OVARIAN CANCER STAGE BASED DETECTION ON CONVOLUTIONAL NEURAL NETWORK

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INTRODUCTION

Ovarian disease is the fifth most regular tumor influencing ladies today. Actually, ovarian disease is responsible for a greater number of passing than whatever other sort of female regenerative malignancy. According to the American Disease Society, 20,000 ladies are related to ovarian tumor consistently.

Ovarian malignancy is a tumor that starts in the ovaries. The ovaries are female generative organs set inside the pelvis, generally the measurements of partner degree almond.

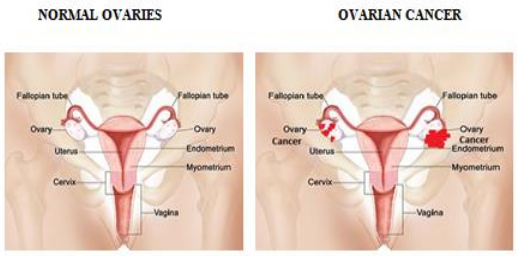

Fig .1 Anatomy of Women Organ[2]

New cells will start to shape superfluously, and old cells won't bite the dust at the correct time. This overabundance cell development could cause a tumor, which might be considerate or harmful. Harmful tumors are destructive and could be life-debilitating. In specific cases, threatening diseases can be isolates, yet quite possibly they could deliver back. Malignancy cells can likewise spread to different parts of the body and prompt genuine inside damage [1].

Cancer affects the body in different ways

Ovarian cancer will affect the body in three different ways:

Attack: A malignant tumor can quickly grow and attack healthy organs near the ovaries, like the uterus and Fallopian tubes.

Magnify: Cancer cells can breakdown off since the main ovarian tumor. These cells are likely to travel to the abdomen and create new tumors on nearby tissues and organs.

Spread: Once tumor cells have cracked off from the central tumor, they can simply spread throughout the lymphatic system to the pelvis, abdomen, and chest. Cancer cells can also penetrate the bloodstream and affect the liver and lungs [2].

Types of Ovarian Cancer

The ovaries are made up of three main kinds of cells. Each type of cell can develop into a different type of tumor:

A. Epithelial tumors
B. Germ cell tumors
C. Stromal tumors [3].

Ovarian cancer staging:

A. Stage 1: Limited to one or both ovaries
B. Stage 2: Limited to the pelvis
C. Stage 3: Disease outside of the pelvis, but limited to the abdomen, or lymph node involvement, but not including the inside of the liver
D. Stage 4: Disease spread to the liver or outside of the abdomen [4].

BACKGROUND

TABLE II. Computation between related papers in Ovarian Cancer

Author Name	Title Name	Technique Used	Parameters or Results
[5]	Automated characterization of ultrasound images of ovarian tumours: the diagnostic accuracy of a support vector machine and image processing with a local binary pattern operator	SVM, LBP	Mean Difference and Average Accuracy
[6]	A new hybrid global optimization approach for selecting clinical and biological features that are relevant to the effective diagnosis of ovarian cancer	MI-LDA And LDA	Accuracy and Detection rate
[7]	A new approach to evaluate drug treatment response of ovarian cancer patients based on deformable image registration	New image registration method and RECIST guideline.	Accuracy
[8]	Prediction of pathological stage in patients with prostate cancer: A neuro-fuzzy model	Neuro – Fuzzy system	Stage Detection

ISSUES IN OVARIAN CANCER

A. The detection on ultrasound image is hard to classify on the basis of clustering or segmentation. It can affect the FAR and FRR rate higher at the time of recognition from the knowledge base .

B. The working accuracy level is 90 to 95 of existing systems. It can be optimized, so the system can classify more accurately and efficiently.

C. The previous systems are not able to classify the stage of cancer. The stage identification helps to treat the patient more efficiently. So this enhancement can also optimize the performance of existing systems.

I. PROPOSED SOLUTIONS

Consider an original ovarian cancer image and perform various filtration and image segmentation algorithms on that image using Fuzzy c-means clustering algorithm, Edge detection, filtration process in the image at an irnage of scale. Scale is referred for medical images as a filter remains in-effective of this cancer detect in the particular image. Using a range of scale like 512*512 multi scale clustering and feature extraction algorithm is obtained to extract the image regions and areas respectively.

