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MULTIPLE DEEP CODER NETWORKS FOR MEDICAL IMAGES USING IMAGE SEGMENTATION

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ABSTRACT

Image segmentation is commonly used to detect objects and boundaries. It is vital in many clinical claims, such as the pathological diagnosis of hepatic diseases, surgical planning, and postoperative assessment. The segmentation mission is hindered by fuzzy boundaries, complex backgrounds, and appearances of objects of interest, which vary considerably. The success of the approach is ability highly based on the operator's abilities and the level of hand-eye coordination. Thus, this project was strongly motivated by the necessity to obtain an early and accurate diagnosis of a detected object in medical images. In this project, propose a new polyp segmentation method based on the architecture of a multiple deep encoder decoder networks combination called CDED-net. The architecture cannot only hold multi-level contextual information by extracting discriminative features at different effective fields-of-view and multiple image scales but also learn rich information features from missing pixels in the training phase. Moreover, the network is also able to capture object boundaries by using multi scale effective decoders. It also proposes a strategy for improving the method's segmentation performance based on a combination of a boundary-emphasization data augmentation method and a new effective dice loss function. The goal of this project is to make our deep learning network available with poorly defined object boundaries, which are caused by the non-specular transition zone between the back ground and fore ground regions.

Keyword: - *Skin Lesion, Convolutional Neural Network (CNN), CDED-net.*

1. INTRODUCTION

The worldwide disclosure of computer networks and the acceptance of electronic managing of medical records have made it feasible for digital medical images to be shared across the world for aid such as telemedicine, teleradiology, telediagnosis, and teleconsultation. Instant diagnosis and comprehension of a definite disease as well as cutting down the number of misdiagnosis has had sizeable social and economic crash, clearly showing the need for structured patient information sharing between experts of disparate hospitals. In the holding of medical images, the main precedence is to secure preservation for the patient's documents against any act of tampering by unauthorized persons. Thus, the main discuss of the existing electronic medical system is to evolve some standard solution to conserve the authenticity and honesty of the content of medical images.

1.1 COMPUTER AIDED SEGMENTATION

The medical image analysis community has taken notice of these pivotal developments. However, the transition from systems that require manual manipulation to systems that learn features from the data has been increased gradually. To help clinicians make faster and more accurate decisions, automatic medical image segmentation approaches have been introduced, and for the last two decades, they have been the most successful methods for medical image analysis. Computer aided segmentation systems can significantly reduce the missing rates of medical objects and help clinicians identify regions of interest despite the complexity of the case.

1.2 ARTIFICIAL INTELLIGENCE

Moreover the transition zone between the object and its surrounding area usually does not exhibit a significant change in texture or colour that would enable clinicians to distinguish it from all other normal regions. In order to deal with these main problems, primarily focused on building a deep convolutional neural network to generate discriminative features that are Artificial Intelligence (AI) is an important field of computer science which thriving enormous research hotspots and applications. AI is an attempt of human intelligence and generates intelligent machines that process information. Its main agenda is to cultivate brain–like machines.

1.3 OBJECTIVE OF THE PROJECT

The main objective of this project is to propose a new polyp segmentation method based on the architecture of a multiple deep encoder decoder networks combination called CDED-net. A deadly skin cancer diseases needs to be detected at an early stage to be diagnosed properly. Early diagnoses can be done with accurate image segmentation of skin lesions. Segmentation is an important step in computer aided diagnostic system to accurately define the lesion area and detect the pigmented skin lesion boundary. It is important that the skin lesion segmentation algorithm is accurate, because resulting segmentation is used as an input to feature extraction and melanoma classification algorithms.

