

CERVICAL CANCER PREDICTION SYSTEM USING CONVOLUTIONAL NEURAL NETWORK

Meghana Shetty*¹, Ranjith N*², Rifthashia*³, Snehal*⁴, Sharon C D'Souza*⁵

*^{1,2,3,4}Student, Computer Science and Engineering, AJ Institute of Engineering and Technology, Mangalore, Karnataka, India.

*⁵Professor, Dept of Computer science and engineering, A J institute of engineering and technology, India.

ABSTRACT

Cervical disease (CC) is one of the most well-known malignancies on the planet which cause riskier to the human existence and can be very difficult to cure once the cancer sets in our body. To work on the location and expectation of the sickness, this interaction was acquainted with work on the analytic exactness of Cervical Cancer in such dataset pictures. Thus, we attempted to propose a wise and effective grouping model for Cervical Cancer in view of convolutional brain organization (Convolutional Neural Network) with somewhat basic design contrasted and others. Likewise, we proposed a simple and functional technique for the grouping of Cervical Cancer from cytological pictures with effective component extraction or exact cell picture division work. This system aims to predict cervical cancer with good accuracy and precision and it also shows the stage the cancer is on. Once the stage has been detected, the system then goes on to automatically generate the diagnosis step that the patient can take. Thus, helping patients take necessary steps in order to cure themselves of this deadly disease before it become life threatening. The programmed cell identification results are contrasted and the physically commented on ground truth and other cutting edge cell location calculations.

Keywords: Cervical cancer, Convolutional Neural Network, Segmentation, Machine Learning, Image processing.

I. INTRODUCTION

Medical diagnosis is a vital and a very complicated task which needs precise identification. Today cancer is one of the most prevailing diseases when it comes to case of incidence as well as death. In women the second most prevailing cancer after breast cancer is the cervical cancer. It is critical to diagnose the disease at appropriate time and to be preserved at the earliest. This project will use Machine Learning algorithms to train the model by providing different datasets and finally after comparing and processing the data provide, system will predict if the person is suffering from Cervical Cancer and also detects the stage of Cancer, after which the system will automatically generate the further diagnosis steps the patient can take to cure the disease. The application is user friendly and can be used by hospital administrator to easily provide the input to the system and based on that the system will predict if the person is afflicted with the disease. Instead of manual-identification which is not so fast, this system will provide accurate and efficient result. Our system uses techniques of image processing to achieve accurate results. Image processing operations can be generally partitioned into three major categories, Image Compression, Image Enhancement and Restoration, and Measurement Extraction. It involves reducing the number of memory needed to store a digital image. Image defects which might be caused by the digitization process or by faults within the imaging set-up (for example, bad lighting) is corrected using Image Enhancement techniques. Once the image is in good shape, the Measurement Extraction operations is used to extract useful information from the image.

II. LITERATURE SURVEY

Image Processing [1] is one of the effective techniques to differentiate the cancer cells from the regular ones. Cell images are taken from Pap smear screening and they are removed of any noise present in them. Then these images undergo segmentation where the nucleus, cytoplasm or other features are extracted. Shapes, colors and other features of the cell are compared, Texture Analysis is performed and finally the images are classified as cancerous or not. Classification of the cell images is done using as Naïve Bayes Classifier which is considered to be an efficient ML algorithm.

The Convolutional Neural Networks [2] are performed to label the cervical cells in cytology photos. This method straightforwardly works on crude RGB channels inspected from a group of rectangular photos fixes

coarsely fixated on each center. A Convolutional Network pre-organized on ImageNet is optimized to separate patches with unusual and normal cells in terms of deep, numerous level highlights. Classification of cell images is more accurate due to ConvNet's dense network. The check returns an accuracy of 98.3% on Herlev dataset and 98.6% on HEMLBC dataset, outperforming the beyond nice correct price of 96.8% and 94.3% on the 2 datasets, separately.

Image Processing [3] is used for recognition and extraction of disorder cells from MRI Prostate photos and completed via means of making use of the MATLAB programming. The proposed technique differentiates and performs extraction of Prostate disorder cells from a patient's MRI image of the Prostate organ. This proposed method joins with a few clamor evacuation capacities, and department and morphological capacities which might be very effective in detecting the cancer from the MRI images.

Neural Networks [4] are one of the typically applied Soft Computing Techniques, which are applied successfully in a vast scope of utilization related with analysis and prediction of cervical cancer. Cervical Cancer is a silent disease that does not reveal any worsening or symptoms until it turns serious. Thus the early prognosis or exam is the main movement to save you in the beginning stages. Neural Networks models like Multi-Layer Perceptron (MLP), Probabilistic Neural Network (PNN), Radial Basis Function (RBF), and Linear Vector Quantization (LVQ) networks are used in detecting the cancer from the cervical cells. Correspondingly reduced Cervical Pap smear Dataset using Fuzzy Edge Detection method is used for segmentation and processing of the cell image.

Deep Learning architecture [5] have been used to analyze a cervical cell image and perform image processing to detect Cervical Cancer. Convolution Neural Network models are considered to most effective when used for analyzing the cervical cells and detecting cancer. The existing methods have been thoroughly researched in order to come up with the suitable technique to analyze the image and give accurate results. CNN is a supervised multilayer perceptron that makes use of very little pre-processing to detect the cancerous pattern in the cell. CNN architecture takes a cell image and performs pre-processing to remove the noise and to enhance the image. The features of the cells are extracted to determine if the cells show any signs of cancer

CNN [6] is one of the most suitable self-learning algorithms in ML that can be used in predicting Cervical Cancer. This system presents an automated system that will detect cervical cancer with image processing. The cell image acquired from women was passed through the shallow layer of CNN to classify whether they were cancerous. This layer of CNN is expected to give high accuracy and precision in predicting Cervical Cancer.

