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VISUAL FEATURE EXTRACTION AND CLASSIFICATION ON CANCER IMAGE USING CNN

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ABSTRACT

The visual feature extraction and classification on cancer image using convolutionary neural network is a very powerful tool to detect the cancer cells in the image. It is developed in python. We apply image processing technique for auto-detecting the tiny nodules, which may present the information of cancer in the early stages. The newly developed ridge detection algorithm is to diagnose indeterminate nodules correctly, allowing curative resection of early-stage malignant nodules and avoiding the morbidity and mortality of surgery for benign nodules. This paper presents two hybrid techniques for the classification of the images to predict if cancer exists. The proposed hybrid techniques consist of three stages, namely, feature extraction, dimensionality reduction, and classification.

Keywords: Convolutionary neural network (CNN)

INTRODUCTION

Cancer is a disease in which a group of cells display uncontrolled growth (division beyond the normal limits), invasion (intrusion on and destruction of adjacent tissues), and sometimes metastasis (spread to other locations in the body via lymph or blood). If the tumor is developed in breast its so-called breast cancer. Aside from

Non-melanoma skin cancer, breast cancer is the most common form of cancer in women. Breast cancer is one of the main causes of cancer death for women. It is the second most common cause of cancer death in white, black, Asian/Pacific Islander, and American Indian/Alaska Native women. The earlier detection of the disease is very important to prevent a fatal condition of the sufferer. The existing cancer detection methods needs special medical test such as blood test. But most of the cancers are not diagnosed in the earlier stage. Many cancers are not diagnosed in earlier stages in existing methods.

PROPOSED METHODOLOGY

An efficient lung cancer detection and prediction algorithm has been built using MATLAB, where we utilize image processing technique. Multi-stage classification has been used to detect lung cancer. The prediction of the lung cancer has been done with this algorithm. If there is no cancer affected cell in the input image, the algorithm then checks the probability of lung cancer. If cancer affected cell has been found, the algorithm then check the corresponding stage of the cancer such as initial, middle and final stage. Before

every stage of classification image enhancement and segmentation has been done using several techniques. Image scaling, color space transformation and contrast enhancement has been used for image enhancement. Threshold and marker-controlled watershed based segmentation have been used for segmentation.

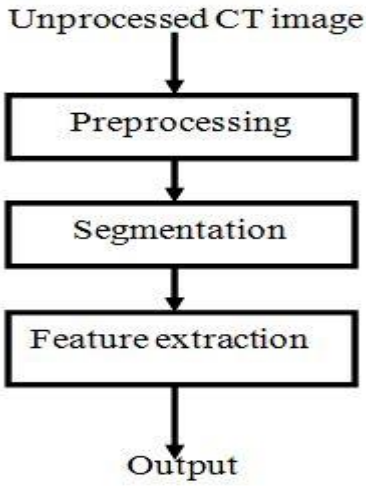

Figure 1. Block diagram of proposed methodology

IMAGE PRE-PROCESSING

The acquired image needs to undergo several filtering to make the image easier to process and generate more accurate results. Preprocessing involved the steps as shown in Figure 2.

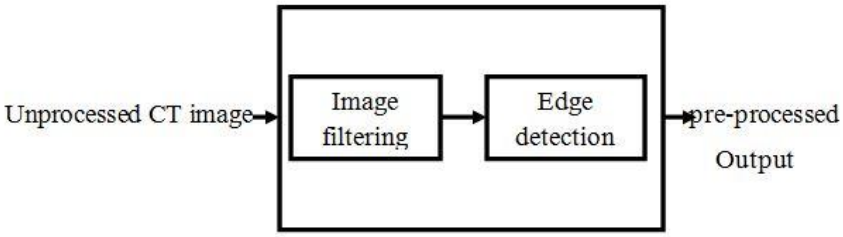

Figure 2. Block diagram of image pre-processing

a. Image Filtering

The median filter is a best known to remove salt and pepper noise in image processing. It is also the foundation upon which more advanced image filters like unsharp masking, rank-order processing, and morphological operations are built. Higher-level applications include object segmentation, recognition of speech and writing, and medical imaging. On account of its simplicity, its edge preservation property and its robustness to impulsive noise, the standard median filter remains among the favorites for image processing applications.

