A SURVEY ON CANCER CLASSIFICATION USING SOFT COMPUTING TECHNIQUES

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ABSTRACT: In image processing domain plays a vital part of real time applications in modern world. Such image processing technique helps to carry process on the digitized image to provide better solutions. Various techniques resembles to be tool for image processing, most of these are involves in enhancing the clarity of image, noise free images and compressing the original image to compressed data in order to reduce the storage space. Cancer is a group of diseases involves abnormal growth of cells with the potential to invade or spread to other parts of the body. These contrast with benign tumors, which do not spread other parts of the body. Possible signs and symptoms include a lump, abnormal bleeding, prolonged cough, weight loss and a change in bowel movements. Over 100 types of cancers affect humans. Soft Computing is a branch of artificial intelligence that employs a variety of statistical, probabilistic and optimization techniques that allows computers to "learn" from past examples and to detect hard-to-discern patterns from large, noisy or complex data sets. This survey paper presents the brief overview and applications for cancer diseases using soft computing techniques.

KEYWORDS: Cancer diseases, soft computing, classification of cancer.

1.INTRODUCTION

Cancer is a term for a large group of diseases, whose causes, characteristics and occurrence can vary greatly. There is no completely clear definition of cancer. Cancer is particularly a disease of older people. Due to population ageing, we have seen an increase cancer diseases and leads to death.There are over 260 000 people in Finland who have had cancer at some stage in their lifetime. There are two kinds of cancer genes. Oncogenes are cancer generating genes, whose activation causes an uncontrollable distribution of cell tissue; Tumour suppressor genes or anti-cancer genes whose cancer inducing effect is due to the cessation of their activity ceases. Cancer is of different types. They are Anal cancer, Breast cancer, Cervical cancer, Eye cancer, lung cancer, Skin cancer etc… Skin cancer have different types.There are actinic keratoses, basal cell carcinoma, squamous cell carcinoma, melanoma and so on.

1.1 CHARACTERISTICS OF SOFT COMPUTING

Human expertise

- Soft computing utilized human expertise in the form of fuzzy if then rules as well as inconventional knowledge representations
- To solve practical problems.

Fault tolerance

- Fuzzy and Neural networks exhibit this property.
- Deletion of a neuron in a neural network or a rule in fuzzy inference system does not destroy the system.
- Performance quality deteriorates.

Biologically inspired computing models

- Biological neural networks-artificial neural networks.
- Perception, pattern recognition, non linear regression and classification problems.

New optimization techniques

- Genetic algorithm
- Simulated annealing
- Random search
- Down hill simplex method

Model free learning

- Neural networks and adaptive fuzzy system have ability to construct models using only target system sample data.

1.2 APPLICATIONS OF SOFT COMPUTING

- Handwriting Recognition
- Image Processing and Data Compression
- Automotive Systems and Manufacturing
- Soft Computing to Architecture
- Decision-support Systems

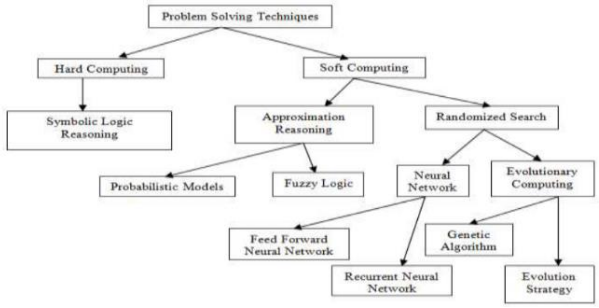

FIGURE 1: Techniques of problem solving computing

2.LITERATURE SURVEY:

Vibha Gupta and **Arnav Bhavsar** [1] proposed the use of colour-texture features and an ensemble classifier framework for classification of breast cancer histopathology images. While we demonstrated the effectiveness of using several features and classification, importantly, we provided various experimental studies which indicates some interesting aspects about the role of optical magnification in classification. From this experiments, it is apparent that with suitable features within an ensemble classification framework, the classification can be made largely magnification invariant, more so for magnification factors than others. The magnification models are learnt in this manner yield performance similar to the magnification independent model. We believe that this is an interesting study which raises some questions about scale invariance properties of feature-classifier combination, role of ensemble classification, considering that the magnification specific model required to relatively less training than the magnification independent model. It can also have important implications for breast cancer histopathology diagnosis systems.

