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Region of Interest and Bag of Features For Predicting Polycystic Ovaries In Females

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Abstract—The PCOS(polycystic ovary syndrome) in females is a disease that is regulated by genetic and other environmental factors. For identifying this type of disease, genes are needed and it is difficult to detect. In the proposed work the medical image processing is utilizes to detect PCOS disease from different type of images. Medical image processing can improve detection of small cysts in females by mixing and merging of various image segmentation techniques. In the proposed algorithm the detection of disease is done using two phases: extraction and classification .the results show that it will improve the accuracy and give better prediction. Region of interest methods give best results having overall accuracy of 89% and F1 score of 85%.

Keywords— image processing, Polycystic ovary, data mining, image processing.

I.INTRODUCTION

The phenomenon of generating input images from a particular place is called imaging. It has a metric and topological edge, specially designed for the image analysis and crack edging which also creates a structure between the pixels. Various studies have been proposed which shows that intensity is varied from small neighbouring pixel boundary. Pixel boundary is one of the most important and concerning topic discussed and describes in image processing. The images produced from this technique are visible to the computer through sinkhole. An important factor on which the integrity of a household might rely is the fertility. Either a women or a man can have the problem of infertility within their reproduction system. Number of sacy bags called polycystic ovaries (PCO) can be introduced when the follicular maturation process is inhibited and is intervenes the ovulation process of women [4]. Today, amongst females of reproductive age, PCOS (Polycystic Ovarian Syndrome) is found commonly. The hormones can be examined to detect PCOS at early stage. In any case if there are around 12 or more number of follicles and the volume of ovary are increased to more than 10cm3, the case is critical. The number and extent of follicles present in ovaries are counted by the doctor by checking the ultrasound image manually. The time consumed however, for investigation is long. Further, to check is the the patient suffers from polycystic ovary syndrome or not higher accuracy is required. Thus, an automated system needs to be introduced through which PCO can be detected from the ultrasound images. A machine learning and stereological approach can be applied generally for detecting follicles.

ISSN: 0971-1260
Vol-22-Issue-3-July-2019

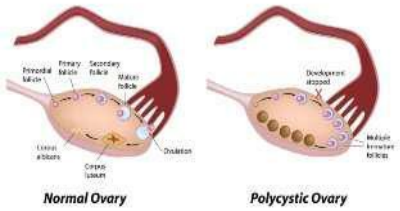

Figure 1 Differentiation between Normal and PCOS ovary[9]

II.LITERATURE REVIEW

Saravanan et al.[10] presented literature survey on the Polycystic Ovarian Syndrome by using Image Processing and Machine Learning techniques. The researcher tries to determine the cause of PCOS by using image processing and the researchers detected the PCOS employing follicles by making use of different classification and image processing technique[1].Ravi Teja Narra et al.[2] presented the automated algorithm for ovarian volume measurement by the means of three-dimensional trans vaginal ultrasound (TVUS) images. These algorithms make use of deep learned energy map which act as a soft shape earlier in the changing segmentation structure for 2-dimensional radical slice segmentation. The results of this segmentation are used for the mesh generation which further uses UV spherical parameters in order to calculate the surface or region of the ovarian capacity .Rose T. Faghih et al[3] has done implementation swift detection or amalysed and measurement of discrete follicles. This has the ability to distinguish between the border of in line follicles and the limit between the follicle and ovary stroma. Therefore, the researcher concluded that the proposed approach generated satisfactory results in order to detect the ovary related diseases at their early stages.

Beant Kaur et.al[4] detected the ovarian cancer and create the phase of the cancer in the precarious cancer image. This method is very helpful to extract the feature with the help of SIFT algorithm. The main objective of this paper was to introduce a calculation method which updates the ovarian disease images with a explicit termination goal to increase the class and differentiate the growth according to the organizer. Therefore, the researcher has concluded from the results that the proposed approach has the accuracy of about 98.8% with CNN and 85.01% with the SVMPalvi Soni et.al[5] Here authors described various uses of image processing in medical field and its applicable area and authors also depicted the future methodology for achieve the great accuracy. In this paper proposed methodology for detecting PCOS disease has elaborated. Proposed methodology will provide accurate results.It has defined by author to make use of segmentation prior CNN so that it will able to show better and prominent results[5]

Le Hoang Thai et al. Firstly, authors isolated the image into various sub-images based on the image features. ANN is used here .Finally,[6] SVM has been assembled all the classify result of ANN. Author