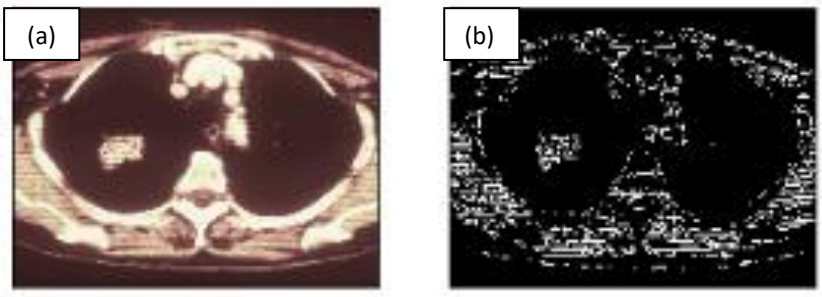

Figure 3. (a) Original CT image of Lung, (b) Lung image after median filtering

b. Edge detection

Laplacian Operator is also a derivative operator which is used to find edges in an image. The major difference between Laplacian and other operators like Prewitt, Sobel, Robinson and Kirsch is that these all are first order derivative but Laplacian is a second order derivative.

IMAGE MANIPULATION AND SEGMENTATION

a. Image Manipulation

Medical image manipulation targets the problems of low contrast and high level noise in a medical image. This achieves better quality image by either suppressing the noise or increasing the image contrast, histogram equalization is used.

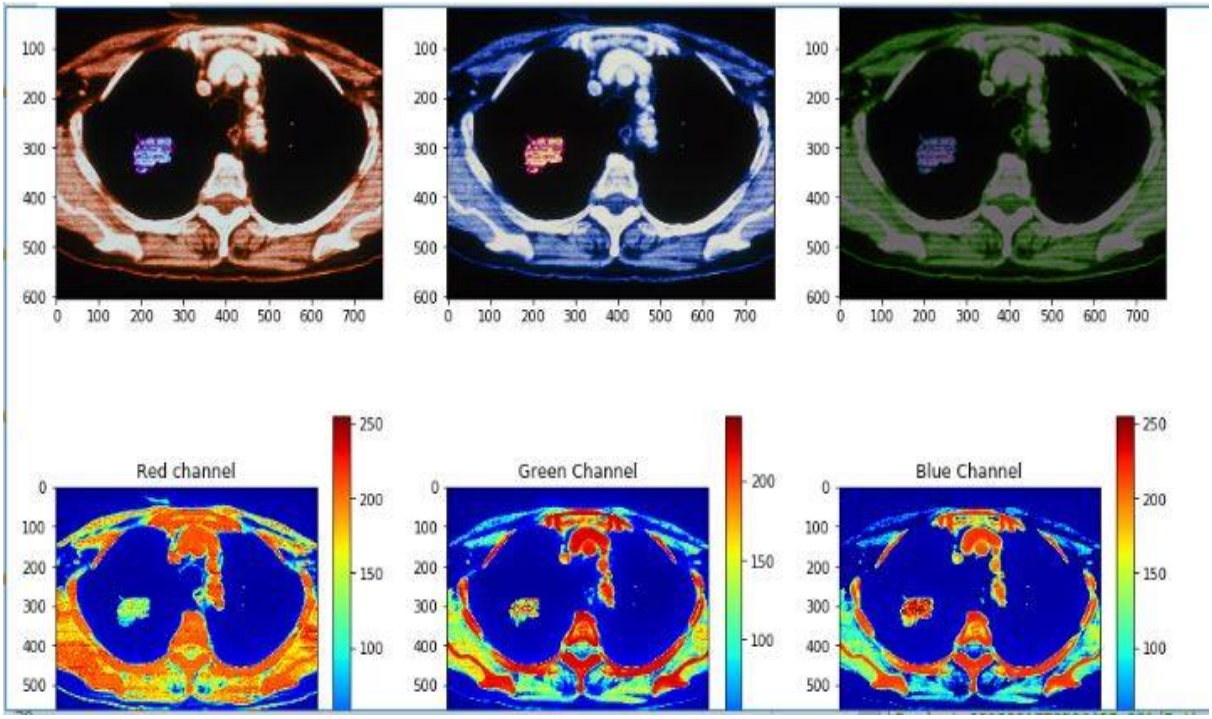

Figure 4. RBG manipulated image of Lung

The Histogram Equalization (HE) spreads out intensity values along the total range of values in order to achieve higher contrast. This method is especially useful when an image is represented by close contrast values, such as images in which both the background and foreground are bright at the same time, or else both are dark at the same time.