Yungang Zhang , Bailing Zhang , Frans Coenen ,Wenjin Lu et al [2] proposed two-stage method used a serial approach where the second classifier ensemble is only responsible for the patterns rejected by the first classifier ensemble. The first stage of the ensemble learning consists of binary SVMs which were trained in parallel, while the second ensemble comprises MLPs. During classification, the cascade of classifier ensembles received randomly sampled subsets of features following the Random Subspace procedure.

Gaurav Agarwal et al [3] proposed the inadequacies of health care infrastructures and standards, sociocultural barriers, economic realities, illiteracy, and the differences in the clinical and pathological attributes of this disease in Asian women compared with the rest of the world result in a different spectrum of the disease. Better socio-economic conditions, health awareness of breast cancer screening in developed Asian countries seem to be the major causes of a favorable clinical picture and outcomes in these countries.

J.Padmavathi et al [4] proposed the sensitivity and specificity of both neural network models had a better predictive power compared to logistic regression. Even it can compared on an external dataset, the neural network models performed better than the logistic regression. When comparing, RBF and MLP network models, we analyze that the former output forms the latter model both in test set and an external set. This study denotes the good predictive capabilities of RBF neural network. The limitation of the RBF neural network is that it is more sensitive to dimensionality reduction and has greater difficulties if the number of units is large.

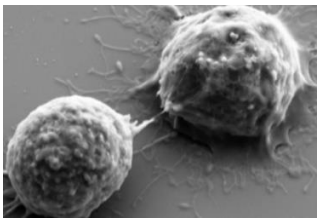

FIGURE 2: Cancer cell image

Christoph Baur et al [5] introduced a novel concept for learning from crowds.The new multi-scale CNN Agg Netis designed to handled at a aggregation directly as part of the learning process via an additional crowd sourcing layer. In this study, we have further presented valuable insights into the functionality of deep CNN learning from crowd annotations and proven the impact of our novel aggregation scheme. To the best of knowledge, this is the first time deep learning has been applied to generate a ground-truth labeling from non-expert crowd annotation in a biomedical context.

Fabio A. Spanhol, Luiz S. Oliveira, Caroline Petitjean, Laurent et al [6] have presented a set of experiments conducted on the BreaKH is dataset using a deep learning approach to avoid hand-crafted features. We have shown that could use an existing CNN architecture, in our case AlexNet, that has been designed for classifying color images of objects, and adapt it to the classification of BC histopathological images. We have also proposed several strategies for training the CNN architecture, based on the

extraction of patches obtained randomly or by a sliding window mechanism, that allow to deals with the high pixel resolution of these textured images without changing the CNN architecture designed for low-resolution images.

Eleni Linos et al [7] examined the validity of this model in Chinese women by using data from the SWHS. The SWHS is a cohort of 74 942 adult Chinese women from urban areas who were recruited between 1997 and 2000 and are interviewed in person every 2 years to collect personal and health-related information (20). We applied the Rosner–Colditz model to the Shanghai cohort to predict the expected annual incidence of breast cancer for each cohort member. We calculated the cumulative incidence rates and expected number of cases for breast cancer in the entire cohort for each year from the year of recruitment up to 2004.

Stolz et al [8] indicated that 96% of asymmetry in melanoma cases had score 2 (both axes represent asymmetry) while it was just about 24.2% in benign images. Many researches considered asymmetry according to the axis of symmetry in the cancer. In such studies, the axis of symmetry may be identified using Fourier transform, best-fit ellipse, diameter length and principal axis. Post that, both created areas by the axes are differentiated. In many studies, the roundness, compactness and thinness of lesion have been considered as appropriate properties of skin cancer images and in they have been considered as accurate geometry variables. In the symmetry distance (SD) was introduced as another measure in images.

Apoorva Raikar et al [9] proposed an image based system implementing diagnostic method is discussed for the automatic detection of melanomas as support to clinicians. A new diagnostic method defines a set of seven features, based on color, texture parameters, which describe the cancerous growth. As Dermoscopy is an in vivo method for the early diagnosis of malignant melanoma and the differential diagnosis of pigmented lesions of the skin, it has to increase the diagnostic accuracy over clinical visual inspection by experienced physicians.

Siti Noraini Sulaiman and Nor Ashidi Mat Isa et al [10] proposed a new clustering algorithm called Adaptive Fuzzy-K- means clustering for image segmentation which could be applied on general images and/or specific images captured using different consumer products. The algorithm gives the concepts of fuzziness and belongingness to provide a better and more adaptive clustering process as compared to several conventional clustering algorithms.

Abdul et al [11] have recommended a technique in which early detection of Skin Cancer using Artificial Neural Network. The diagnosing methodology uses Image processing technique and Artificial Intelligence. This describe the dermoscopy image of skin cancer is taken and it subjected to various pre processing for noise removal and image enhancement.