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Vol-22-Issue-3-July-2019

used many ANN and one SVM. Let it denote ANN_SVM. ANN_SVM has been functional for Roman numerals acknowledgment application and the precision rate is 86%. The experimental results show the possibility of our proposal model .Stephen O'Hara et al.[7] in this author depicted an introduction to BoF image representations, describes critical design choices, and surveys the BoF literature. Prominence is positioned on latest techniques that lessened quantization faults, mend feature/variable detection, and increase image retrieval[7].Among the more essential challenges are how and whether BoF procedures can give to localizing objects in compound images, or to combining high-level semantics with accepted images. Nasreen Sultana et al.[8] Authors presented, One-against-all MSVM classifier is a orthodox method which resourcefully builds 6 binary classifiers for distinguishing each class from the other available classes The practical and experimental outcomes have depicted that the proposed methodology is achieved or attained to improve the full classification accuracy to 95%. These likely upshots open the link to a innovative side with respect to embrace multi SVM's in ECG beat classificationAll the SVM classifiers are similarly trustworthy. Here three metrics such as mean accuracy, sensitivity and specificity to ration the accuracy of the classifier[8].

Wen Lu et al.[10] This paper has discussed the mining **ROI** method of mammogram which has two dimensional principal component and feature analysis. The complete technique for doing classification procedure is instinctive, and has high rational power[10]. The two dimensional principal component analysis was used here, that has full tendency to build up training speed of the neural network in a fast and efficient way , which can further helps in mitigating the total calculating time in whole. This paper associations the numerous distinctive parameters for the classification used to find neural network, which posseses the ability to make classification supplementary efficient and precision Extraction of microcalcification region was done in the mammogram so as to lessened the computing work of the computer aided diagnosis dimensions the basis of digital hospital system.**Luxit Kapoor et al.[11]** Author surveyed the various techniques that are included or are part of Medical Image Processing and are importantly used in exploring or scrounging tumors in brain from MRI Images. Author studied various methods used in medical imaging for detection of different types of diseases[11]Author shown various types of segmentation techniques,where that technique is used and where that can not be used or deployed.Here how the process of detecting tumors is also involved by mentioning the relevant steps by author.

ISSN: 0971-1260
Vol-22-Issue-3-July-2019

III.COMPARATIVE ANALYSIS OF DIFFERENT TECHNIQUES

Table 1:Analysis of different techniques

Sr.No	Paper Title	Techniques and Summary
1.	Detection of Polycystic Ovarian Syndrome? A Literature Survey	The researcher tries to determine the cause of PCOS by Using image processing an the researchers detected the PCOS Employing follicles by making use of different classification and image processing technique.
2.	Automated Ovarian Volume Quantification in Trans vaginal Ultrasound	an automated algorithm energy map. The results of this segmentation are used for the generation further uses spherical parameters in order to calculate surface or region of the ovarian capacity. yielded approx. 86% of segmentation framework.
3.	Automated Ovarian Follicular Monitoring: A Novel Real-Time Approach	Swift detection or amalysed and measurement of discrete follicles.This has the ability to distinguish between the border of in line follicles and the limit between the follicle and ovary stroma.The Researcher rather than using only one segmentation technique, researchers detected follicles by using several types of segmentation methods which depends On the characteristics of the images and traits of the identified follicle regions like roundness.
4.	Ovarian Cancer Stage based detection on Convolutional Neural network	The Identification or detect of the ovarian cancer and its phases stages are determined making use of convolutional neural network. The proposed approach has the accuracy of about 98.8% With CNN And 85.01% with the SVM and they make use of Sensitivity Specificit and accuracy.
5.	Classification of ovarian Cyst using soft computing technique.	Automatic Thresholding In addition of feed forward neural network yielded accurate segmentation. In This paper, fuzzy logic was used to distinguish amid the two types of cysts namely;simple,normal and complicated cyst. namely; simple,normal and complicated cyst
6.	An Implementation Of Convolutional Neural Network On PCO Classification Based on Ultrasound Image	Proposed a solution where the feature extraction was achieve automatically with the aid of Convolutional Neural NetworK Yielding f1 score of 76.3%
7.	A Classification Of Polycystic Ovary Syndrome Based On Follicle Detection Of Ultrasound Images	Gabor wavelet..used for extracting features.This count is performed with the help of Mean,Kurtosis, Entropy Skewness, and Variance texture features then got 339 follicle images.Classification is very last step and done by three methods. The researcher concluded that the proposed approach gained best accuracy from the SVM and shows that The Dataset A Possessed 82.55% Whereas dataset B That possessed 78.81%.

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IV. PROPOSED METHODOLOGY

The methodology is divided into sections in which pre-processing is followed by segmentation and classification. Pre-processing is accomplished using Gaussian smoothening and scaling operation is applied for contrast enhancement.

