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CANNY-BACK PROPAGATION MODEL FOR THYROID PREDICTION

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ABSTRACT:

Thyroid is one of the most common illnesses that occur within the humans. Number of patients with thyroid disorders worldwide is more than three hundred million people and among them about forty two million people in India. Recent computational techniques such as data mining and neural network to detect and predict the thyroid but these techniques have some limitations. In data mining, SVM (Support Vector Machine) can take only numerical values and Neural Networks prone to over fitting problem. In this regard, propose a hybrid model called Canny- Back propagation (C-Back propagation) to predict the thyroid from the Ultrasound image. In this frame work use the Gaussian filter, Canny, Optimal Threshold Unit (OTSU), Texture feature extraction and Back propagation techniques in different phases of the proposed model. The comparative analysis results showed that C-Back propagation model performance and accuracy is best compared to Support Vector Machine(SVM), Random Forest Classifier.

KEYWORDS: Thyroid, Support Vector Machine(SVM), Neural Networks, Canny- Back propagation, Gaussian filter, Canny, OTSU

I. INTRODUCTION

Thyroid is the common disease in humans. In worldwide three hundred million people are suffering from thyroid. According to this, in India forty two million people are affected from thyroid disorder. A large butterfly-shaped endocrine gland situated low on the front of neck. It is worried in numerous frame mechanisms including limit the level of protein synthesis, deploy energy resources and limiting the frame's susceptibility to other hormones[1]. Because of essential performances, the endocrine gland is only the critical body part within the individual frame. Still, this is far vulnerable to majority of people illnesses similar to Tumulus (immoderate manufacturing of endocrine gland hormone), sub acute thyroiditis (swelling of endocrine gland), endocrine gland tumour, goitre (endocrine gland inflammation), etc. The whole cases, the scale of the thyroid aging. Therefore, this is vital to maintain tune of the endocrine gland dimensions above flow [2].

Ultrasonics(US) visualization has been broadly accustomed for endocrine gland performing, is more safe and pain free to apply for the sick persons correlated to different picturing techniques along with Scanning which uses radio and magnetic signals, Computarized axial Tomography (CT) which makes use of radioactivity and a computerized radiographic technique to examine the metabolic activity in various tissues which uses atomic picturing method. Division along with quantity evaluation of the endocrine gland have excessive objective significance in relation to the prognosis and treatment of thyroid illnesses[3].

Nowadays, by growing generation and facts in scientific experimental, the computer technology specialists are efficient of contributing specialist arrangement to detect non-identical types of illnesses with excessive correctness. The clinical specialists are made to deploy these method due to the few feasible took place inaccuracy at some stage in prognosis process. Disease prognosis operations the usage of specialists techniques are executed found on a sets of sickness indications. These methods are primarily depends on automation which allows the health practitioner to reduce the charges and flow and skilful in valuable detection. Some of these, Artificial Neural Networks (ANNs) are regularly utilized to take care of picture acknowledgment issues by parallel preparing techniques. ANNs have a few favourable circumstances: they don't have to begin with a theory or from the earlier distinguishing proof of expected key factors; they requires less formal factual preparing; they can verifiably recognize complex nonlinear connections among reliant and autonomous factors, just as every single imaginable collaboration between indicator factors; and there are numerous preparation calculations accessible[4].

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II. OBJECTIVES OF STUDY

1. The main objective is develop the framework using Canny Backpropagation whether a patient is suffering from thyroid or not.
2. The Ultrasound images are taken from the Healthcare Global Enterprises(HCG) Kalaburgi,Banglore.

III. STATEMENT OF THE PROBLEMS

Mostly taking blood samples for prediction of endocrine gland. But in some cases it will not give correct accuracy. So we are taking thyroid images for prediction of thyroid accurately.

IV. HYPOTHESIS

1. By using Canny Backpropagation technique predict the thyroid with better accuracy compared to Support Vector Machine,Random Forest and ANN.
2. Taking Ultrasonic 2D images only for prediction of endocrine gland.

