A REVIEW PAPER ON THE ROLE OF MEDICAL IMAGING IN VARIOUS SPECIALIZATION

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Abstract—The major aim of this paper is to analyze the major role where the medical imaging is applied in various specialization of different aspects. Through this paper we can clearly understand the importance of medical imaging which is mainly applied in Data Mining, Digital Image Processing and Soft Computing Approach.

Keywords—*Data Mining Technique, KPCA, IRS-FFT based feature extraction technique.*

I. INTRODUCTION

The main motivation behind medical image processing deals with selective visualization, further improvement of analysis and with the development of problem-specific approaches to the enhancement of raw medical image data. So many domain are available in medical image processing. They are applicable theory and some specific applications [1].

Imaging science visualizes an object and quantitatively characterizes its structure and/or function. Biomedical imaging applies imaging science to the presentation of and interaction with multi-modality biomedical images with a view to using them productively to examine and diagnose disease in human patients.

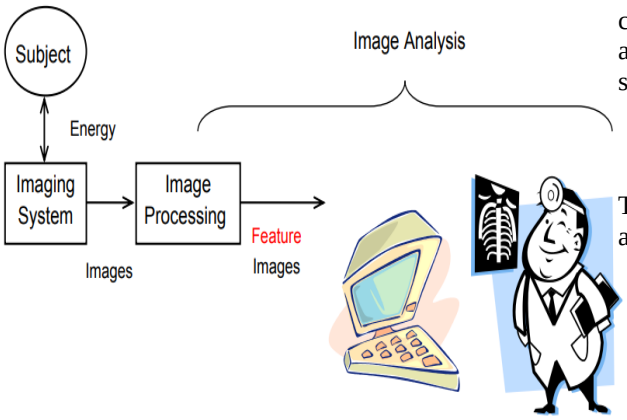

Fig 1.1 Medical Image Analysis

II. RELATED WORKS IN MEDICAL IMAGING

Vamsidhar Enireddy et al[2] made a study on the classification of compressed medical images. Haar Wavelet transform method is utilized for compression. Edge features are extricated using Sobel Edge detector and texture features are extricated using the Gabor Transforms. The features are used for classification of compressed medical images using CART, IBL, SVM, Naive Bayes, MLP-NN, RNN, and Modified RNN with BPTT. The image database consists of 6000 compressed medical images with five different classes are taken and classification accuracy of the different techniques are calculated. They finally conclude that the better classification accuracy is obtained from the RNN-BPTT with modified activation function.

Yungang Zhang et al [3] proposed a method based on a one-class kernel principle component analysis (KPCA) model. The effectiveness of the proposed classification scheme was verified using a breast cancer biopsy image dataset and a 3D optical coherence tomography (OCT) retinal image set. The combination of different image features exploits the complementary strengths of these different feature extractors. The results show a promising results with respect to the biopsy image classification task. The images applied in this work were taken from the original biopsy scans and mainly cover the major areas of the scans.

MohandassDivya et al[4] proposed a novel method called a modified IRS-FFT-based feature extraction Technique to enable telemedicine using soft computing approaches. Feature extraction was performed on the scan images called diffusion weighted imaging (DWI) scan images which performs stroke. Experiments were implemented with the collection of uncompressed and compressed images. The proposed methods proves from compressed images which efficiently extracts features and retrieves relevant images and provide a good support for telemedicine applications.

III. GOALS OF MEDICAL IMAGE ANALYSIS TECHNIQUES

The main goals of medical image analysis techniques are

- Quantification which deals with the measurement of features on medical images. For example, helping radiologists to obtain measurements from medical images either area or volume. It is necessary to extract objects from images by segmentation.
- Computer Aided Diagnosis (CAD) also deals with measurements and features for diagnosis the radiologists to obtain accuracy and efficiency.

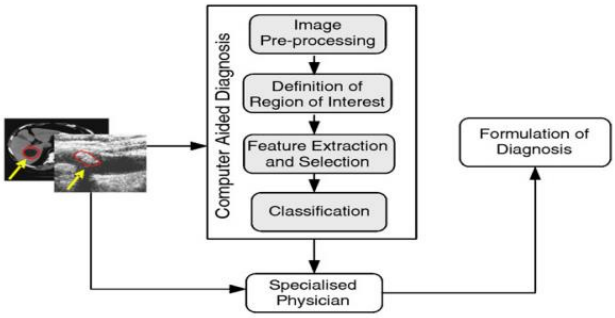

Fig 1.2 Procedure for Image Analysis Techniques

IV. REVIEW RESULTS OF VARIOUS SPECIALIZATION

The following table results in various specializations where the medical image processing plays a major role.