ISSN: 0971-1260
Vol-22-Issue-3-July-2019

A. Preparing the Data

In this method the we preprocess the data which contains noise and also the noise related to resizing operations.Gaussian Mechanism is used to handle with the noise and impulse noise and also smoothening process is handled by the filter of the Gaussian mechanism.The filtering and smothering values are processed through the following equation i.e Equation 5 .

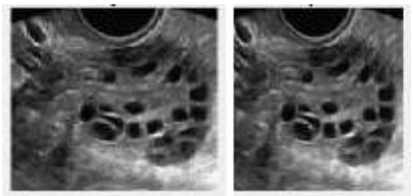
$$G_{Smoothened_{image}} = \frac{1}{2\pi\alpha^2} e^{(a^2+b^2)\frac{1}{2a^2}}$$

Equation 1:Smoothining of image

In the above equation variable α is standard deviation, In this equation 'a 'and 'b' are the origin of the distance from horizontal axis's and distance from the vertical axis's respectively.Once the noise has been handled ,then we focus on the resizing operation and it is done to present input layer uniformed data and the operation is describe in equation 6.

$$Resized_G = Resize\left(G_{Smoothened_{image}}, [77\ 100]\right)$$

Equation 2: Resizing of image



Original Image Resized image
Figure 2: Original Image And Resize image

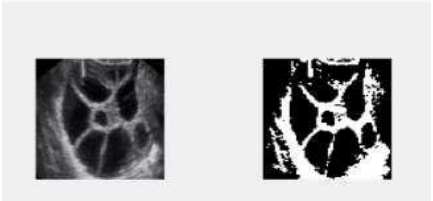


Figure 3: RGB to Gray

B. Training and Segmentation

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Vol-22-Issue-3-July-2019

Now once the data has been processed and now we need to train the data and for this the input is the output we received from the previous phase .So the image received after the processing and in the proposed system the input layers accepts the images with the specific resolution and by using the trqaining option commands we provide the training parameters and the network is fully trained after the train network functions are used in the deep learning toolbox..

C. Classification

In this last phase on the basis of the region of intrest and features the classification is perfomed.In this method we use in order to reach the solution of certain problem which include unrequired regions and outlier detection,rule based environment is used by support vector machine.So we propose this system which resolve the issue of unclassified region. Bag of features and region of interest helps in finding the classes and in order to find the satisfactory criteria we define the optimal hyper planes which are used to realize the criteria value

SATISFACTION CRITERIA D(X)>1

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For the determination of the separating hyper planes which are defined by $D_j(x) = 0$ we use membership if the one dimensional function $m_{i_j}(x, y)$ by the following method

We need to determine the diagonal values equate or not, equation 3 is used if variable i and j are equal and equation 4 is used if variables are not equal

$$m_{i_j}(x) = \begin{cases} 1 \ for\ D_i(X) > 1 \\ D_i(x) for\ D_i(X) < 1 \end{cases}$$

Equation 3:Classification of class I and II

$$m_{i_j}(x) = \begin{cases} 1 \ for\ D_i(X) < 1 \\ -D_i(x) for\ D_i(X) > 1 \end{cases}$$

Equation 4: Rule of determination for class I,II orIII

Classification is done on the basis of the underlisted If the pixel value x is such as $D_i(x)>0$ and is satisfied only for that class then it is fed into that class.

- In case $D_i(x) > 0$ and when x is between classes and them it is maximum then it belongs $D_i(x)$
- In case $D_i(x) <\_ 0$ and when x is between different classes then data will be classified into the class having min $D_i(x)$

V.FLOW OF PROPOSED SYSTEM

The proposed work operates on dataset derived from online source. The demonstration of proposed work is described in terms of flowchart in this section