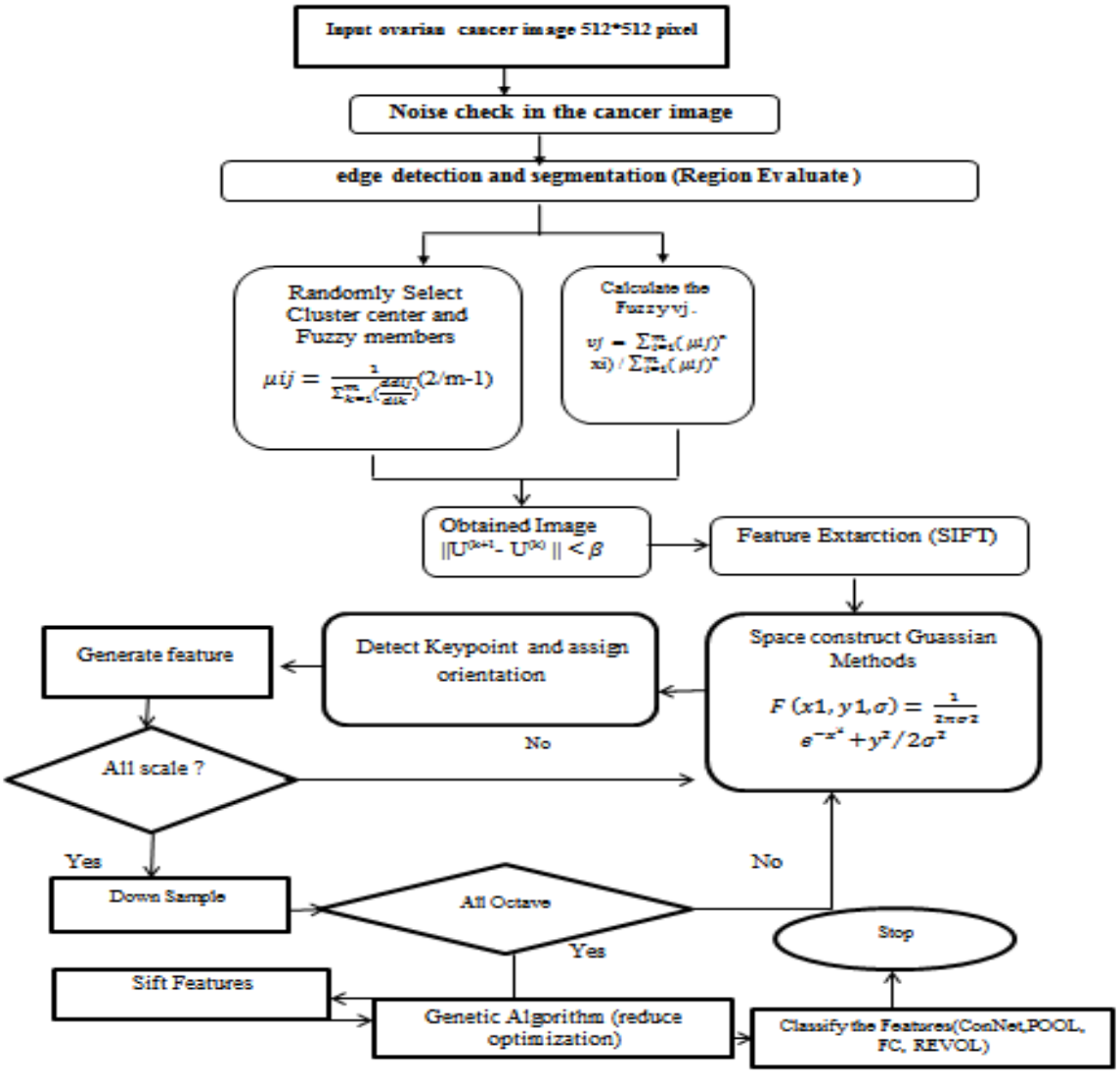

Fig 2. Proposed Flow Chart

Proposed Steps :

The following is the proposed methodology of the work to be done.

a. Image Acquisition

Step 1: First, select the image from the data set .

b. Image Preprocessing

Step 2: Upload the image of the dataset and convert RGB image into in grayscale format image

Step 3: Edge detection: It apply the canny edge detection means detects the edge based on minimum, maximum and average value. After edge approach, we remove the distortion and edge detection used to create the image noise free.