2. EXISTING SYSTEM

Existing problems in medical image segmentation fields: recognizing the transition space between the object region and non-object region and the large variety of segmenting object shapes when it comes to the first issue, unlike the contour of a common object, which clearly distinguishes the object of interest from the background, the boundary of a medical object is hardly defined. There are two causes of this problem. The first is the quality of the camera. Owing to the nature of the medical task, the camera usually goes inside the patient to take images of internal organs and tissue. Therefore, its size should be small, but unfortunately, the images taken by small cameras have distorted resolutions. Besides, for computed tomography (CT) images and other types of images, the ability to differentiate materials depends on the images respective linear attenuation coefficients. Practically speaking, the quality of a CT image is strongly dependent on material properties such as density and atomic composition, the machine parameters of the X-ray spectrum utilized, and the signal-to-noise ratio.

Endoscopists have claimed that even when good quality tools are used to take images, the object of interest is still difficult to find because they cannot distinguish between its boundary and the normal area. Hence, Chen et al. modified the U-Net network for gland segmentation and inspired to find a better segmentation method based on prior knowledge. Nevertheless, when applied in medical fields, the DCAN gives poor boundary segmentation, owing to its weak contrast and is therefore less effective than commonly used methods. To overcome this issue, rather than masking polyp boundaries by using fixed contours to explore complementary information randomly mask object boundary thickness and the objects neighboring regions that do not differ widely from the object by

casually changing pixel values inside the interest area. These masked regions are considered as new labels that provide richer information than previous augmentation methods in the medical segmentation task.

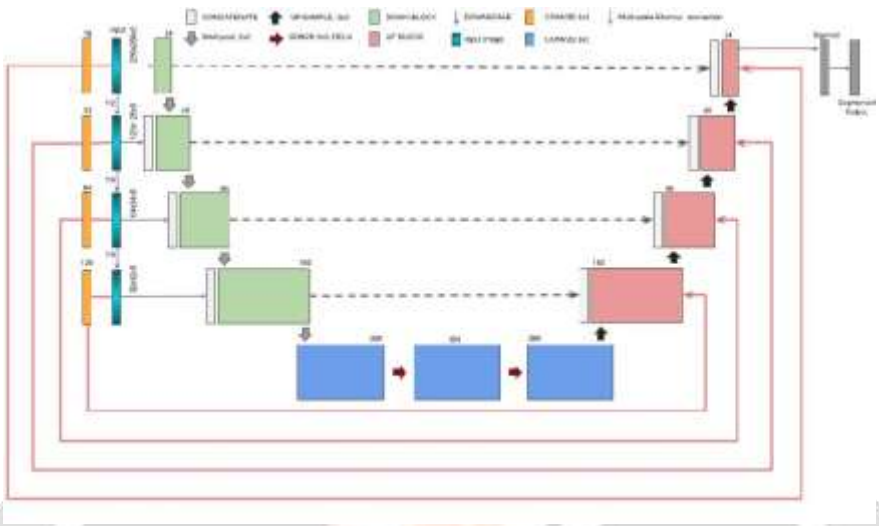

Fig -1: Architecture of u-net

3. PROPOSED SYSTEM

The methodology on which the proposed method is based, including the set of sample images used for evaluation, as well as detailing the theoretical basis of the proposed medical object segmentation. First, present the novel medical segmentation data augmentation method. Second, incorporate all the augmented datasets into the CDED-net to teach the model to discriminate the background and foreground. In the last step, propose a Discuss-cost function that can effectively boost the segmentation performance of our network. Propose a new continuous multiple deep encoder decoder network, CDED-Net, to extract the most useful features from images and learn completely from multi scale image inputs. Introduce a boundary-emphasization augmentation method for making a high number of object boundary patterns from each image in a training set. The novel augmentation method enhances and boosts the segmentation performance of CDED-net.

This architecture can also effectively learn important information and recover parts related to object boundaries that are lost when the data passes through many convolutions and pooling layers because the second network always learns patterns that were missed in the best network training phase. The proposed method enlarges the perceived ability size without missing important information. In CDED-net, instated of using constraint dilate convolution, use different both of strides and rates for each component network to capture contextual information at multiple scales input. Present a new Discuss-loss function, which is a measure of overlap widely used to assess segmentation performance of a network. The combination of the loss function and our CDED-net result gives a better performance. The cascade architecture of dilated convolutions is used at the end of our network to extract multi-scale context information in local regions and does not require an increased number.