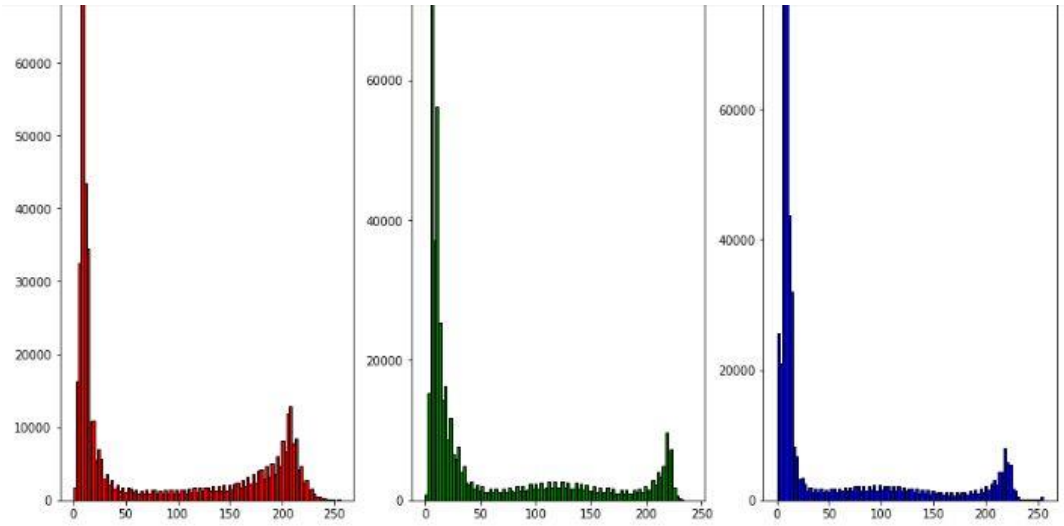

Figure 5. RBG intensity of Lung image

b. Image Segmentation

In this paper, we are using Convolution Neural Network for image segmentation. In machine learning, a convolutional neural network (CNN or ConvNet) is a class of deep, feed forward artificial neural network that are successfully been applied to analyzing visual imagery. CNN use a variation of multilayer perceptrons designed to require minimal preprocessing. They are also known as shift invariant or space invariant artificial neural networks (SIANN) based on their shared weight architecture and translation invariant characteristics.

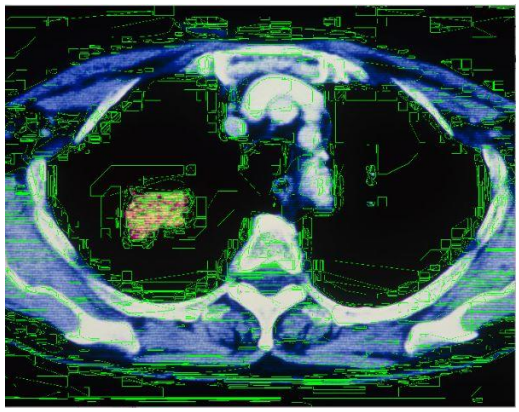

Figure 6. Image of Lung after segmentation

FEATURE EXTRACTION AND CANCER DETECTION

a. Feature Extraction

Feature extraction reclassifies a huge arrangement of repetitive information into an arrangement of elements of decreased measurement. Feature extraction decides the normality or variation from the norm of a picture. For feature extraction we utilized GLCM (Gray Level Co- Occurrence Method) technique which can arrange large combination of pixel brightness values happen in a sample.

b. Cancer Stage Classification

For stage classification, we calculated the total lung area and the total disease affected area. Then we divided the total disease affected area by the total lung area to calculate how much portion of the total lung is

affected. If the affected area was less than 0.1 then we added 0.1 to the affected area to calculate affected area. After that, we compared the result with a pre-selected table to determine the stage of the cancer such as initial, middle or final.