Step 4: Segmentation: The approach consists of adding a weighted regularization function to the standard FCM algorithm. This function is formulated to resemble the standard FCM objective function but the distance is replaced by a new one generated from the local complement or residual membership. The applied regularizing weight is a constant weight or alternatively an adaptive one. The adaptive weight is the Euclidian distance between the center prototype and the local image data mean. The regularizing function aims at smoothing out additive noise and biasing the clustered image to piecewise homogenous regions. Simulation results of clustering and segmentation of synthetic and real-world noisy images have been presented [9].

c. Feature Extraction

Step 5: It implement the feature extraction technique using SIFT algorithm.There are many features, stimulating opinions on the object, that can be extracted to provide a "feature" description of the object. This description can then be used when attempting to locate the object in an image containing many other objects [10]. There are many thoughts when extracting these structures and how to record them. SIFT

image features proposal a set of features of an object that are not artificial by several of the complications experienced in other approaches [10].

d. Optimized Features

Step 6:The genetic algorithm used for reducing the feature extraction matrix. Genetic algorithm used for three operators (Selective, Crossover and Mutation) function optimizes the dataset with the help of fitness function.

e. Classification

Step 7: The proposed a classification using convolutional neural network. In this approach classify the data in two phases:

(i) Training Phase

(ii) Testing Phase

Step 8: After classification, It evaluate the performance parameters based on Novel approach i.e accuracy, false acceptance rate , false rejection rate and mean square error rate and compare the base paper technique.

RESULT ANALYSIS

The images collected from Guru Gobind Singh Medical College and Hospital Faridkot . There is two type of images used. One is Normal Case means without cancer image and the second is malignant tumor. Total no. of images used 250 which have 50images of normal case and 50images of stage 1,50 images of Stage 2 ,50 images of stage 3 and 50 images of stage 4 .The database images generally includes the CT scan image of pelvis.

Fig .3 Dataset Ovarian Cancer (Stage)

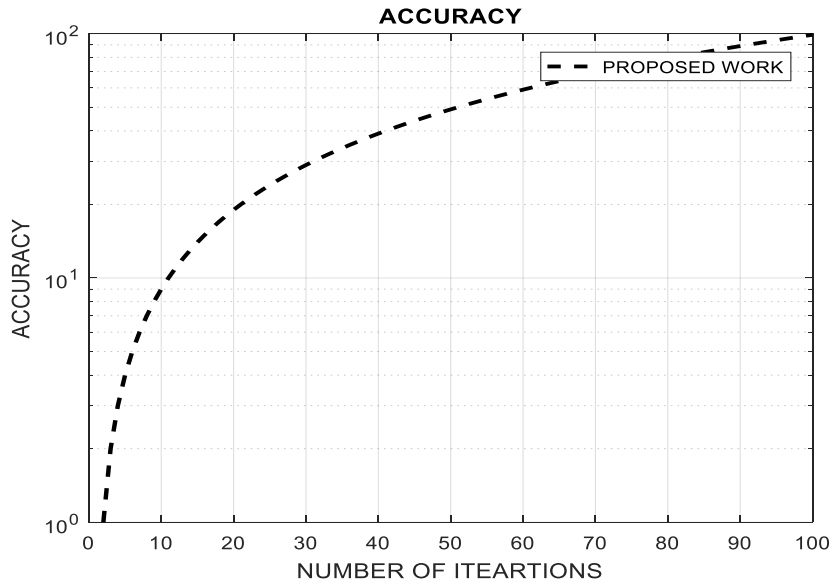

Fig. 4 Accuracy in CNN Proposed Work

The above figure shows that the accuracy calculate the based on reducing the error rate in the proposed work. It achieve the accuracy value is 98.01% with CNN (Classification Approach).