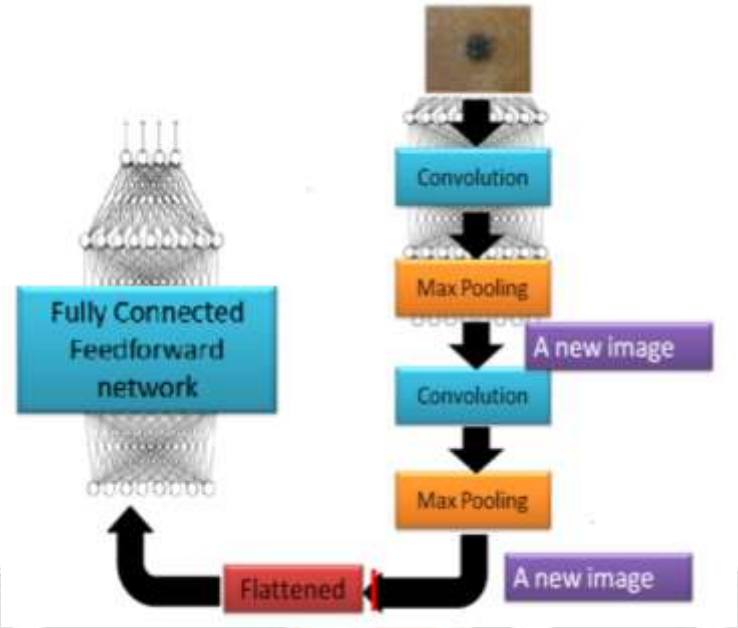

Fig -2: Architecture diagram

4. DEEP LEARNING APPROACH IN MEDICAL AREA

Deep learning technology is a kind of machine learning technology .These technologies used to extract the data and process for as per requirements. The fundamental idea of Deep learning is to acquire data representations by improving abstraction levels. Different kinds of architectures for deep learning have proposed including Convolutional Neural Network (CNN), Deep Auto-Encoder and Deep Neural Network (DNN). Image processing is the growing concept in medical field. Image processing delivers significant information on decision making. Different kinds of steps are followed on medical field before obtaining output. Medical image is given as input to the deep learning and it is partitioned into segments in order to concentrate on important area. Next, those segments are used to extract significant information with the help of information retrieval techniques. Then the required features are obtained without noise by using noise removal techniques. The obtained data classified by using classifier and predictions are done by using classification. These steps are followed for every experiment performed in machine and deep learning.

5. NEURAL NETWORK

A neural network is a series of algorithms that attempt to allow underlying relationships in a set of data through a process that imitate the way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature. Neural networks can adapt to changing input; so the network generates the best possible result without needing to redesign the output criteria. The concept of neural networks, which has its roots in artificial intelligence, is swiftly gaining popularity in the development of trading systems. A neural network works similarly to the human brain's neural network.

A "neuron" in a neural network is a mathematical function that collects and classifies information according to a specific architecture. The network bears a strong resemblance to statistical methods such as curve fitting and regression analysis. Hidden layers fine-tune the input weightings until the neural network's margin of error is minimal. It is hypothesized that hidden layers extrapolate salient features in the input data that have predictive power regarding the outputs. This describes feature extraction, which accomplishes a utility similar to statistical techniques such as principal component analysis.

Table -1: Matlab commands for displaying an image

Operation	Mat lab command
Display an image represented as the matrix X.	images(X)
Adjust the brightness. s is a parameter such that -1<s<0 gives a darker image, 0<s<1 gives a brighter image.	brighten(s)
Change the colors to gray.	color map(gray)

5.1 ACTIVATION FUNCTIONS

The activation function used in the demo neural network is called a log-sigmoid function. There are many other possible activation functions that have names like hyperbolic tangent, Heaviside and Gaussian. It turns out that choosing activation functions is extremely important and surprisingly tricky when constructing practical neural networks. The method accepts a type double input parameter z. The return value is type double with value between 0.0 and 1.0 inclusive. In the early days of neural networks, programs could easily generate arithmetic overflow when computing the value of the Exp function, which gets very small or very large, very quickly. For example,Exp (-20.0) is approximately 0.000000002061153622438 6. Even though modern compilers are less susceptible to overflow problems, it's somewhat traditional to specify threshold values such as the -20.0 and +20.0 used here.

