

# Abnormal Cell Segmentation Using Convolutional Neural Network

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**Abstract:** This project describes about the segmentation of abnormal cells. The purpose of image segmentation is to partition an image into meaningful regions with respect to a particular application. Automatic segmentation can be possible by using Convolutional Neural Network. The CNN is built over convolutional layers with small 3\*3 kernels to allow deeper architectures. CNN segmentation provides better delineation of the abnormal cell. Advantage of CNN is to provide intensity normalization. Convolutional layers have fewer weights to train than dense FC layers, making CNN easier to train and less prone to over fitting. The proposed system is to implement CNN for the diagnosis of lung tumor with complex patterns.

## 1. Introduction

Tumor affects nearly 1 million cases per year, that becomes a major threat to the living which can be easily treatable by means of various techniques. Those abnormal cells can be detected by using a very efficient and effective method termed as Convolutional Neural Networks. CNNs are very similar to ordinary Neural Networks since they are made up of neurons that have learnable weights and biases. Each neuron receives some inputs, performs a dot product and optionally follows it with a non-linearity.

The whole network still expresses a single differentiable score function i.e from the raw image pixels on one end to class scores at the other.

ConvNet architectures make the explicit assumption that the inputs are images, which allows us to encode certain properties into the architecture. These then make the forward function more efficient to implement and vastly reduce the amount of parameters in the network.

### 1.1 Image Processing Description

Image processing is any form of signal processing for which the input is an image such as photograph or video frame. The output of the

image processing may be either an image or set of characteristics or parameters related to the image. Image processing allows one to enhance image features for a given application. It is a subset of the electronic domain wherein the image is converted to an array of small integers, called pixels. Each pixel in the image is stored as a number between 0 to 255, where 0 represents a black pixel, 255 represents a white pixel and values in-between represents shades of gray.

## 2. Objective

The goal of abnormal cell segmentation is to detect the location and extension of the tumor regions, namely active tumorous tissue (vascularized or not), necrotic tissue, and edema (swelling near the tumor). This is done by identifying abnormal areas when compared to normal tissue.

CNNs are a very efficient and effective class of models for computer vision, and they have been shown to learn and extract visual features able to generalize well across many tasks. An automatic segmentation method based on convolutional neural network (CNN) is performed to be very effective for abnormal cell (tumor, stone, glioma) segmentation in CT and MRI images. Abnormal cell segmentation from MR images can have great impact for improved diagnostics, growth rate prediction and treatment planning. While some tumors such as meningiomas can be easily segmented, others like gliomas and glioblastomas are much more difficult to localize. This treatment planning is a key stage to improve the quality of life of patients.

## 3. Description

The proposed method involves the use of small  $3 \times 3$  kernels to obtain deeper CNNs. With smaller kernels we can stack more convolutional layers, while having the same receptive field of bigger kernels. For instance, two  $3 \times 3$  cascaded

Convolutional layers have the same effective receptive field of one 5×5 layer, but fewer weights. At the same time, it has the advantages of applying more non-linearities and being less prone to overfitting because small kernels have fewer weights than bigger kernels. In the existing method, the input image will be noisy due to the absence of filtering process therefore enhanced images must be used. This system uses median filters to smooth the cell images. The contrast and colour of the images are enhanced. On this basis, a lung tumor cell identification module is employed to analyse the features to identify whether the tumor cell exist in specimens are not.

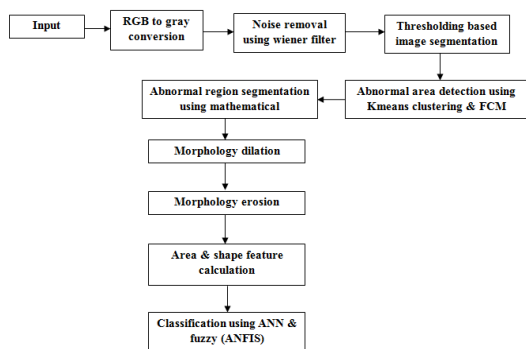


Figure.3.1. Block diagram of proposed method

### 3.1. Threshold Technique

The threshold technique is simplest in segmenting methods. To set two thresholds on the histogram of the image, we can classify between the two thresholds in the histogram as the same region and classify the others as the second region. Multi-level thresholding through a statistical recursive algorithm is one of the algorithm, which is used in segmenting an image into multi-level by using mean and variance.

### 3.2. K-Means and FCM Clustering

The members which are similar in some way are organized into a group. A cluster is therefore a collection of objects which are “similar” between them and are “dissimilar” to the objects belonging to other clusters. The goal of clustering is to determine the intrinsic grouping in a set of unlabeled data. K-means is an exclusive clustering algorithm, Fuzzy C-means is an overlapping clustering algorithm. K-Means is a least-squares partitioning method that divide a collection of objects into K groups. The initial assignment of points to clusters can be done randomly. Fuzzy c-means (FCM) is a method of clustering which allows one piece of data to belong to two or more clusters.

## 3.3. Morphological Segmentation

The two basic operators in the area of mathematical morphology are dilation and erosion. It is basically work on binary images ,but there are some version for grayscale images .The use of the dilation operator is to enlarge the boundaries of pixels of foreground pixels i.e .white pixels.In general dilation causes objects to grow in size. Dilation is the dual of erosion i.e. dilating foreground pixels is equivalent to eroding the background pixels. Erosion causes objects to shrink.

## 4. Technology Used

### 4.1 MATLAB

MATLAB(MATrixLABoratory) is a fourth generation programming language that allows matrix manipulations, plotting of data, implementation of algorithm and creation of user interfaces. The MATLAB application is built around MATLAB scripting language. The MATLAB version used here is MATLABr2014a.

## 5.Simulation Results

The input is taken as the image and fed into the software for the compilation.The captured image moved into the pre-processing stage. This stage is composed of smoothing enhancement and segmentation. Following this stage, feature extraction is performed. Finally the lung tumor cell is being identified.The compilation makes us to differentiate the abnormal cell from the normal cell.

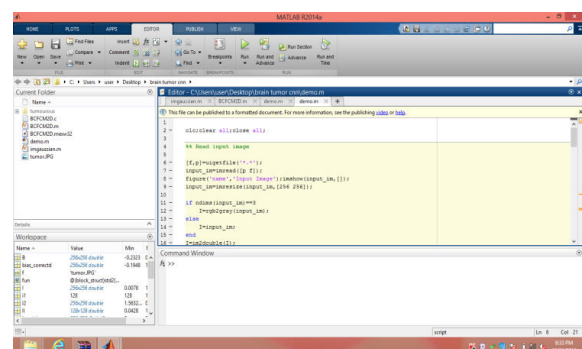


Figure.5.1 Simulation

## 6. Conclusion

It is concluded that the analysis of the Convolutional Neural Network can be used for segmentation of organs with complex patterns. The study of segmentation of the abnormal cells in

various organs has been a very active field of research in recent years. This lead to big advances in the field of medical diagnosis. Among the neural networks, Convolutional Neural Network proves to be very effective in the areas of tumor ailments. Although the CNN is complex, the results are very accurate.

## **7. References**

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