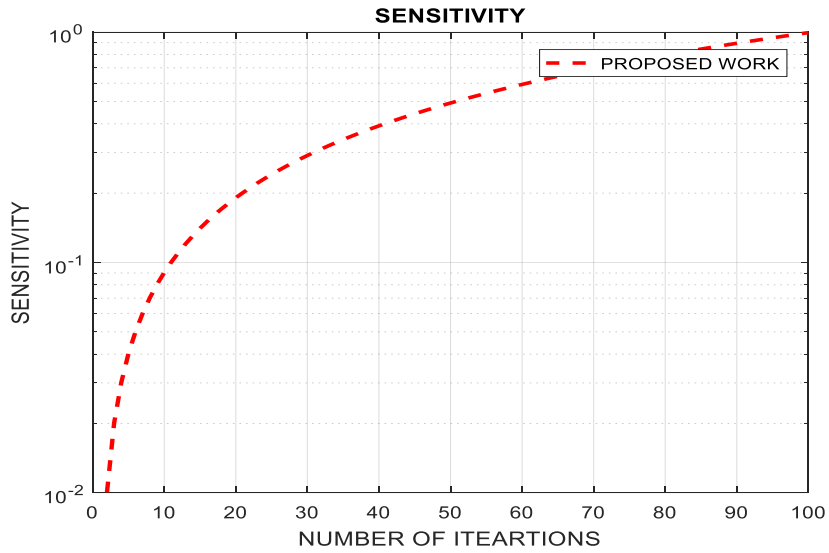

Fig .5 Sensitivity in Proposed Work

The above figure shows that the sensitivity performance parameters in proposed work.

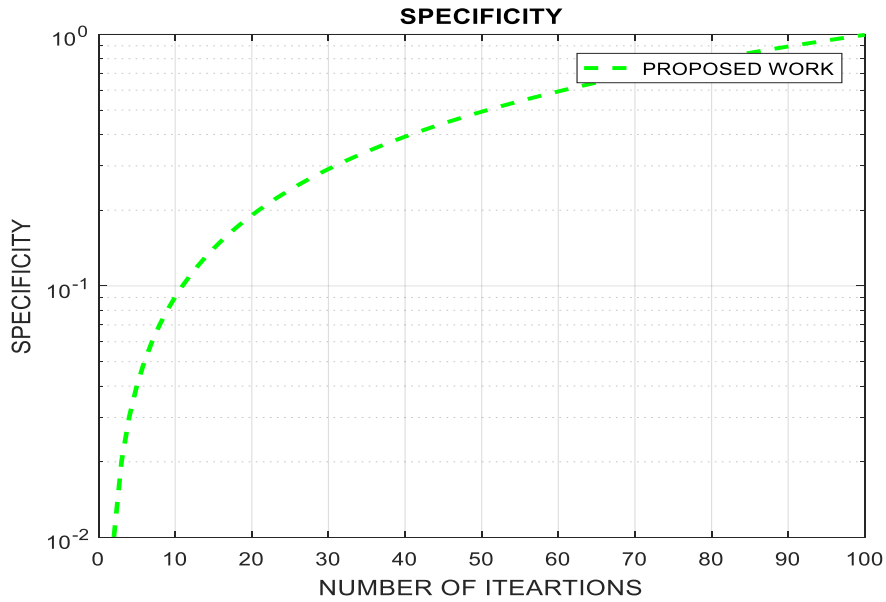

Fig .6 Specificity in Proposed Work

The above figure represents that the specificity in proposed work.

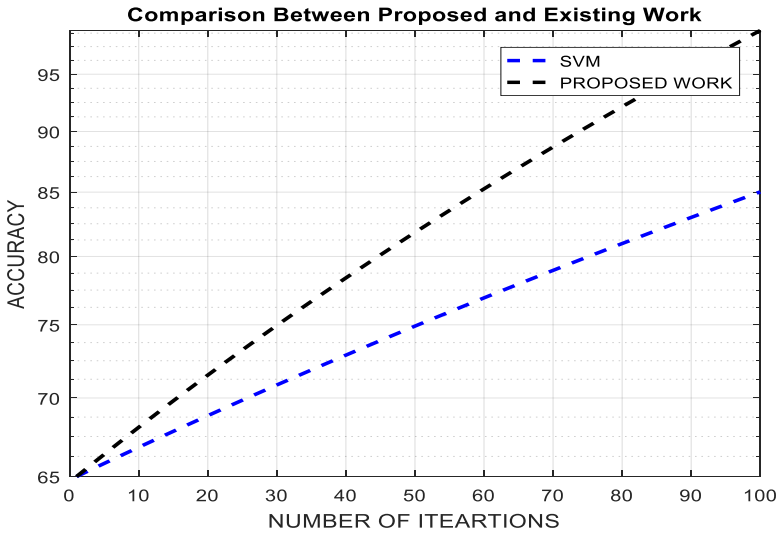

Fig .7 Comparison between proposed and existing work (Accuracy)

The above figure shows that the comparison between proposed and existing work in accuracy. It improves the performance parameters inaccuracy in CNN value is achieved 98% and SVM with accuracy performance value is 85.01%.