6. SOFTWARE SPECIFICATION

- System : Windows XP Professional Service Pack 2
- Processor: Up to 1.5 GHz
- Memory : Up to 512 MB RAM

MATLAB is a mathematical computer package from The Math Works. "MATLAB" stands for "Matrix Laboratory". MATLAB's functions operate on matrices and vectors, as well as scalar numbers, so it is very useful for linear algebra applications. It performs any number of simple or complicated mathematical operations, including image processing. As a general-purpose programming language, it is easy to learn and use, but powerful enough for a wide range of science and engineering applications. The built-in and online documentation is excellent. Please keep the manuals in the lab. To access MATLAB, log in to one of the PCs and double-click on the MATLAB icon on the desktop. The MATLAB environment will open. It is a window with several panes. The largest one is the command line.

7. VARIOUS TYPES OF IMAGES

7.1 Intensity Image (Gray Scale Image)

This is the equivalent to a "gray scale image". It represents an image as a matrix where every element has a value corresponding to how bright/dark the pixel at the corresponding position should be coloured. There are two ways to represent the number that represents the brightness of the pixel: The double class (or data type). This assigns a floating number between 0 and 1 to each pixel. The value 0 corresponds to black and the value 1 corresponds to white. The other class is which assigns an integer between 0 and 255 to represent the brightness of a pixel.

7.2 Indexed Image

This is a practical way of representing color images. An indexed image stores an image as two matrices. The first matrix has the same size as the image and one number for each pixel. The second matrix is called the color map and

its size may be different from the image. The numbers in the first matrix is an instruction of what number to use in the color map matrix.

7.3 RGB Image

This is another format for colour images. It represents an image with three matrices of sizes matching the image format. Each matrix corresponds to one of the colours red, green or blue and gives an instruction of how much of each of these colours a certain pixel should use.

8. IMAGE FILE FORMATS

Image file sizes

Image file size expressed as the number of bytes increases with the number of pixels composing an image, and the color depth of the pixels. The greater number of rows and columns, the greater image resolution, and the larger the file. Also, each pixel of an image increases in size when its color depth increases an 8-bit pixel (1 byte) stores 256 colors, a 24-bit pixel (3 bytes) stores 16 million colors, the latter known as color. Image compression uses algorithms to decrease the size of a file. High resolution cameras produce large image files, ranging from hundreds of kilobytes to megabytes, per the camera's resolution and the image-storage format capacity. High resolution digital cameras record 12 megapixel images, or more, in true color. For example, an image recorded by a 12 MP camera; since each pixel uses 3 bytes to record true color, the uncompressed image would occupy 36,000,000 bytes of memory a great amount of digital storage for one image, given that cameras must record and store many images to be practical. Faced with large file sizes, both within the camera and a storage disc, image file formats were developed to store such large images.

9. CONCLUSIONS

In this project, proposed approach that uses an ensemble of multi model deep encoder-decoder networks, called CDED-Net, for medical object segmentation and also presented a new data augmentation method called boundary emphasization that can be easily applied in most of the segmentation approaches in the medical field; it can strongly help the network to focus on the object contour. The main motive of this project is to give valuable insights to apply deep learning techniques in MRI modal based area. Deep learning techniques have been implemented in MRI based image analysis and processing. The deep learning helps to classify disease pattern enumeration and categorize from the processing of image. It permits to enhance analytical goals also generates prediction prototypes for the betterment of treatment. The researchers from medical image consider these tasks as challenges for continuing to flourish. This deep learning grows rapidly in health care based applications and it will conquer significant accomplishments in the medical field.

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