Nilkamal et al [12] have described the past and present technologies for skin cancer detections along with their relevant tools. This design new approach for Skin Cancer detection and analysis from given photograph of patient's cancer affected area, which can be used to automate the diagnosis and theruptic treatment of skin cancer. The proposed scheme is using Wavelet Transformation for image improvement, de noising and Histogram Analysis whereas ABCD rule with good diagnostic accuracy worldwide is used in diagnostic system as a base and Fuzzy Inference System for Final decision of skin type based on the pixel color severity for decision of Benign or Malignant Skin Cancer.

Ada and Ranjeet Kaur et al [13] proposed a computational procedure that sort the images into groups according to their similarities. In this system, Histogram Equalization is used for preprocessing and feature extraction process and neural network classifier to checks the state of a patient in its early stage whether it is normal or abnormal. The prediction is performed and the survival rate of a patient by extracted features. Experimental analysis is designed with dataset to evaluate the performance of the different classifiers. The performance is based on the correct and incorrect classification of the machine classifier. In this paper Neural Network Algorithm is implemented using open source and its performance is compared to other classification algorithms such as SVM, decision trees etc. Finally it gives the best results with highest TP Rate and lowest FP Rate and in case of correctly classification, it gives the 96.04% result as compare to other classifiers.

Aqeel Mohsin Hamad et al [14] proposed neural network and fuzzy logic based lung cancer detection techniques. Neural network has been used as a classifier to segregate the normal and abnormal stage of the lung cancer.Fuzzy logic Rule based system used for diagnose the other than cancer such as Coughing up blood, Shortness of breath, Pain in Chest, Hoarseness, Weight loss,etc., with the help of membership functions.

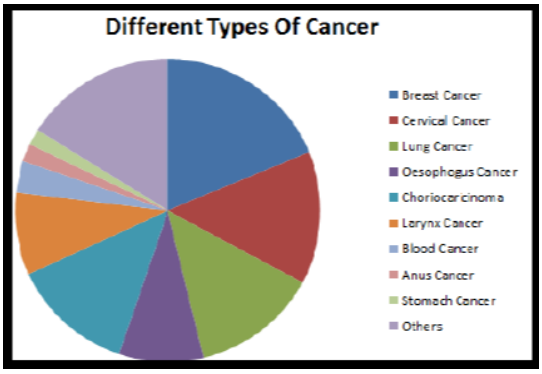

FIGURE 3 : Different types of cancer

Amutha and **Wahidabanu et al [15]** has proposed level set Active shape model for the identification of lung tumor. This system depended on the part capacity having the base mean square error value. At that point second request components were computed which depended on the histogram equalization of the noise free image. The classification between the normal and abnormal lung cancer image was made on these components.

3. COMPARATIVE STUDY OF SOFT COMPUTING TECHNIQUES

S.No	Algorithm	Adavantages	Disadvantages
1.	Neural Networks	Good speed, easy to use, does not need any user action.	It takes more time.
2.	ROI, Neuro Fuzzy classifier	Uses readily available accounting figures, Acceptable	Computational time for larger data set was more.
3.	Artificial neural network	Neural networks are systems that can acquire, store, and utilize knowledge	Do not have any hidden layers.
4.	Genetic algorithm	Easy to umderstand, chances of getting optimal solutions are more.	Genetic algorithms do not scale well with complexity
5.	Multilayer Perceptron	The main advantage is they can be used for difficult to complex problems. However, they need long training time sometimes.	Cannot be parallelized

TABLE 1: Various soft computing techniques used in cancer classification

4. CONCLUSION AND FUTURE WORK

CONCLUSION

Cancer is the very most dangerous diseases, so early detection of this diseases is necessary. But the detection of skin cancer is most difficult task. From this study, it is concluded that the soft computing intelligence techniques plays a major role in disease classification and prediction. In this paper various cancer segmentation and detection techniques are to be implemented and analyzed in an very efficient manner. Many experimental researches attempt to build automatic cancer detection and improve the accuracy of diagnosis. The literatures on these attempts are reviewed. The conducted survey indicates feature selection methods can improve the classification complexity through minimizing the utilized number of features.

FUTURE WORK

The future work of this paper is to improve classification of the cancer diseases and accuracy of images using Morphological neural network.. However, a classification method affects the performance gain in terms of accuracy. Through this literature review, using morphological neural network increases the parameter, statistical and geometric features like mean, brightness, skewness, kurtosis, area, perimeter.

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