Table III: Comparison between proposed and existing work (Accuracy)

Number of iterations	Accuracy with SVM	Accuracy in CNN
20	68.6	71.52
40	72.68	78.38
60	76.93	85.26
80	80.97	92.13
100	85.02	99

CONCLUSION AND FUTURE SCOPE

The primary goal of this postulation was to propose a calculation to upgrade the ovarian disease pictures with a specific end goal to enhance the quality and distinguish the growth as per organize. In Image acquisition upload the image from

database. After this image Pre processing task was completed. The Preprocessing includes the canny edge detection means detects the edge based on minimum, maximum and average value. After edge approach, remove the distortion and edge detection used to create the image noise free. To detect region based on Fuzzy c means clustering methods. The performance measurement is depends upon the work performed on the developed system and passed information which are mainly belongs to training stages. Another working achievement which is followed by the author in this research to find various performance parameters. Here in the implement feature extraction technique using SIFT algorithm. In SIFT algorithm extract the feature based on key point forms with the help of rotation, assignment and orientation forms. We identify the optimized result based on genetic algorithm. Three operations used in optimize mutation, crossover and selection. We found the fit value using fitness function. After that we implement the CNN algorithm , to transfer the information in different -2 neurons and filter the output information in various layers.In last achievement The accuracy achieved with CNN classifier value is 98.8% and Accuracy with SVM value is 85.01%. We compare the performance parameters with Sentivity, specificity and accuracy.

In future scope, it will identify the AREA of the ovarian cancer. The second one it will implement the ROI with DWT to filter the image and detect the infected area in the particular cancer image. It can use FUZZY LOGIC for the training and testing process which will have high response time and high reaction time with less error probabilities.

REFRENCES

1. (2016) www.cancer.org. [Online] https://www.singaporecancersociety.org.sg/index.php
2. (2001-2007) www.babymed.com. [Online]. https://www.babymed.com

3. (2016) www.ocrfa.org. [Online]. https://ocrfa.org/patients/about-ovarian-cancer/types-ovarian-cancer/

4. (1996-2017) www.medicinenet.com. [Online]. http://www.medicinenet.com/ovarian_cancer/article.htm

5. Khazendar S1 et al., "Automated characterisation of ultrasound images of ovarian tumours: the diagnostic accuracy of a support vector machine and image processing with a local binary pattern operator," Facts Views Vis Obgyn, pp. 7(1):7-15, 2015.

6. Abeer Alzubaidi, Georgina Cosma, David Brown, and A. Graham Pockley, "A New Hybrid Global Optimization Approach for Selecting Clinical and Biological Features that are Relevant to the Effective Diagnosis of Ovarian Cancer ," IEEE, p. 1/16, 2016.

7. Maxine Tan* et al., "A New Approach to Evaluate Drug Treatment Response of Ovarian Cancer Patients Based on Deformable Image Registration ," IEEE, 2015

8. Georgina Cosma et al., "Prediction of Pathological Stage in Patients with Prostate Cancer: A Neuro-Fuzzy Model," plos one, p. 11(5), 2016.

9. R R Gharieb, G Gendy, and A Abdelfattah, "Image Segmentation Using Fuzzy C-Means Algorithm Incorporating Weighted Local Complement Membership and Local Data Distances," in World Symposium on Computer Applications & Research, Cairo, Egypt, 2016, pp. 6-11.

10. (2017) http://www.ed.ac.uk/. [Online]. http://homepages.inf.ed.ac.uk/rbf/CVonline/LOCAL_COPIES/AV0405/MURRAY/SIFT.html

11. Moore RG1 et al., "A novel multiple marker bioassay utilizing HE4 and CA125 for the prediction of ovarian cancer in patients with a pelvic mass," gynecol oncol, pp. 112(1),40-6, 2009.

12. Lauren Scheuer et al., "Outcome of preventive surgery and screening for breast and ovarian cancer in BRCA mutation carriers," Journal of Clinical Oncology, pp. 1260-1268, 2002