ISSN: 0971-1260
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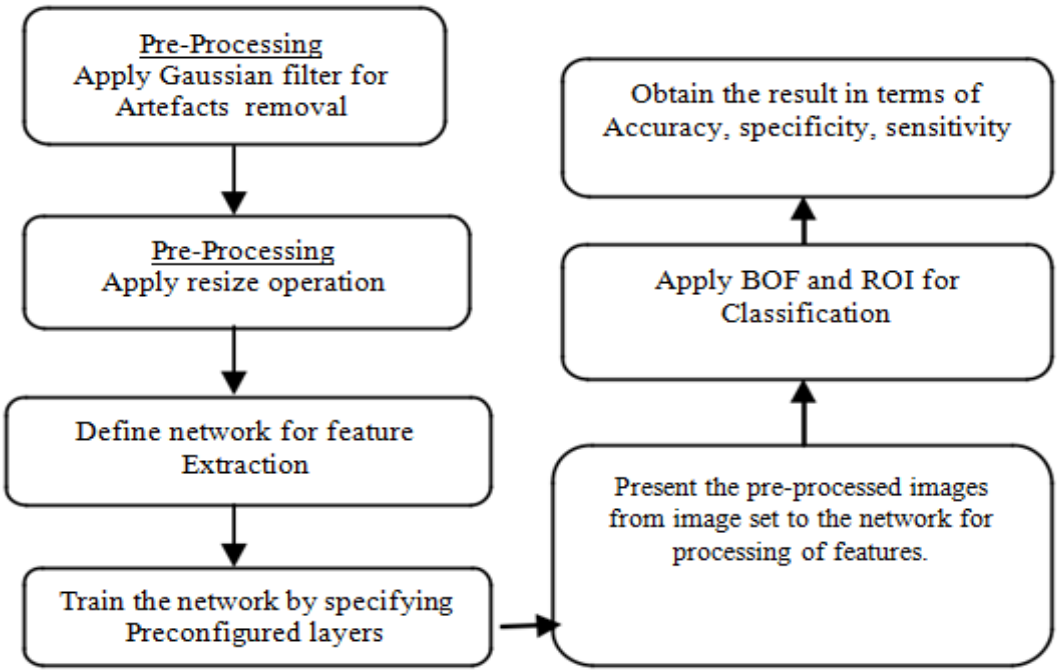

Figure 4: Flowchart of Proposed Methodology

V. EXPERIMENTAL RESULTS AND ANALYSIS

On the basis of features liked accuracy, sensitivity and specificity the system performance is analysed. When we subtract actual result from the approximate result we can obtain the value of accuracy and accuracy is obtained in terms of prediction.

$$Accuracy = \frac{Correct_{Pre}}{Total_{Pred}}$$

Equation 5: accuracy in terms of prediction

When positive predictions are divided by total true positive rate then Sensitivity is obtained.

$$\text{Sensitivity} = \frac{Correct_{Positive_{predictions}}}{Total_{Positives}}$$

Equation 6: Sensitivity evaluation formula

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Vol-22-Issue-3-July-2019

The other parameter that can be used to evaluate the correctness of the stated system is Specificity amd it is calculated as :

$$\text{Specificity} = \frac{True_{Negitives}}{TP+FN}$$

Equation 7: Specificity obtaining formula

The detection and prediction of the disease is done through the correct and precise classification and its results are plotted as shown in the figure below.

In the case of the 1st Level MRI the accuracy of the image set is under the classification accuracy for the basal carcinoma is better by the margin of 3% than existing system. Statistical features are sufficient to predict the disease using the proposed system. However in case of existing neural network approach, statistical features shows deviation since image classification through neural network is not sufficient for predicting the disease.

The plot for the level 1 disease of multi class prediction is given in figure 5.1

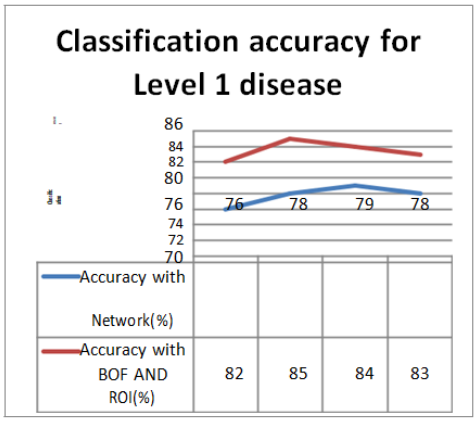

Figure 5: Classification Accuracy for level 1 disease

In case of the 2nd Level MRI image set accuracy is discussed as under 2nd Level disease Burkett lymphoma disease images are scattered or have low pixel density. The impact of noise handling and smoothening is profound in this case. Without pre-processing less features are extracted but with noise handling more features are being extracted. The accuracy is improved by the margin of 4% than existing system. The plot for level 2 disease is given in the plot figure 5.2

ISSN: 0971-1260
Vol-22-Issue-3-July-2019

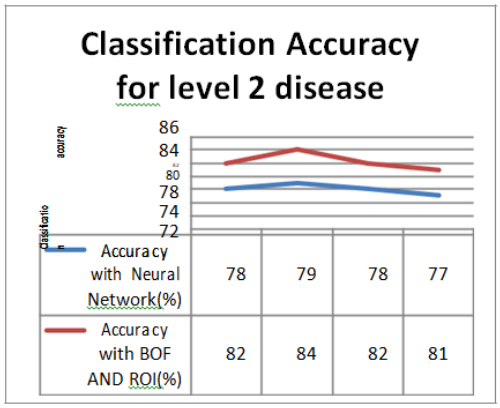

Figure 6: Classification accuracy for level 2 disease

Incase of 3rd Level image set accuracy is discussed as follows :The malignant images are clear and have least impact as pre- processing mechanism is deployed. The features from the images extracted as statistical and texture based features. The features are used for training and testing. The hold out rate is kept at 0.3 i.e 30% and testing and training imagesets are same. The classification accuracy is improved by the margin of 4%. The plot 5.3 indicates the classification accuracy for level 3 disease.

