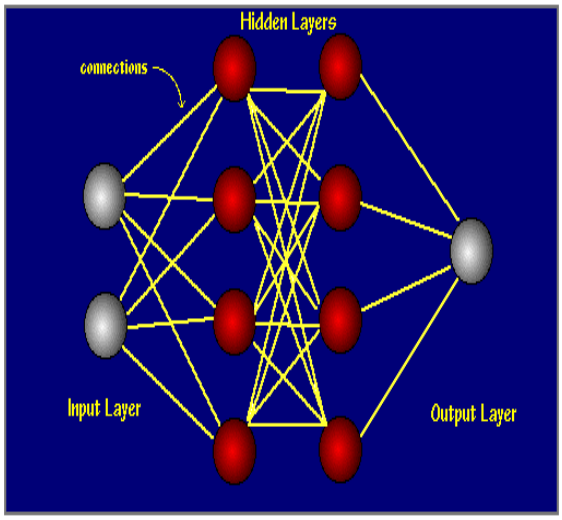

fig 13: Neural networks

VII. RESULTS

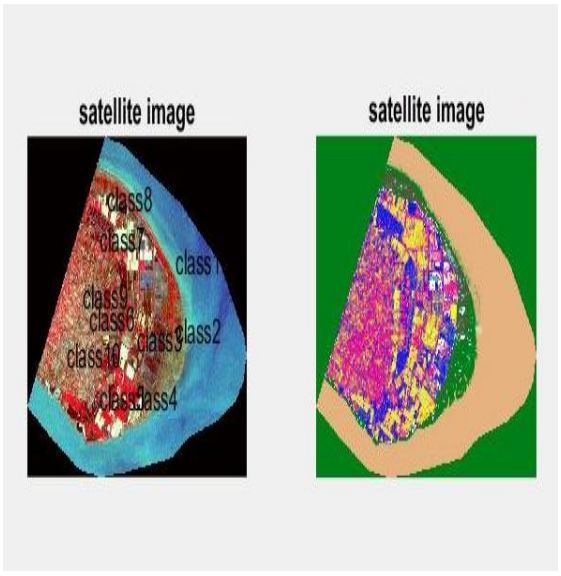

fig 14: Supervised Classification

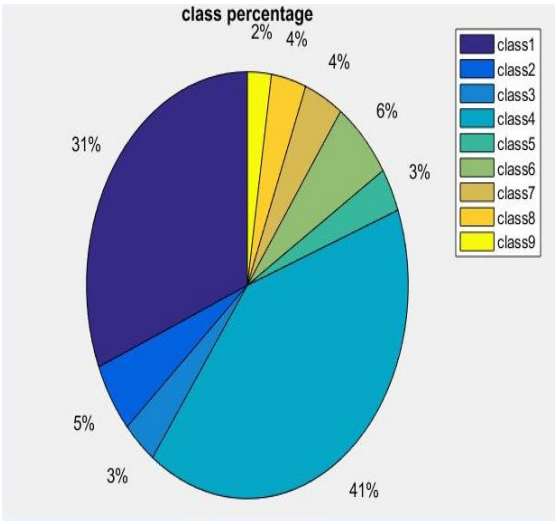

fig 15:Class Percentages

VIII. CONCLUSION

By using NUERAL NETWORKS we can classify the hyper spectral satellite image using supervised classification technique.

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REFERENCES

1. Ran, Lingyan; Zhang, Yanning; Wei, Wei; Zhang, Qilin (23 October 2017). "A Hyperspectral Image Classification Framework with Spatial Pixel Pair Features". Sensors. **17** (10): 2421. doi:10.3390/s17102421. PMC 5677443. PMID 29065535.
2. 2.^ Schowengerdt, Robert A. (2007). Remote sensing: models and methods for image processing (3rd ed.). Academic Press. p. 2. ISBN 978-0-12-369407-2.
3. 3.^ Schott, John Robert (2007). Remote sensing: the image chain approach (2nd ed.). Oxford University Press. p. 1. ISBN 978-0-19-517817-3.
4. ^ Jump up to:[a] [b] Guo, Huadong; Huang, Qingni; Li, Xinwu; Sun, Zhongchang; Zhang, Ying (2013). "Spatiotemporal analysis of urban environment based on the vegetation–impervious surface–soil model" (PDF). Journal of Applied Remote Sensing. 084597. Bibcode:2014JARS....8.4597G. doi:10.1117/1.JRS.8.084597.
5. ^ Liu, Jian Guo & Mason, Philippa J. (2009). Essential Image Processing for GIS and Remote Sensing. Wiley-Blackwell. p. 4. ISBN 978-0-470-51032-2.
6. ^ "Saving the monkeys". SPIE Professional. Retrieved 1 January 2016.
7. ^ Howard, A.; et al. (19 August 2015). "Remote sensing and habitat mapping for bearded capuchin monkeys (Sapajuslibidinosus): landscapes for the use of stone tools". Journal of Applied Remote Sensing. **9** (1): 096020. doi:10.1117/1.JRS.9.096020.
8. ^ "Archived copy". Archived from the original on 29 September 2006. Retrieved 18 February 2009.
9. ^ Goldberg, A.; Stann, B.; Gupta, N. (July 2003). "Multispectral, Hyperspectral, and Three-Dimensional Imaging Research at the U.S. Army Research Laboratory" (PDF). Proceedings of the International Conference on International Fusion [6th]. 1: 499–506.
10. ^ Makki, Ihab; Younes, Rafic; Francis, Clovis; Bianchi, Tiziano; Zucchetti, Massimo (1 February 2017). "A survey of landmine detection using hyperspectral imaging". ISPRS Journal of Photogrammetry and Remote Sensing. **124**: 40–

11. ^ Mills, J.P.; et al. (1997). "Photogrammetry from Archived Digital Imagery for Seal Monitoring". The Photogrammetric Record. **15** (89): 715–724. doi:10.1111/0031-868X.00080.

AUTHORS PROFILE

K. Srilatha, received M. tech degree in VLSI design from JNTUK. She is presently working as an Asst.Professor in the department of Electronics and Communication Engineering in Bapatla Women's Engineering College, Bapatla.

M. Udaya Sri is pursuing B.Tech in the stream of Electronics and Communication Engineering in Bapatla Women's Engineering College, Andhra Pradesh. Her research areas include supervised classification of satellite image processing using neural networks and Mat lab.

G. Udaya Lakshmi is pursuing B.Tech in the stream of Electronics and Communication Engineering in Bapatla Women's Engineering College, Andhra Pradesh. Her research areas include supervised classification of satellite image processing using neural networks and Mat lab.

M. G. Vineela is pursuing B.Tech in the stream of Electronics and Communication Engineering in Bapatla Women's Engineering College, Andhra Pradesh. Her research areas include supervised classification of satellite image processing using neural networks and Mat lab.

G. Varapriya is pursuing B.Tech in the stream of Electronics and Communication Engineering in Bapatla Women's Engineering College, Andhra Pradesh. Her research areas include supervised classification of satellite image processing using neural networks and Mat lab.

CH. Suneetha is pursuing B.Tech in the stream of Electronics and Communication Engineering in Bapatla Women's Engineering College, Andhra Pradesh. Her research areas include supervised classification of satellite image processing using neural networks and Mat lab.