V. LITERATURE REVIEW

FarhadSoleimanian et al. [5] proposed Multi-layer Perceptron (MLP) ANN using back propagation learning algorithm to classify Thyroid disease. It contains an input sheet with 5 nerve cells, a concealed layer with 6 nerve cells and an out-turn layer with just 1 nerve cell. Data set is taken from the UCI which comprise 215 prototypes and everyone one has 5 effectual specifications to categorize the kind of illness. The main advantage is the hidden layer reaches to better performance. The limitation is slow convergence.

ShaikRazia et al. [6] review the various machine learning techniques for Thyroid Disease Diagnosis. In this survey paper the author describes the elaborate work that has been done earlier in the Artificial Neural Networks. Based on using these networks, the authors have tried to show the path for future researchers in using artificial neural networks in ailment diagnosis.

Vikram et al. [7] suggested a neural network for prediction of thyroid disease. Thyroid samples are collected from Lakshmi laboratory, chikmagalore, India. The dataset is divided in to 80:20 ratios for training and testing, applied to ANN. First apply the pre-processing to clean the data and then classify thyroid disease is whether hypothyroid, hyperthyroid, or normal.

Dehua Chen et al. [8] proposed A Deep Learning Based Ultrasound Text Classifier for Predicting Benign and Malignant Thyroid Nodules. Ultrasonic content categorizer is a type of superintend classifying depend on deep neural system which is directed by the labelled ultrasound content with healthy or harmful mark of paleopathology. Proposed method gives excessive precision amount of 93% and 95% both on the actual pharmaceutical information set and the UCI quality dataset, differentiate with the customary Random Forest, Support Vector Machine and Neural Network both on the actual pharmaceutical textfile and the UCI quality text file.

Xueyan Mei et al. [9] proposed Thyroid Nodule Benignty Prediction by Deep Feature Extraction. Dataset is taken from the Endocrine gland Picturing Investigating & Information Method. Advanced method uses, Artificial intelligence element removal and neural networks categorizer to forecast the healthy of endocrine gland bumps. Attributes comprise concealed attributes from Convolution Auto encoders, Regional Binary Marking, Scatter diagram of Aligned Slopes, and TIRADs attributes.

This paper provides a novel approach for the prediction of thyroid disease accurately compare to other techniques. In this we are using Gaussian filter to remove the noise in the thyroid image. Optimal threshold unit is used for improve the brightness of that image. K- Nearest Neighbour technique used to combine the similar points into one group, by calculating k-value it is easy to identify the thyroid affected region. Feed forward neural network is one of the simplest forms of ANN, where the data or the input travels in one direction. The data passes through the input nodes and exit on the output nodes. This neural network may or may not have the hidden layers. In simple words, it has a front propagated wave and no back propagation by using a classifying activation function usually.

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VI. RESEARCH METHODOLOGY:

Thyroid is one of the most common illnesses that occur within the humans. Number of patients with thyroid disorders worldwide is more than three hundred million people and among them about forty two million people in India. Recent computational techniques such as data mining and neural network to detect and predict the thyroid but these techniques have some limitations. In data mining, SVM (Support Vector Machine) can take only numerical values and Neural Networks prone to over fitting problem. In this regard, propose a hybrid model called Canny- Back propagation (C-Back propagation) to predict the thyroid from the Ultrasound image. This frame work is divided into five phases namely pre-processing, segmentation, feature extraction, classification and thyroid prediction. Figure 1 depicts the black diagram of proposed hybrid algorithm. In this frame work use the Gaussian filter, Canny, Optimal Threshold Unit (OTSU), Texture feature extraction and Back propagation techniques in different phases of the proposed model.