X-ray [7] is a normally used method of imaging in clinics; the sensitive tissue comparison and painlessness are the big advantages of X-rays. The radiologist analyzed the X-ray to recognize the presence of growth of strange tissues. Another method that is used is Texture analysis, where the pictures obtained from the imaging are measured with the variation in the surface. After inputting the image from the dataset they are enhanced and features are extracted using GLCM method. The advantage here is it speaks about the segmentation process which gives better result in segmenting the image and simulation process which can be implemented in this project.

The importance of Segmentation [8] cannot be overstated when it comes to examination of cervical cell images to detect cancer in them. It works on taking the nucleus and cytoplasm areas of the cell and it is compared with normal cell to check the difference. This difference-ratio is used to determine if the cell shows any signs of cancer. Fuzzy C Means clustering method is used to perform segmentation on the cervical cells.

The MATLAB® Image Processing Toolbox [9] was utilized to fragment the computerized pictures and calculate different statistical data. By comparing cell nuclei distribution and taking into account the shape and size features MATLAB® can be programmed to distinguish normal cervical cell to abnormal ones. The analysis of Pap smear images of cervical region based on cell nuclei distribution and shape and size analysis. Pap smear test is a proficient and simple methodology to identify any irregularity in cervical cells. But human observation is not always satisfying and it is a tedious task to manually analyze a large number of Pap smear images. The proposed approach is implemented in MATLAB, a high level, interactive environment for data visualization/analysis/computation.

Malignant cells [10] are detected by nuclear enlargement and color density of nuclei, and distinguish between positive images and negative ones Cells first and foremost should be separated into the blue cells and red ones

since cells are colored in various tones based on sort of cell: superficial, moderate squamous and basal cells. Nuclei are then extracted by super pixel segmentation. By using super pixel segmentation, each nucleus is segmented into one pixel length and nuclei can be extracted more accurately.

Classification [11] is divided in to two steps training and testing. Training is the one where we tell the classifier what steps are taken to classify images. In testing, we give an input and test the class. Here whatever the features are extracting it consists of a trained matrix. After training feature library is created. The trained image is classified using K-NN and ANN classifier.

Support Vector Machine (SVM) [12] is supervised learning method and one of the kernel-based techniques in machine learning algorithms. The combination of texture and shape features is extracted from each image. It has 44 features. The cervical cancer affected images are found using SVM classifier.

Pre-processing [13] The Input Image presents a set of weak features which need to be strengthened so that features can be extracted more accurately. To reduce the running time it is better that we focus just on the areas of interest as opposed to the entire image. The pre-processing technique uses imresize and im2bw modules to first converts the image to Gray scale color model and then filters the noise with the help of filters and then uses a set of morphological operators to strengthen the image.

Local feature Extraction [14] is performed in which features like mean, standard deviation, area, centroid of nucleus is extracted and is used in Convolutional Neural network for image processing to achieve higher accuracy in image segmentation.

Histogram of Oriented Gradients [15], also known as HOG, is a feature descriptor. It is used in computer vision and image processing for the purpose of object detection. The HOG descriptor centers around the structure or the shape of an object. For the areas of the picture, it creates histograms utilizing the size and directions of the gradient.

III. METHODOLOGY

Input Image

The cervical cell image loaded from the dataset will be the input to the system.

Pre-processing

The system processes the input image by resampling that is the process of adding or subtracting pixels from an image, when an image is resampled, it's width and height are increased or decreased.

Segmentation

To be relevant and useful for image analysis and interpretation, segmentation divides an image into discrete sections, each having pixels with comparable properties.

Data Augmentation

Performs centroid feature extraction where it locates the centroid of each zone and calculates the distance and angle between the starting and finishing points

Classification

Finally, CNN Classifier is used to recognize if the affected region is normal, Pre-Cancerous or Malignant. After which the system will show the stage of cancer and automatically generate diagnostic steps that has to be taken.

IV. RESULTS AND DISCUSSION

System should be able to Process the input cell image by resampling that is enhancing the image by increasing or decreasing its size. Perform segmentation which divides an image into discrete sections, each having pixels with comparable properties. Then the system does feature extraction to locate the centroid and angle of the nucleus. Finally, the system should be able to classify the cell as cancerous or not. Once the system detects cancer it also predicts the stage of cancer. System should automatically generate diagnosis steps that has to be taken. Finally, performance analysis is performed which shows the performance and accuracy

V. CONCLUSION

Cervical cancer is one of the most common malignant tumors in the world, more dangerous to human life. The proposed method aims to make the cell detection possible with the best accuracy. This system is a smart and

efficient classification model for cervical cancer based on Convolutional Neural Network (CNN) with relatively simple architecture compared to other ML algorithms like SVM. This system is a simple and practical method that can be used by medical staffs for classifying cervical cancer from cytology with accurate cell image segmentation. Unlike the other CNN-based method that used only raw image data as input, our method combines raw image data with segmental masks of the nucleus and cytoplasm as input. The input images are refined on the cervical cell image dataset and form the final network output. Our system can accurately predict the stages of cervical cancer and give the appropriate diagnosis for each stage.

VI. REFERENCES

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