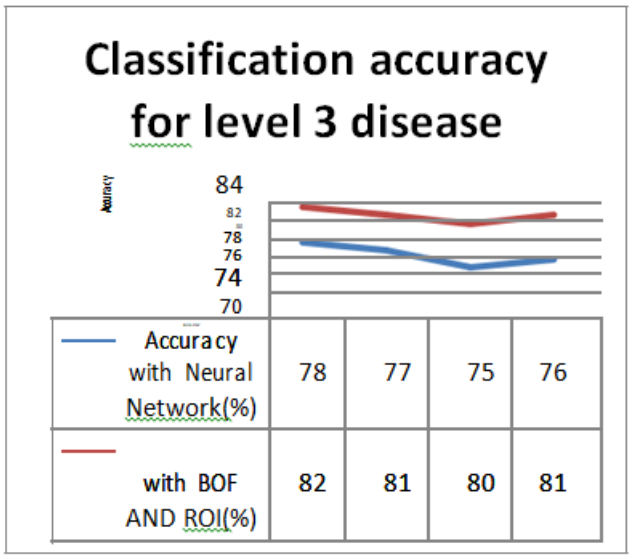

Figure 7: Classification Accuracy for level 3 disease

When the results are compared on the basis of features such as accuracy, sensitivity and specificity ,and its clear from the comparison plot that accuracy of classification of the proposed system is higher then the already implemented and used techniques So Multiple forcasting class mechanism shows the greater accuracy proves the worth of the study.

ISSN: 0971-1260
Vol-22-Issue-3-July-2019

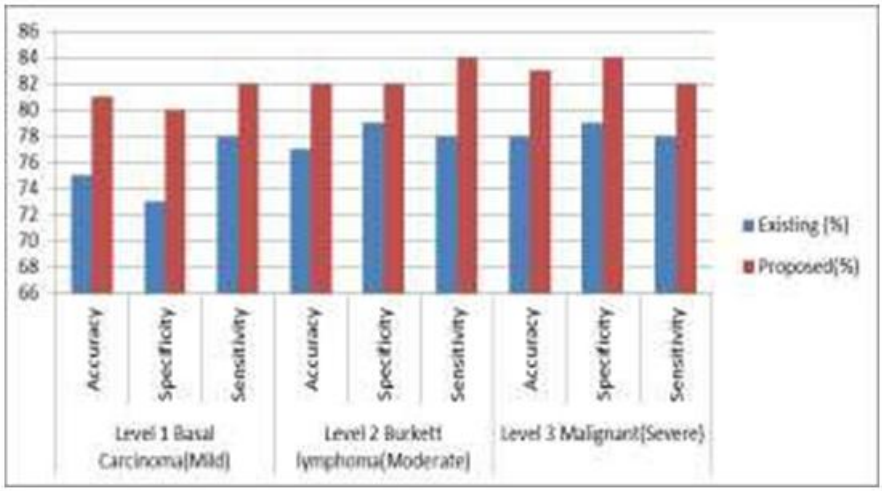

Figure8:Confusion matrix:

Confusion matrix is described in terms of rows and columns vectors. This matrix is obtained using aggregation of true positive and true negative values. The mechanism used to obtain specificity is dependent greatly upon true positive values. sensitivity is dependent upon true negative values and classification accuracy is obtained using aggregation of true positive and true negative values.

	TP	TN
Predicted Positive	23	1
Predicted Negative	4	1

Figure 9: Confusion Matrix

From the above results analysis ,it is clearly indicated that Deep learning in combination of Roi yields better results with F1 SCORE of 86.3% and classification accuracy of 87%.

VI. CONCLUSION

In this work, it is concluded that medical image processing is the field of image processing which detect various of disease from different type of images. Medical image processing can improve detection of small cysts in females by mixing and merging of various image segmentation techniques. The polycystic ovary detection has the two phases which are variable extraction and classification. In this research work, the approach is proposed for polycystic ovary detection using approach of classification. The proposed approach provides 87 % F1 score and Accuracy of 86.3%.

ISSN: 0971-1260
Vol-22-Issue-3-July-2019

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