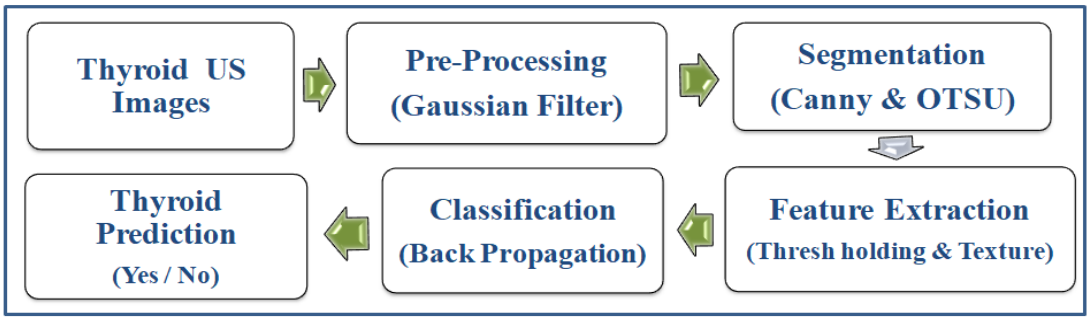

Fig 1: Black diagram of Canny-Back propagation

6.1 Thyroid Input Image:

In this frame work, consider the Ultrasonic (US) pictures are used as input to categorize the healthy and harmful lumps. In this frame work make use of 7 benign and 2 malignant lumps pictures of distinct sick persons which are Digital Imaging and Communications in Medicine (DICOM) in essence. These pictures are series of B-mode pictures from Philips HD11XE, 3-12MHz of frequency. B-mode images are 2-D ultrasonic pictures exhibit collected of vivid stipples describing the ultrasonic reflections. B-mode images are provided by Healthcare Global Enterprises Ltd (HCG) cancer centre, Kalaburgi, Bangalore. These images are labelled by the expert radiologist.

6.2 Pre processing:

In pre-processing phase, consider the Ultrasound image of thyroid is consider as input and apply the pre-processing to resize image and remove the noise. Gaussian filter is applied to remove the noise from the input image and enhance the quality of thyroid image which is helpful to extract the features of thyroid in further process. The figure 2 depicts as input image and figure 3 depicts the pre-processed image without noise.

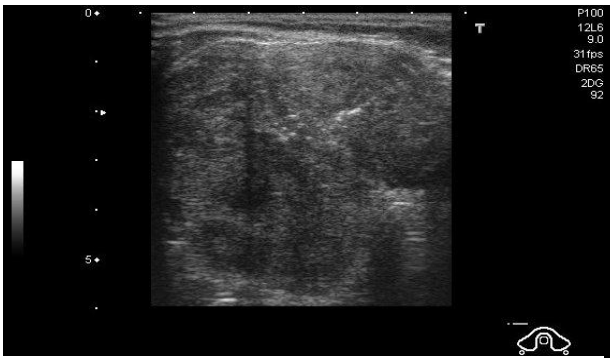

Fig 2: Input US image

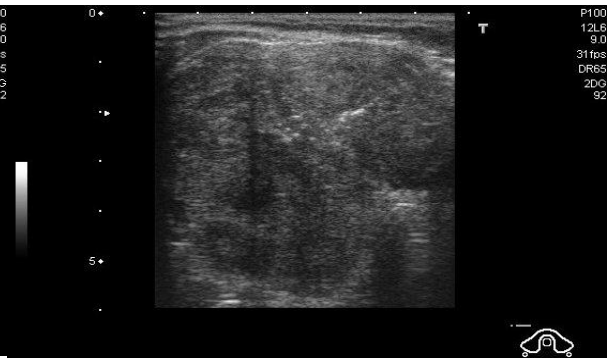

Fig 3: Processed image

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6.3 Segmentation of thyroid nodule:

The aim of segmentation is to modify the presentation of an picture into something that is extra relevant and simpler to study. Boundary identification is a bit of picture division. It is unique method for distinguishing severity interrupting in a digital picture. In this frame work, use the Canny edge detection technique, it is one of the beached border perception methods. It was earliest generated by John Canny. After that Optimal Threshold Unit (OTSU) is used for Segmentation to improve the brightness of the thyroid image. The figure 4 depicts the output of segmented image of original image after apply the Canny and OSTU techniques.