Table 1.1 Results of Medical Image in Data Mining and Neural Network [2]

Specialization	Techniques used	Results Obtained
Data Mining and Neural Network	CART, IBL, Naive Bayes, Support Vector Machine, MLP-NN, RNN-BPTT and modified activation function with RNN-BPTT	1. Compressed Medical Images taken – 6000 2. Classes taken – 5 3. Accuracy have been calculated 4. Better accuracy results are obtained from the Proposed RNN-BPTT with Modified activation function.
Medical Image : CT and MRI		
Advantage: Improvement in the classification accuracy, precision, increased recall and increase F-measure.		

The following medical imaging results obtained in the field of Data Mining and Neural Network

Table 1.2 Sample Results of Medical Image Processing in Data Mining and Neural Network [2]

Techniques Used	Classification Accuracy	Precision	Recall	F-Measure
CART	0.8173	0.81734	0.82116	0.81768
IBL	0.8107	0.81068	0.81448	0.81128
NB	0.8227	0.82268	0.82648	0.82304
C-SVM	0.836	0.836	0.83822	0.83622
mnSVM	0.832	0.832	0.83418	0.83232
MLPNN	0.8387	0.83866	0.84022	0.83896
RNN-BPTT	0.852	0.85466	0.85462	0.85292

The following table 1.3 shows the major role of medical image in the field of digital image processing

Table 1.3 Results of Medical Image in Digital Image Processing [3]

Specialization	Techniques used	Results Obtained
Digital Image Processing	One-class KPCA model	With the help of breast cancer biopsy image dataset and 3D OCT retinal image set the effectiveness of the proposed classification scheme was calculated.
Medical Image: A breast cancer benchmark biopsy images dataset, a 3D OCT retinal image set, and the breast cancer dataset (diagnostic).		
Advantage : • Proposed method of a classification scheme based on a one-class KPCA model ensemble for the medical images. • It obtained high classification accuracy on the given tested image sets.		

The following table shows the major role of medical image in the field of digital image processing

Table 1.4 Comparison of Classification Accuracy on the UCI breast cancer image set [3]

	MLPE	BoostNN	DT-SVM-SMO	Proposed
Classification Accuracy	**97.10**	**96.25**	**91.67**	**97.28**

The following results obtained in the field of Soft Computing approach

Table 1.1 Results of Medical Image in Soft Computing[4]

Specialization	Techniques used	Results Obtained
Soft Computing Approach	IRS-FFT-based feature extraction Technique	Accuracy for compressed medical images is obtained by the proposed CBIR system. Compressing images for transmission in limited bandwidth is a norm in telemedicine.
Medical Image: A set of 52 DWI scan images consisting of 25 positive stroke patients was used.		
Advantage: minimize bandwidth utilization.		

The classification accuracy, precision, and recall are computed as

$$\text{Classification accuracy} = \frac{\text{Number of correctly classified samples}}{\text{Total number of tested samples}} \times 100$$

$$\text{Precision} = \frac{\text{Number of relevent images retrived}}{\text{Total number of images retrieved}}$$

$$\text{Recall} = \frac{\text{Number of relevent images retrived}}{\text{Total number of relevent images in the database}}.$$

With the help of the above formulae the classification accuracy of the several proposed feature extraction technique is high. The graphs show the proposed classification accuracy together with the existing MLP neural network using conventional FFT and the proposed IRS-FFT for both compressed and uncompressed images.

Conclusion

In this paper we have shown the major role of medical imaging in Data Mining, Neural Network, Digital Image Processing and Soft Computing Approach. When we apply data mining technique, we can be able to detect and classify each one. Furthermore the convention of Soft Computing Based Medical Image Analysis includes image enhancement, segmentation, classification-based soft computing, and application in diagnostic imaging, as well as an extensive background for the development of intelligent systems based on soft computing used in medical image analysis and processing. Finally, we conclude that applying medical image through various specializations can predict, screen or diagnose diseases earlier.

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