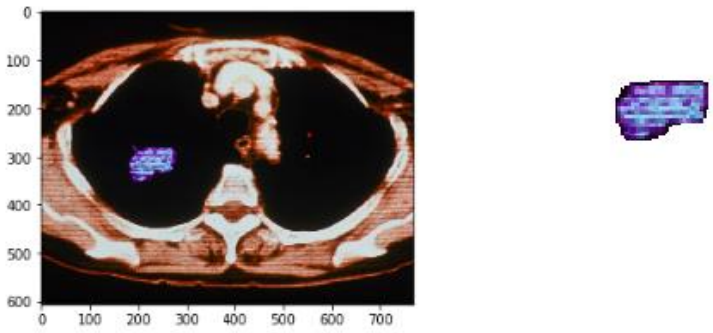

Figure 7. Cancer extracted from Lung image

CONCLUSION

The proposed work is a reliable and robust technique for estimating the affected cancer tissues using a deep convolution neural network. Deep network with multiple convolution and fully connected layers using regularization techniques makes the complex feature extraction task from cancer images effectively. Estimating the cancer tissue sample can be done in seconds with very little human effort. This deep learning network need does not require reprogramming, as it is adaptive and flexible.

FUTURE WORK

In our concept there are various small tasks that can improve the accuracy**.** We are using colored CT images as our dataset. It is also possible to use grey scale images. In addition to that, removing the black patched images from our dataset might increase the overall accuracy of our findings. It is also good to use large training set for deep learning. We can also find the intensity of cancer using these deep learning techniques. Increasing the number of convolutional and fully connected layers, tweaking the parameters like regularization and learning rate for further optimization might improve the accuracy.

REFERENCES

1. J.Dai, K.He and J. Sun, “Convolutional feature masking for joint object and stuff segmentation,” in IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2015.
2. Y. Jia, E. Shelhamer, J. Donahue, S. Karayev, J. Long, R. Girshick, S. Guadarrama, and T. Darrell. Caffe: Convolutional architecture for fast feature embedding. arXiv preprint arXiv:1408.5093, 2014.
3. S. Kim, C. D. Yoo, S. Nowozin, and P. Kohli, “Image segmentation using higher- order correlation clustering,” IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI).
4. B. Hariharan, P. Arbelaez, R. Girshick, and J. Malik. Simul- ´ taneous detection and segmentation. In ECCV. 2014
5. P. Dollar and C. L. Zitnick, “Fast edge detection using structured forests,” IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI).
6. K. Simonyan and A. Zisserman, “Very deep convolutional networks for large- scale image recognition,” in International Conference on Learning Representations (ICLR), 2015.
7. P. Felzenszwalb and D. Huttenlocher, “Efficient graph-based image segmentation,” International Journal of Computer Vision, vol. 59, pp. 167–181, 2004.
8. S. Kim, S. Nowozin, P. Kohli, and C. D. Yoo, “Higher-order correlation clustering for image segmentation,” in Proc. Neural Information Processing Systems, 2011.
9. J. Donahue, Y. Jia, O. Vinyals, J. Hoffman, N. Zhang, E. Tzeng, and T. Darrell. Decaf: A deep convolutional activation feature for generic visual recognition. arXiv:1310.1531, 2013.

10. R. Mottaghi, X. Chen, X. Liu, N.-G. Cho, S.-W. Lee, S. Fidler, R. Urtasun, and A. Yuille. The role of context for object detection and semantic segmentation in the wild. In CVPR. 2014.
11. M. D. Zeiler and R. Fergus. Visualizing and understanding convolutional neural networks. arXiv preprint arXiv:1311.2901, 2013.
12. R. Girshick, J. Donahue, T. Darrell, and J. Malik. Rich feature hierarchies for accurate object detection and semantic segmentation. arXiv preprint arXiv:1311.2524, 2013.