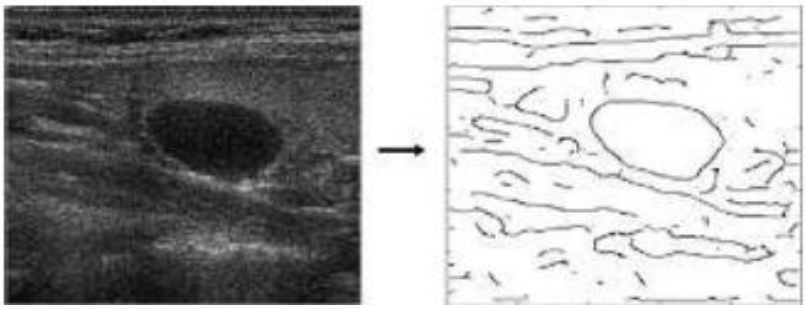

Fig: 4Segmented thyroid image from original image

6.4 Feature Extraction:

In image processing, feature extraction means bringing out useful information from input image, which is relevant for solving computational task. In feature extraction phase, apply the thresholding and texture based feature approach to extract the shape features like circles, ellipses cluster shade, contrast, entropy, energy and correlation from thyroid ultra sound image. Usually the endocrine gland bumps are oval in figure, and the bumps components vary from usual endocrine gland sector consequently employ the thresholding. In quality founded approach, extract the features such as uniformity characteristic, clump shadow, difference, falling apart, power and connection. Figure 5 depicts the output of feature extraction phase.

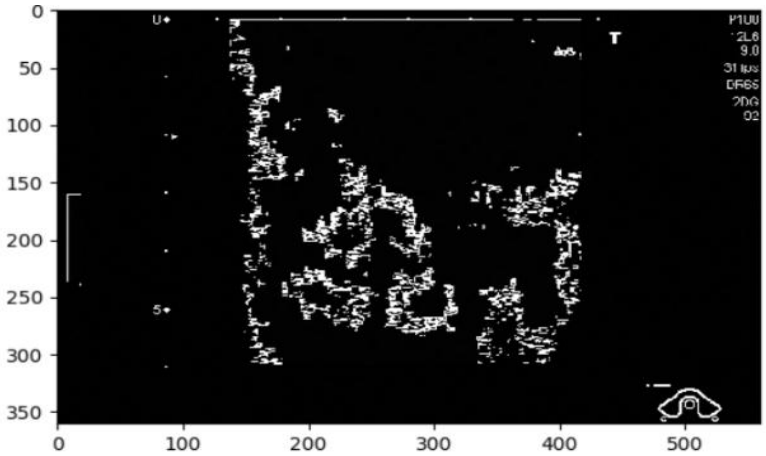

Fig 5:Extracted features of US image

6.5 Classification:

The main aim of this frame work is to categorize the endocrine lumps. So in this phase, we use the Back propagation technique of Artificial Neural Network (ANN) for better accuracy. It is a self instructed method that modifies its frameworks deploys on exterior or interior data that passes through the *system* through the training period. Three distinct layers in the system are input, hidden and output layer. It has a concealed surface with 10 neurons. The visual system employs the appearance and body characteristic to categorize the lumps. The fig 6 depicts the classified image of the US image.

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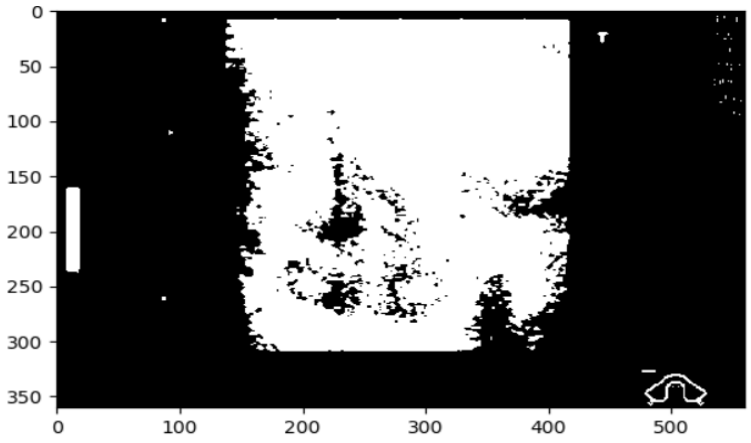

Fig 6: Classified image of the US image

VII. RESULTS AND DISCUSSION:

In this frame work, consider the Ultra Sound 2D images from different patients for diagnosing the thyroid. The images are in jpg format. In this frame work use the Gaussian filter, Canny, Optimal Threshold Unit (OTSU), Texture feature extraction and Back propagation techniques in different phases of the proposed model. Fig 7 depicts the input image of thyroid and Fig 8 depicts the result of the effected thyroid image.

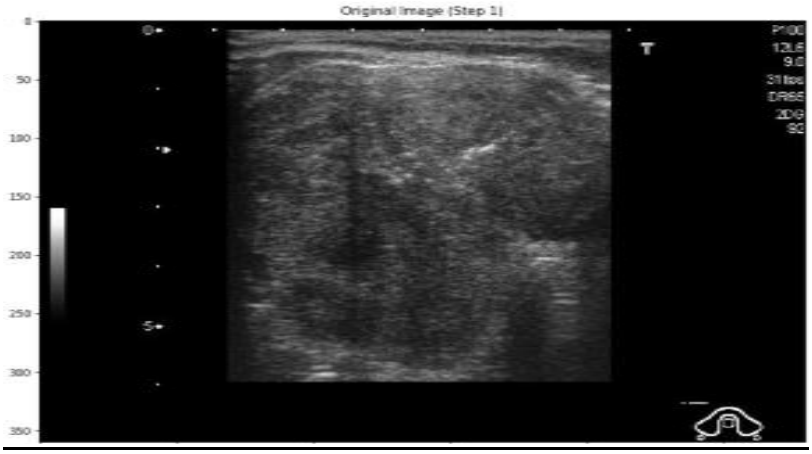

Fig 7: Thyroid Input Image

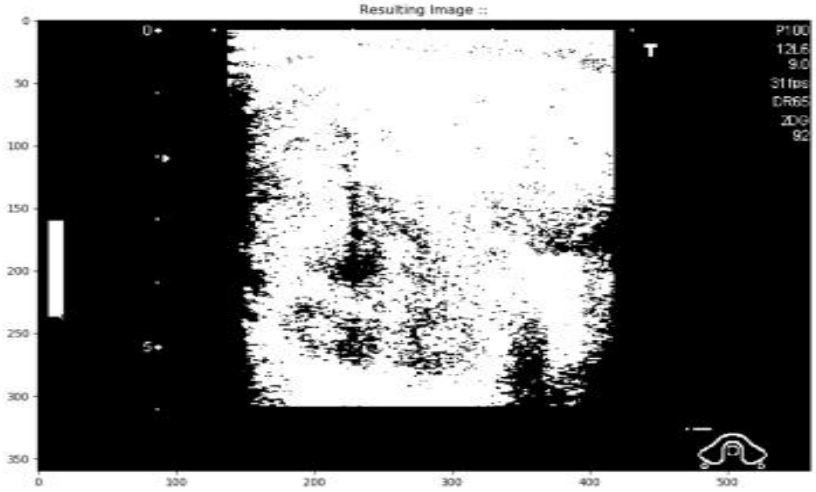

Fig 8: Resultant Thyroid effected image

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Results of the Comparative analysis showed that Canny-Back propagation model accuracy, precision, recall and F1 score values are best compared to existing methods of SVM and Random forest. The Table 1 depict comparative results of Canny-Back propagation model with SVM and Random forest.

Table 1:Comparison Techniques

Name of the Model	Accuracy	Precision	Recall	F1 score
SVM	95.25%	0.95	0.95	0.95
Random Forest	96.30%	0.96	0.96	0.96
Canny-Back propagation	**97.00%**	**0.97**	**0.97**	**0.97**

VIII. CONCLUSION:

In this paper, introduce a hybrid model called Canny-Back propagation to predict whether Ultrasound image of the patient is suffering from thyroid or not. The experimental results showed that, Canny-Back propagation model has produced better results and the accuracy of the model is 97% when compared with accuracy of Random Forest Classifier, Support Vector Machine.

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